



**RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:**

**Regional Manager/Real Property
Contracting/PWGSC
Ontario Region, Tendering Office
12th Floor, 4900 Yonge Street
Toronto, Ontario
M2N 6A6
Ontario**

**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

**THIS PROCUREMENT CONTAINS A SECURITY
REQUIREMENT**

Vendor/Firm Name and Address

**Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Issuing Office - Bureau de distribution

**Regional Manager/Real Property Contracting/PWGSC
Ontario Region, Tendering Office
12th Floor, 4900 Yonge Street
Toronto, Ontario
M2N 6A6
Ontario**

Title - Sujet 441 University Recapitilization	
Solicitation No. - N° de l'invitation EQ754-162494/A	Date 2016-04-18
Client Reference No. - N° de référence du client R.076516.013	
GETS Reference No. - N° de référence de SEAG PW-\$PWL-023-2134	
File No. - N° de dossier PWL-5-38212 (023)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2016-06-02	Time Zone Fuseau horaire Eastern Daylight Saving Time EDT
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Lau, Karen	Buyer Id - Id de l'acheteur pwl023
Telephone No. - N° de téléphone (416) 512-5297 ()	FAX No. - N° de FAX (416) 512-5862
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: 441 University Avenue West Windsor, ON N9A 5P9	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée	Delivery Offered - Livraison proposée
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

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REQUEST FOR PROPOSAL (RFP)

**441 UNIVERSITY RECAPITALIZATION,
WINDSOR, ONTARIO**

SOLICITATION NO.: EQ754-162494/A

PROJECT NO.: R.076516.013

PWGSC Contracting Authority:

Karen Lau

4900 Yonge Street

Toronto, Ontario – M2N 6A6

Telephone: 416 512-5297

Fax: 416 512-5862

E-mail: karen.lau@pwgsc-tpsgc.gc.ca

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THIS PROCUREMENT CONTAINS A SECURITY REQUIREMENT

REQUEST FOR PROPOSAL (RFP)

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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 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 (2016-04-04), 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;
 - (d) the document entitled “Doing Business with Public Works and Government Services Canada”;
 - (e) the document entitled "Feasibility Study";
 - (f) the document entitled "PWGSC Commissioning Manual (CP.1) 4th edition";
 - (g) the Security Requirements Check List (SRCL);

- (h) any amendment to the solicitation document issued prior to the date set for receipt of proposals; and
 - (i) 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 ten (10) 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), the World Trade Organization - Agreement on Government Procurement (WTO-AGP).

SI5 CERTIFICATIONS

1. Integrity Provisions – Declaration of Convicted Offences

In accordance with the Ineligibility and Suspension Policy (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Proponent must **provide with its bid, as applicable**, to be given further consideration in the procurement process, the required documentation as per R1410T (2016-04-04), General instructions 1 (GI1), Integrity Provisions – Proposal, **section 3b**.

SI6 SECURITY REQUIREMENT

1. At the date of bid closing, the following conditions must be met:
- (a) the Proponent must hold a valid organization security clearance as indicated in Supplementary Conditions SC1;
 - (b) the Proponent's proposed individuals requiring access to classified or protected information, assets or sensitive work site(s) must meet the security requirement as indicated in Supplementary Conditions SC1;
 - (c) the Proponent must provide the name of all individuals who will require access to classified or protected information, assets or sensitive work sites.;
2. For additional information on security requirements, proponents should refer to the Canadian Industrial Security Directorate (CISD), Industrial Security Program of Public Works and Government Services Canada (<http://ssi-iss.tpsgc-pwgsc.gc.ca/index-eng.html>) website.

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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 (2016-04-04), General Condition (GC) 1 - General Provisions – Architectural and/or Engineering Services
 - R1215D (2016-01-28), 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 (2016-01-28), 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 (2016-01-28), General Condition (GC) 8 - Dispute Resolution
 - R1250D (2015-07-03) R1650D (2015-07-03), General Condition (GC) 9 - Indemnification and Insurance
 - Supplementary Conditions
 - Agreement Particulars
 - (c) Project Brief;
 - (d) the document entitled "Doing Business with Public Works and Government Services Canada";
 - (e) the document entitled "Feasibility Study";
 - (f) the document entitled "PWGSC Commissioning Manual (CP.1) 4th edition";
 - (g) the Security Requirements Check List (SRCL);
 - (h) any amendment to the solicitation document incorporated in the Agreement before the date of the Agreement;
 - (i) 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.

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- (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;
- (h) the document entitled "Doing Business with Public Works and Government Services Canada";
- (i) the document entitled "Feasibility Study";
- (j) the document entitled "PWGSC Commissioning Manual (CP.1) 4th edition";
- (k) the document entitled "Security Requirements Check List";
- (l) the proposal.

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SUPPLEMENTARY CONDITIONS (SC)

SC1 SECURITY REQUIREMENT

The following security requirement (SRCL and related clauses) applies and form part of the Agreement.

1. The Contractor/Offeror must, at all times during the performance of the Contract/Standing Offer, hold a valid **Designated Organization Screening (DOS)**, issued by the Canadian Industrial Security Directorate (CISD), Public Works and Government Services Canada (PWGSC).
2. The Contractor/Offeror personnel requiring access to sensitive work site(s) must **EACH** hold a valid **RELIABILITY STATUS**, granted or approved by CISD/PWGSC.
3. Subcontracts which contain security requirements are **NOT** to be awarded without the prior written permission of CISD/PWGSC.
4. The Contractor/Offeror must comply with the provisions of the:
 - (a) Security Requirements Check List and security guide (if applicable), attached at Appendix "G";
 - (b) Industrial Security Manual (Latest Edition).

SC2 CONSTRUCTION COST LIMIT

1. The Construction Cost Limit is \$12.7M (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.

SC3 CHANGES TO CLAUSE R1250D (2015-07-03), GENERAL CONDITION (GC 9) – INDEMNIFICATION AND INSURANCE

R1250D GC9.2 (2015-07-03) Insurance Requirements, 3. Professional Liability, article b. is amended as follows:

Delete: In it's entirety.

Insert: b. The following provision must be incorporated into the conditions of the Consultant's Professional Liability insurance coverage: "Notice of Cancellation of Insurance Coverage: The Consultant agrees to immediately advise the

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Contracting Authority in writing upon being informed or in receipt of any notification of a pending cancellation of its professional liability insurance and /or cancellation of its Certificate of Practice, or of any intention by the Consultant to reduce the claim limits it maintains."

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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.

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PROJECT BRIEF

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- PD 3 Project Background
- PD 4 Existing Documentation
- PD 5 Program
- PD 6 Project Objectives
- PD 7 Issues
- PD 8 Consultant Services

Description of Services (PA)

- PA 1 Project Administration

Required Services (RS)

- RS 1 Analysis of Project Requirements
- RS 2 Design Concept
- RS 3 Design Development
- RS 4 Construction Documents
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- AS 1 Waste Management

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PROJECT BRIEF

This Project Brief is divided into two sections:

- **Description of Project (PD)**
- **Description of Services**
 - Project Administration (PA)
 - Required Services (RS)
 - Additional Services (AS)

For standards relating to the service provisions herein please refer to the document “Doing Business with A&ES”. The standards in “Doing Business with A&ES” must be adhered to in conjunction with this scope of services.

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DESCRIPTION OF PROJECT (PD)

PD 1 PROJECT INFORMATION

Public Works and Government Services Canada (PWGSC) intends to retain an Architectural firm, acting as Prime Consultant, for the provision of the services required for this project.

- 1.1 PWGSC Project Title:** 441 University Recapitalization
- 1.2 Location of the Project:** 441 University Avenue West, Windsor, Ontario
- 1.3 PWGSC Project Number:** R.076516.013
- 1.4 Client / User:** Canada Revenue Agency (CRA), and Environment Canada (EC).
- 1.5 PWGSC Project Manager:** Michael Barrett

PD 2 PROJECT IDENTIFICATION

2.1 Description

Public Works and Government Services Canada (PWGSC) is renovating the building at 441 University Avenue West in Windsor. The facility is underutilized and in need of rehabilitation and upgrades so as to achieve the project mandate. The Scope of Work for this project is to develop construction documents and undertake construction and contract administration for the upgrading of the base building for an extended life expectancy of 25 years, and for tenant fit-up.

Areas of work that have been identified for upgrade include, but not limited to masonry repair, roof replacement, Heating, Ventilating, and Air Conditioning (HVAC) upgrade suitable for 300 employees (150 on the 1st floor and 150 on the 2nd), elevator modernization, window upgrade, new interior walls, high density mobile storage, communications equipment, and fire alarm to name a few.

2.2 Cost

The construction budget is estimated at \$12.7M (Excludes HST). The estimate includes:

- Base building construction.
- Fit-up construction.
- Tenant funded work.
- Contractor's overhead and profit.
- Design and Construction contingencies.

2.3 Schedule

Project final completion date is January 2018.

PD 3 PROJECT BACKGROUND

PWGSC is the building owner and the custodian department for the Government of Canada Building (GoCB) at 441 University Avenue West in Windsor. The site fronts north onto University Avenue and is bordered by asphalt paved lanes ways on the east and west and by Park Street to the south. The building was constructed in 1958 and is a two story structure with a partial concrete basement. The first and second floors of the building are of wood construction with exterior face brick. The building has an approximate usable floor area of 4,562 m² and is classified as a Group D Occupancy. The building was designed in 1952 by Department of Public Works (DPW) Chief Architect E.A. Gardner.

The first and second floors consist of various open and closed office areas, meeting rooms, corridors, storage spaces, and semi-finished offices. Access to the flat roof is provided by an exterior stair, which is accessed from the secure parking lot on the south side of the building. The building is occupied by Service Canada, Canada Revenue Agency (CRA) and Environment Canada (EC). There are approximately 60 people working in the building currently. They are almost exclusively CRA employees working on the 1st floor. The basement consists of service areas, storage space, and semi-finished office space (office of facility manager).

This facility has been reviewed by the Federal Heritage Building Review Office (FHBRO) and IS NOT designated as a heritage building.

PWGSC will engage an independent Environmental Consultant to undertake a designated substance survey, provide a remedial plan of action, write abatement specifications, and provide a strategy for abatement monitoring. The Consultant under this proposal, will be required to coordinate and incorporate this remedial work into the plans and specifications for the General Contractor's contract.

A building condition report and feasibility study was conducted by a separate third party Consultant that identified the current state of the facility, when building elements will reach the end of their useful life, and which elements need to be replaced immediately if the building is going to be renovated for future use.

PD 4 EXISTING DOCUMENTATION

4.1 Existing Documentation - available for all proponents

- Doing Business with Public Works and Government Services Canada, dated April 8, 2013 (attached as Appendix D).
- Feasibility Study, dated January 21, 2016 (attached as Appendix E).
- PWGSC Commissioning Manual (CP.1) 4th edition, dated November 2006 (attached as Appendix F).

4.2 Access to documentation for Proponents

- Fit-up Standards at <http://www.tpsgc-pwgsc.gc.ca/biens-property/amng-ftp/index-eng.html>

4.3 Existing Documentation - to be made available for successful Proponent

- AutoCAD floor plans.
- Functional Program.
- Hazardous materials and designated substance report.

PD 5 PROGRAM

A Functional Program will be provided identifying the space functional requirements for Canada Revenue Agency (CRA) and Environment Canada (EC). The report will include the following information:

- FTE's and space allocations.
- Existing Architectural floor plans.
- Approved CRA furniture interior layouts.

PD 6 PROJECT OBJECTIVES

The Consultant shall undertake design and construction administration activities that will rehabilitate and upgrade the base building, with a 25 year useful life in mind. The rehabilitation and upgrades will prepare the building to receive future tenants and allow the building to be fully utilized. Scope of work for this project will adopt recommendations outlined as “option 1” and “option 3” from the Feasibility Study (attached as Appendix E). The proposed future use of the building will consist of an office occupancy where 273 employees from two tenants will be occupying the first and second floors.

The main objectives of this project are:

- Optimize space utilization in the building by using Workplace 2.0 Fit-up Standards.
- Provide Federal Clients with accommodation that meet their program requirements.
- Address accessibility standards.
- Elimination of health and safety risks.
- Reduction of operation and maintenance costs.

6.1 Quality

6.1.1 Design Principles – General

The Department expects the Consultant to maintain a high standard of architectural design, based upon recognized contemporary design principles. All design elements, planning, architectural, engineering and landscaping, must be fully coordinated, and consistent in adherence to good design principles.

The level of quality is to be consistent with other Government of Canada Buildings.

The project is to be implemented in an environmentally responsible manner.

Quality of materials and construction methods shall be commensurate with the type of building and the budget. Avoid experimental materials. Take into account the total life-cycling of the building.

Operating costs must be kept to a minimum and reflect the projected operating costs in the cost plan. This is to be achieved by compliance with the Energy Budget, selection of equipment, requiring the minimum of operating personnel, and building finishes for easy maintenance, etc.

Design for maximum flexibility in immediate and future use of space. Where possible, devise a building grid with column spacing, fenestration and service runs suited to flexible interior space arrangements.

6.1.2 Design Principles – Specific

The Consultant to adhere to PWGSC security requirements

6.2 Sustainable Development

The Canadian Federal Government has begun a series of initiatives to ensure that sustainable development principles are built into the policy of all federal organizations. Public Works and

Government Services Canada (PWGSC) like all federal departments require to have a Sustainable Development Strategy (SDS). Real Property Services Branch of PWGSC has developed their Strategy Plan that sets out principles, goals and actions for integrating sustainable development principles into its policies and operations. The Branch has established the following sustainable development goals under the issues of management, leadership and operation.

This project is to achieve a minimum of Leadership in Energy and Environmental Design (LEED) Canada NC-Silver or 3 Green Globes for Design in accordance with Federal Government policy.

6.3 Waste Management

The Construction, Renovation, and Demolition (CRD) Non-hazardous Solid Waste Management Protocol to which Real Property Services (RPS) is bound, provides directions on the undertaking of non-hazardous solid waste management actions for CRD projects. The protocol is designed to meet the requirements of federal and provincial policies and the objectives of the RPS Sustainable Development Strategy (SDS) as these relate to non-hazardous solid waste generated in CRD projects.

For all Real Property Services projects where the area exceeds 2,000 m², a solid waste management program must be implemented. This requirement exists by regulation in the province of Ontario and by policy for the rest of Canada.

6.4 Code Compliance

Codes, regulations, by laws and decisions of “authorities having jurisdiction” will be observed. In cases of overlap, the most stringent will apply. The Consultant shall identify other jurisdictions appropriate to the project.

6.5 Risk Management

A risk management strategy is crucial for PWGSC Project Management and integrates project planning into procurement planning. All the stakeholders of a project will be an integral part of the risk management strategy, culminating in an integrated product team. Specific services required for project delivery are outlined in Required Services.

6.6 Health and Safety

Public Works and Government Services Canada (PWGSC), recognizes the responsibility to ensure the health and safety of all persons on Crown construction projects and the entitlement of both federal employees and private sector workers to the full protection afforded them by occupational health and safety regulations.

Solicitation No. - N° de l'invitation
EQ754-162494/A

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

Client Ref. No. - N° de réf. du client
R.076516.013

File No. - N° du dossier
PWL-5-38212

CCC No./N° CCC - FMS No./N° VME

In keeping with the responsibility and in order to enhance health and safety protection for all individuals on federal construction sites, PWGSC will voluntarily comply with the applicable provincial/territorial construction health and safety acts and regulations, in addition to the related Canada Occupational Safety and Health Regulations.

PD 7 ISSUES

7.1 Major Cost Issues

Effective cost estimating and cost control is of prime importance and shall be provided by professional quantity surveyors. The class 'C' and class 'B' cost estimates shall be submitted in elemental cost analysis format. The standard of acceptance for this format is the current issue of the elemental cost analysis format issued by the Canadian Institute of Quantity Surveyors.

The class 'A' cost estimate shall be submitted in trade cost breakdown format. Cost estimates shall have a summary plus full back-up showing items of work, quantities, unit prices and amounts.

PD 8 CONSULTANT SERVICES

The consultant team for this project must be capable of providing the following services:

Structural Engineering
Civil Engineering
Architecture
Mechanical Engineering
Electrical Engineering
Commissioning
Interior Design
Cost Control
Time Control

Environmental Consultant
Security and Controls
Fire Protection Engineer
Specification Writing
Elevator Specialist
Code Consultant
Waste Management

DESCRIPTION OF SERVICES

PROJECT ADMINISTRATION (PA)

PA 1 PROJECT ADMINISTRATION

INTENT

The following administrative requirements apply during all phases of project delivery.

1.1 PWGSC Project Management

The Project Manager assigned to the project is the Departmental Representative.

The Project Manager is the Departmental officer directly concerned with the project and responsible for its progress. The Project Manager is the liaison between the Consultant, Public Works and Government Services Canada and the Client Departments.

Public Works and Government Services Canada administers the project and exercises continuing control over the Consultant's work during all phases of development. Unless directed otherwise by the Project Manager, the Consultant obtains all Federal requirements and approvals necessary for the work.

1.2 General Project Deliverables

Where deliverables and submissions include summaries, reports, drawings, plans or schedules, six (6) hard copies shall be provided plus one (1) copy shall be provided in electronic format unless otherwise specified.

1.3 Lines of Communication

Unless otherwise arranged with Project Manager, the Consultant shall communicate with the Project Manager only. There shall be no direct official contact between client departments and the Consultant.

During construction tender call, Public Works and Government Services Canada conducts all correspondence with bidders and makes the contract award.

1.4 Media

The consultant shall not respond to requests for project related information or questions from the media. Such inquiries are to be directed to the Project Manager.

1.5 Meetings

The Project Manager shall arrange meetings bi-weekly throughout the entire project development period,

for all members of project team, including representatives from:

- Client Department(s)
- Public Works and Government Services Canada
- Consultants

The Consultant shall attend the meetings, record the issues and decisions and prepare and distribute minutes within 48 hours of the meeting.

1.6 Project Response Time

It is a requirement of this project that the key personnel of the successful proponent and sub consultant or specialist firms be personally available to attend meeting or respond to inquiries within 2 business days.

1.7 Submissions, Reviews and Approvals

Work in progress is to be reviewed by the Project Manager as well as the following:

PWGSC in-house services

- ♦ Submission Format: reports, drawings and specifications, colour boards, mockups, etc.
- ♦ Submission Schedule: Submissions are reviewed when completed work has been forwarded to the Project Manager.
- ♦ Expected Turnaround Time: 1 week.
- ♦ Number of Submissions: until approval has been received

Design review committee - Client

- ♦ Submission Format: reports, drawings and specifications, colour boards, mockups, etc.
- ♦ Submission Schedule: Submissions are reviewed when completed work has been forwarded to the Project Manager.
- ♦ Expected Turnaround Time: 1 week.
- ♦ Number of Submissions: until approval has been received.

Design review Committee - PWGSC

- ♦ Submission Format: reports, drawings and specifications.
- ♦ Submission Schedule: Submissions are reviewed when completed work has been forwarded to the Project Manager.
- ♦ Expected Turnaround Time: 1 week.
- ♦ Number of Submissions: until approval has been received.

Labour Canada - Fire Protection

- ♦ Submission Format: reports, drawings and specifications.
- ♦ Submission Schedule: Submissions are reviewed when completed work has been forwarded to the Project Manager.
- ♦ Expected Turnaround Time: 1 week.
- ♦ Number of Submissions: until approval has been received.

Chart of Reviews and Approvals		PWGSC		Client	
		R	A	R	A
RS1 Analysis of Project Brief					
Project Scope of Services Report			X		
Class 'D' Estimate			X		
RS2 Design Concept					
Design Options		X		X	
Recommended Design Option			X	X	
Class 'C' Estimate(s)			X		
RS3 Design Development					
Design Development Documents			X		
Class 'B' Estimate(s)			X		
RS4 Construction Documents / Tender Call					
33% Construction Drawings			X	X	
66% Construction Drawings and Specs			X	X	
99% Construction Drawings and Specs			X	X	
Class 'A' Estimate(s)			X		
Final Tender Documents			X	X	
RS5 Tender Call, Bid Evaluation & Construction Contract Award					
Addendums and changes to documents			X		
RS6 Construction and Contract Administration					
Contemplated Change Orders		X			
Change Orders			X		
Progress, Interim and Final Payments			X		
RS7 Commissioning the Facility					
O&M manuals and As Built		X			
Performance Verification & Checklists		X			
Systems Operational Manuals		X			
RS8 Risk Management					
Risk Management Plan		X			
AS1 Waste Management					
Waste Management Plan		X			

R = Review

A = Approval

REQUIRED SERVICES (RS)

RS 1 ANALYSIS OF PROJECT REQUIREMENTS

1.1 INTENT

The purpose of this stage is to ensure that the Consultant has reviewed and integrated all the project requirements, identified and evaluated conflicts or problems, provide alternative strategies, presented and received approval on a Project scope, delivery process, schedule and estimate required to deliver a cohesive quality project. This approved deliverable will become the Project Scope of Services and will be utilized throughout the project to guide the delivery.

1.2 GENERAL

Scope and Activities:

- Visit the building/site and verify the availability and capacity of services needed for the project.
- Attend project start up meeting.
- Analyze the project requirements/program.
 - Review all available existing material related to the project.
 - Review the proposed project schedule for verification that all milestone dates are achievable.
 - Review the cost plan/budget for verification that the costs are realistic and achievable.
 - Identify and verify all authorities having jurisdiction over the project.
 - Identify the codes, regulations and standards that apply.
 - Establish a policy for project to minimize environmental impacts consistent with the project objectives and economic constraints.
 - Establish Sustainability Target using LEED or Green Globes.

1.3 DELIVERABLES

Project Scope of Services; comprehensive summary of the project requirements/program demonstrating understanding of the scope of work including:

- Report on existing base building system elements including their condition, deficiencies and life expectancy.
- Confirmed or adjusted project cost and time plans.
- Written identification of the problems, conflicts or other perceived information/clarifying assumptions for the acknowledgment of the Project Manager.

RS 2 DESIGN CONCEPT

2.1 INTENT

To translate the project requirements into space perimeters. To explore design options and analyze them against priorities and program objectives previously identified. Out of this process, one option will be recommended to proceed to Design Development

2.2 GENERAL

Scope and Activities:

- Present three (3) alternative design options which are viable and have potential for development
- Analyze each solution with regard to the project goals including cost and schedule
- Recommend one option for further development with all supporting background and technical justifications

2.3 DELIVERABLES

Provide the following:

- Design Concept Drawings
- Description of the options with recommendation of preferred solution
- Class 'C' Estimate
- Report on deviation from schedule and recommend corrective measures or updated time line.

2.4 DETAILS

2.4.1 Architectural Drawings:

- Site plan showing building outline, orientation, and main accesses.
- Schematic building plans of alternatives showing relative disposition of main accommodation areas, circulation patterns, numbers of floors, etc.
- Sketch elevations and sections indicating the basic design approach and aesthetic philosophy.
- Outside gross building areas and summary of main accommodation areas required and proposed
- Horizontal and Vertical space relationships

2.4.2 Mechanical:

- The concept submission shall include a description a specific mechanical requirements and function for each area (room) in the building. Incorporate in the submission a schedule of requirements listing all rooms and identify the mechanical building services to be provided.
- Explain in the concept submission the manner in which the proposed mechanical systems correlate with user requirements.
- Identify the volume of outdoor air to be supplied per person.
- Identify the delivery rate of supply air to occupied spaces.
- Identify whether full time operating staff will be needed for operating any of the mechanical equipment. Differentiate between staff that is needed by code requirements versus that staff which is needed because of the nature and size of the facility.

- Identify location of entry point into the building of all mechanical services into the building.
- Identify in square meters the area to be provided for mechanical rooms, and then identify what percentage of total building area this represents. Identify location of mechanical spaces in the building.
- Analysis of alternative mechanical schemes at the conceptual design stage shall reveal energy consumption of building systems, operating and maintenance costs on a month by month basis for a time span of one year. Accordingly the estimated energy, operating and maintenance costs shall be used in life cycle cost analyses in order to determine the most beneficial mechanical systems alternative. Life cycle cost analyses shall be based on a projected building life of 25 years.
- Carry out energy analysis on system alternatives.
- Establish an energy budget for the building and compare it to energy consumption of other similar buildings. Total energy consumed in the building shall be expressed in kWh/sq. m.
- Submit a complete energy analysis as described in this section in the paragraphs under the heading Building Loads and Energy Analysis.
- Identify the type of boilers to be used (i.e. cast iron sectional, fire tube, etc.) and provide an economic and technical explanation of the reason for the type of boiler to be used.
- List of non-Canadian products and materials proposed for the project with written justification

2.4.3 Electrical:

- Proposed basic electrical systems of significance to the early design.
- Site plan showing location of service entrances.
- Distribution diagram showing single line diagrams to distribution centers.
- Floor plans complete with locations of major electrical equipment and distribution centers.
- Lighting layouts.
- Power outlets.
- Ceiling distribution systems for lighting, power and telecommunications.
- List of standard PWGSC details to be utilized.
- Telephone rooms, conduits and telecommunication cable systems requirements and layout.
- Provide an electrical design synopsis, describing the electrical work in sufficient detail for assessment and approval by the Department. Include feasibility and economic studies of proposed systems complete with cost figures and loads.
- List of non-Canadian products and materials proposed for the project with written justification.

2.4.4 Commissioning:

- Define Commissioning Requirements.
- Identify in square meters the area to be provided to maintenance personnel, including storage and workshops for mechanical, electrical and housekeeping.
- Define project archives.

2.4.5 Sustainable Development:

- Design and evaluate Design Options exploring positive environment strategies.
- The Consultant is to conduct a ½ day workshop at RS1. The Consultant is to use a Sustainability Matrix Report and assessment of the existing building to evaluate how the building would rate when the project is completed.

RS 3 DESIGN DEVELOPMENT

3.1 INTENT

To further develop one of the options presented at the Design Concept stage. The Design Development documents consist of drawings and other documents to describe the size and character of the entire project as to architectural, structural, mechanical and electrical systems, materials and such other elements as may be appropriate.

3.2 GENERAL

Scope and Activities:

- Obtain written approval from Project Manager for development of one of the proposed Design Concept options
- If any alterations are demanded, document all required changes, analyze the impact on all project components, and resubmit for approval if required
- Expand and clarify the Concept Design intent for each design discipline
- Present the design materials to the client, design review or other committees as indicated by the project manager
- Present the design to the government or local authorities where required
- Analyze the constructability of the project and advise on the construction process and duration
- Based on all material available at the time, prepare a milestone schedule for the consideration with special attention to the impact on tenants
- Continue to review all applicable statutes, regulations, codes and by-laws in relation to the design of the project
- Provide a list and draft specification sections of all NMS sections to be used. Submit outline specifications for all systems and principle components and equipment. Provide in the outline specifications manufacturers' literature about principal equipment and system components proposed for use in this project.

3.3 DETAILS

Scope and Activities:

3.3.1 Architectural Drawings:

- Site Plan showing the building(s) and existing or proposed environmental items including the following:
 - Parking:
 1. Employees
 2. Visitors
 3. Service vehicle parking and loading areas.
 - Grading:
 1. Existing and proposed grade elevations.
- Floor Plans of each floor showing all accommodation required, including all necessary circulation areas, stairs, elevators, etc., and ancillary spaces anticipated for service use. Define areas relating to fall-out shelter space. Indicate building grids, modules, etc., and key dimensions.

- Furniture and Equipment plans.
- Elevations of all exterior building facades showing all doors and windows accurately sized and projected from the floor plans and sections. Indicate clear floor and ceiling levels and any concealed roof levels.
- Cross Sections through the building(s) to show floor levels, room heights, inner corridor or court elevations, etc.
- Detail Sections of walls or special design features requiring illustration and explanation of this stage, including fireproofing methods.

3.3.2 Structural Drawings:

- Drawings indicating the proposed structural materials, cladding details and other significant or unusual details proposed. Drawings may be separate or incorporated on the Architectural sheets.

3.3.3 Mechanical:

- Site Plan showing service entrances for water supply, sanitary and storm drains and connections to public utility services, including all key invert elevations.
- Drawings showing preliminary sizing of ventilation, cooling and heating systems showing locations, and all major equipment layouts in mechanical rooms.
- Drawings of plumbing system, showing routing and sizing of major lines and location of pumping and other equipment where required
- Drawings of the fire protection systems showing major components.
- Produce preliminary designs based on the approved concept. Update the energy analysis and energy budget established at the concept design stage.
- Update the schedule of requirements.
- Provide information of all internal and external energy loads in sufficient detail to determine the compatibility of the proposal with existing services, approved concept and energy budget.
- Analysis of selected equipment and plant with schematics and calculations sufficient to justify the economy of the selected systems.
- Describe the mechanical systems to be provided and the components of each system. Describe the perceived operation of the mechanical systems.
- Explain what operating staff will be needed to operate the building systems and the expected functions of the operation staff.
- Describe the building systems control architecture. Provide preliminary EMCS network architecture, mechanical control schematics, and sequence of operation.
- Explain what acoustical and sound control measures are to be included in the design.

3.3.4 Electrical drawings:

- Provide drawings showing advanced development of the following:
 - Single line diagram of the power circuits with their metering and protection, including:
 1. Complete rating of equipment.
 2. Ratios and connections of CT's and PT's.
 3. Description of relays when used.
 4. Maximum short circuit levels on which design is based.
 5. Identification and size of services.
 6. Connected load and estimated maximum demand on each load center.
 - Electrical plans with:
 1. Floor elevations and room identification.

2. Legend of all symbols used.
 3. Circuit numbers at outlets and control switching identified.
 4. All conduit and wire sizes except for minimum sizes which should be given in the specification.
 5. A panel schedule with loadings for each panel.
 6. Telephone conduits system layout for ceiling/floor distribution.
- Riser diagrams for lighting, power, telephone and telecommunication cable systems, fire alarm and other systems.
 - Elementary control diagrams for each system.
 - Schedule for motor and controls.
 - Complete lighting layout and fixture schedule clearly indicating methods of circuiting, switching and fixture mounting.
 - Electric heating layout and schedule.
- Provide the following data:
 - Total connected load.
 - Maximum demand and diversity factors.
 - Sizing of standby load.
 - Short-circuit requirements and calculations showing the ratings of equipment used.

3.3.5 Commissioning

- Define operational requirements.
- Define Commissioning Requirements.
- Prepare a commissioning Brief describing major commissioning activities for mechanical, electrical and integrated system testing.
- Define and establish project specific archives

3.4 DELIVERABLES:

- Floor plans including all disciplines showing all floor elements and services to detail necessary to make all design decisions and to substantially estimate the cost of the project
- Two (2) or three (3) building sections
- Demolition Plans
- Architectural, structural, engineering, millwork and finishing details to determine choice of materials and finishes
- Reflected ceiling plans
- Elevations
- Site and building models as required
- Finished and colour schemes
- Outline specifications for all systems and principle components or equipment
- Class 'B' cost estimate
- Preliminary construction schedule including long term delivery items
- Fire Protection Engineers Report including requirements, strategies or interventions for protection of the building and its occupants
- Project dossier detailing the basic assumptions of the project and the justifications for all major decisions
- Commissioning Plan

- Updated Sustainability Matrix Report
- Waste Management Plan.

RS 4 CONSTRUCTION DOCUMENTS

4.1 INTENT

To prepare drawings and specifications setting forth in detail the requirements for the construction and final cost estimate of the project.

- 33% indicates technical 33% completeness of all working documents
- 66% indicates substantial technical development of the project - well advanced architectural and engineering plans, details, schedules and specifications
- 99% is the submission of complete Construction Documents ready for tender call and submission to local authorities for pre-permit purposes
- Develop project specific Systems Operations Manual (SOM)
- Final Submission incorporates all revisions required in the 99% version and is intended to provide PWGSC with complete construction documents for tender call.

4.2 GENERAL

Activities are similar at all three stages; completeness of the project development should reflect the stage of a submission.

Scope and Activities:

- Obtain Project Manager's approval for Design Development submissions (33%, 66%, 99% and final)
- Confirm format of drawings and specifications
- Clarify special procedures (i.e. phased construction)
- Submit drawings and specifications at the required stages. (33%, 66%, 99%)
- Provide written response to all review comments and incorporate them into Construction Documents where required.
- Advise as to the progress of cost estimates and submit updated cost estimates as the project develops
- Update the project schedule
- Prepare a final Class 'A' estimate Review and approve materials and construction processes specifications to meet sustainable development objectives.

4.3 DETAILS

Scope and Activities:

4.3.1 Technical and Production Meetings

- Production of construction documents will be reviewed during the meetings arranged by Project Manager and Consultant.

- Representatives from Client Department(s) and PWGSC support staff will be present as arranged by the Project Manager.
- Consultant shall ensure that his staff and the sub-consultant representatives attend the technical and production meetings as required.
- Consultant shall arrange for all necessary data, progress prints, etc.
- Consultant shall prepare minutes of the meetings and distribute copies to all participants.

4.3.2 Progress Review

- As work progresses on construction drawings, submit drawings, schedules, details, pertinent design data and updated Cost Plan and Project Schedule as required.
 - Mechanical:
 1. Flow diagrams, system layouts, equipment selections and sizes, floor plan layouts showing major equipment.
 2. All major ductwork sized and shown on drawings including layout of all major mechanical and transformer rooms.
 3. EMCS network architecture, mechanical control schematics, sequence of operation for each mechanical system, electrical control schematics, DDC input/output point schedules.
 4. Commissioning Plan in accordance with CP.3
 5. Update the building load calculation, energy analysis and energy budget.
 6. Submit at the stipulated progress submission all calculations for mechanical design and equipment selection. These calculations shall be bound (3-ring binder) and indexed.
- Calculations submitted shall not necessarily be reviewed. They are required for record purposes and in certain instances to assist in the understanding and interpretation of designs. Calculations shall be submitted in a format that is legible, neat and easily understandable.
- Specifications and an index of specifications. The specifications shall consist of typed and edited PWGSC amended NMS sections, PWGSC in-house master specs sections and NM Ssections.

4.4 DELIVERABLES

Deliverables are similar at all three stages; completeness of the project development should reflect the stage of a submission.

4.4.1 99% Submission:

- Complete specification and working drawings.
- 99% Commissioning plan and Systems Operations manual
- One copy of the complete colour schedules, including textures, sheens, super-graphics, colour chips and material samples.
- One copy of support data, studies, calculations, etc., required by PWGSC Engineering disciplines for final checking and record.
- One copy of updated Cost Plan and Project Schedule.
- One copy of updated Sustainability Matrix Report.
- One copy of updated Waste Management Plan.

4.4.2 Final Submission:

- This submission incorporates all revisions required by the review of the 99% submission. Provide

the following:

- Complete set of originals of the working drawings.
- Complete sets of original specifications.
- Class 'A' estimate
- Complete Commissioning Plan
- Complete Systems Operations manual
- Complete set of original Colour Schedule.
- As a safeguard against loss or damage to the originals, retain a complete set of drawings in reproducible form and one copy of specification.
Inspection Authorities Submission
- Submit and obtain approval on plans and specifications required by Inspection Authorities before tender call.

RS 5 TENDER CALL, BID EVALUATION & CONSTRUCTION CONTRACT AWARD

5.1 INTENT

To obtain and evaluate bids from qualified contractors to construct the project as per the Tender Documents. To award the construction contract according to government regulations, including Federal Rules for Bid Depositories.

5.2 GENERAL

Scope and Activities:

- Attend tenderers briefing meeting(s)
- Prepare addenda based on questions arising in such meetings for issue by the Project Manager
- Provide the Project Manager with all information required by tenderers to fully interpret the Construction Documents. The Project Manager will issue the addenda to all participants.
- Keep full notes of all inquiries during the bidding period and submit same to Project Manager at the end, for PWGSC records.
- Assist in tender evaluation by providing advice on the following:
 1. The completeness of tender documents in all respects.
 2. The technical aspects of the tenders.
 3. The effect of alternatives and qualifications which may have been included in the tender.
 4. The tenderers capability to undertake the full scope of work.
 5. The availability of adequate equipment to carry out the work.
- If PWGSC decides to re-tender the project, provide advice and assistance to the Project Manager
- Revise and amend, at your cost, the construction documents to bring the cost of the work within the limits stipulated
- Examine and report on any cost and schedule impact created by the issue of tender / contract addenda

5.3 DELIVERABLES

- Originals of drawings and specifications.
- Electronic copies of drawings and specifications.

- Addenda where needed.
- Changes to the documents, if re-tendering is necessary.
- Updated cost estimate or schedule.
- Registration of the building under LEED or Green Globes when work commences.

RS 6 CONSTRUCTION AND CONTRACT ADMINISTRATION

6.1 INTENT

To implement the project in compliance with the Contract Documents and to direct and monitor all necessary or requested changes to the scope of work during construction.

6.2 GENERAL

Scope and Activities:

- During the implementation of the project, act on PWGSC's behalf to the extent provided in this document
- Carry out the review of the work at intervals appropriate to determine if the work is in conformity with the Contract Documents
- Keep PWGSC informed of the progress and quality of the work and report any defects or deficiencies in the work observed during the course of the site review
- Ensure compliance with Commissioning Plan, update plan as necessary
- Determine the amounts owing to the Contractor based on the progress of the work and certify payments to the contractor
- Act as interpreter of the requirements of the Contract Documents
- Provide cost advice during construction
- Advise the Project Manager of all potential changes to scope for the duration of the implementation
- Review the Contractor's submittals
- Prepare and justify change orders for issue by the Department Representative
- Indicate any changes or material/equipment substitutions on Record Documents
- Prepare and post Systems Operating Instructions
- Finalize Systems Operations Manual

6.3 DETAILS

Scope and Activities:

6.3.1 Construction Meetings

- Immediately after contract award arrange a briefing meeting with the Contractor and the Departmental Representatives. Prepare minutes of the meeting and distribute copies to all participants and to other persons agreed upon with the Project Manager.
- Call job meetings as frequently as required, commencing with the construction briefing meeting. The meetings should include the job superintendent, Inspector of Construction main sub-subcontractors, affected sub-consultants and Government Services representatives as necessary.

Prepare minutes of the meeting and distribute copies to all participants. The Project Manager may invite client Departments to attend any of these meetings.

6.3.2 Project Schedule

- Obtain Project Schedule with detailed commissioning component shown separately, as soon as possible after contract award and ensure proper distribution.
- Monitor the approved construction schedule, take necessary steps to ensure that the schedule is maintained and submit a detailed report to the Department concerning any delays.
- Keep accurate records of causes of delays.
- Make every effort to assist the Contractor to avoid delays.

6.3.3 Time Extensions

- Only the Department may approve any request for Time Extensions. Approval will be issued in writing by the Project Manager.

6.3.4 Cost Breakdown

- Obtain from the Contractor detail cost breakdown on standard PWGSC form and submit to the Department with the first Progress Claim.

6.3.5 Sub-contractor Changes

- The Contractor is required to use the sub-contractors listed on the tender form unless a change is authorized by the Department. Changes are only considered when they involve no increase in cost. Review all requests for changes of sub-contractors, and submit recommendations to the Project Manager.
- When sub-contractors have not been listed on the Tender Form, obtain the list from Contractors not later than 10 working days after date of award.

6.3.6 Labour Requirements

- The Contractor is bound by the Contract to maintain competent and suitable workmen on the project and to comply with the Canada Department of Labour - Labour Conditions. Inform the Department of any labour situations that appear to require corrective action by the Department.
- The Consultant shall ensure that a copy of the Labour Conditions for the Contract is posted in a conspicuous place on site.

6.3.7 Bylaw Compliance

- Ensure that construction complies with applicable bylaws and regulations.
- Matters pertaining to the Department of Labour shall be referred to the Engineer.

6.3.8 Construction Safety

- All construction projects that are occupied by federal employees during construction are subject to the Canada Occupational Safety and Health Act and Regulations as administered by Health and Welfare Canada.
- Fire safety provisions during construction must comply with FCC Standards 301 and 302, administered by the Fire Commissioner Canada.
- In addition to the above, the Contractor must comply with the provincial and municipal safety laws and regulations, and with any instructions issued by the officers of these authorities having jurisdiction relating to construction safety.

- Ensure the Contractor is mandated to provide all required coordination, isolation, protection and reinstatement of the fire protection and suppression systems throughout construction. Notify the Property Manager each time the fire protection and suppression systems are bypassed and advise of estimated reinstatement time. Ensure the Contractor is mandate to provide Watchman Service as defined in FC 301 and by the Fire Commissioner

6.3.9 Site Visits

- Provide non-resident construction inspection services. Ensure compliance with contract documents.
- Provide services of qualified personnel who are fully knowledgeable with technical and administrative requirements of project.
- Establish a written understanding with contractors as to what stages or aspect of the work are to be inspected prior to being covered up.
- Assess quality of work and identify in writing to the Contractor and to the Department all defects and deficiencies observed at time of such inspections.
- Inspect materials and prefabricated assemblies and components at their source or assembly plant, as necessary for the progress of the project.
- Any directions, clarifications or deficiency list shall be issued in writing to PWGSC.

6.3.10 Clarifications

- Provide clarifications on Plans and Specifications or site conditions, as required in order that project not be delayed.

6.3.11 Progress Reports

- Report to the Department regularly on the progress of the work. Submit bi-weekly reports.
- Report progress in meeting sustainability targets set out in Sustainability Matrix Report.

6.3.12 Work Measurement

- If work is based on unit prices, measure and record the quantities for verification of monthly progress claims and the Final Certificate of Measurement.
- When Contemplated Change Notice is to be issued based on Unit Prices, keep accurate account of the work. Record dimensions and quantities.

6.3.13 Detail Drawings

- Provide for the Department's information any additional detail drawings as and when required to properly clarify or interpret the contract documents.

6.3.14 Shop Drawings

- On completion of project forward three copies of reviewed shop drawings to the Department. Ensure that shop drawings include the project number and are recorded in sequence.
- Verify the number of copies of shop drawings required. Consider additional copies for Client's departmental review.
- Shop drawings shall be stamped: "Checked and Certified Correct for Construction" by the Contractor and stamped: "reviewed" by the Consultant before return to the Contractor.
- Expedite the processing of Shop Drawings and maintain a Shop Drawing Log.

6.3.15 Inspection and Testing

- Prior to tender, provide Department with recommended list of tests to be undertaken, including

on site and factory testing

- Ensure all testing is detailed within commissioning plan
- When contract is awarded, assist Departmental Representative in briefing testing firm on required services, distribution of reports, communication lines, etc.
- Review all test reports and take necessary action with Contractor when work fails to comply with contract.
- Immediately notify Project Manager when tests fail to meet project requirements and when corrective work will affect schedule.
- Assist Departmental Representative in evaluating testing firm's invoices for services performed.

6.3.16 Training

- Prior to tender, provide Department with recommended list of training to be undertaken
- Ensure all training is detailed within the commissioning plan

6.3.17 Construction Changes

- The Consultant does not have authority to change the work or the price of the Contract.
- Changes which affect cost or design concept must be approved by the Department.
- Upon Departmental approval obtain quotations from the Contractor in detail. Review prices and forward promptly recommendations to the Department.
- The Department will issue Consultant-prepared Change Orders to the Contractor, with copy to Consultant.
- All changes, including those not affecting the cost of the project, will be covered by Change Orders.
- The practice of "tradeoffs" is not allowed.

6.3.18 Contractor's Progress Claims

- Each month the Contractor submits a progress claim for work and materials as required in the Construction Contract.
- The claims are made by completing the following forms where applicable:
 - Request for Construction Payment
 - Cost Breakdown for Unit and/or combined Price Contract
 - Cost Breakdown for Fixed Price Contract
 - Statutory Declaration Progress Claim
- Review and sign designated forms and promptly forward claims to the Department for processing.
- Submit with each progress claim:
 - Updated schedule of the progress of the work.
 - Photographs of the progress of the work.

6.3.19 Materials On Site

- The Contractor may claim for payment of material on site but not incorporated in work.
- Material must be stored in a secure place designated by the Department.
- Detailed list of materials with supplier's invoice showing price of each item must accompany claim; Consultant shall check and verify the list.
- Items shall be listed separately on the Detail Sheet after the break-down list and total.
- As material is incorporated in the work the cost must be added to the appropriate Detail item and removed from the material list.

6.3.20 Acceptance Board

- Inform the Department when satisfied that the project is substantially completed. The Consultant shall ensure that his representative, his sub-consultant representative, Resident On-Site Reviewer, Contractor and major sub-trades representatives shall form part of the Project Acceptance Board and attend all meetings as organized by the Department.

6.3.21 Interim Inspection

- The Acceptance Board shall inspect the work and list all unacceptable and incomplete work on a designated form. The Board shall accept the project from the Contractor subject to the deficiencies and uncompleted work listed and priced.

6.3.22 Interim Certificates

- Payment requires completion and signing, by the parties concerned, of the following documents:
 1. Interim Certificate of Completion
 2. Cost Breakdown for Fixed Price Contract
 3. Cost Breakdown for Unit or Combined Price Contract
 4. Inspection and Acceptance
 5. Statutory Declaration Interim Certificate of Completion
 6. Workmen's Compensation Board Certificate.
- Verify that all items are correctly stated and ensure that completed documents and any supporting documents are furnished to the Department for processing.

6.3.23 Building Occupation

- The Department or Client Department may occupy the building after the date of acceptance of the building by the Acceptance Board. The acceptance date is normally that of the Interim Certificate issued to the Contractor. As of the acceptance date, the Contractor may cancel the Contract Insurance, and the Department or Client Department (as the case may be) assumes responsibility for:
 - Security of the work(s).
 - Fuel and utility charges.
 - Proper operation and use of equipment installed in the project.
 - General maintenance and cleaning of the work(s).
 - Maintenance of the site. (Except any landscaping maintenance covered by the contract.)

6.3.24 Operation and Maintenance Data Manual

- Operation and Maintenance Data Manual: 4 sets of each volume produced by Contractor in accordance with the applicable section of project specification and verified for completeness, relevance and format by the Architectural, Mechanical and Electrical Consultants and submitted to PWGSC Project Manager prior to interim acceptance or actual start of operation and instruction period, whichever occurs sooner. The Contractor shall retain one copy of each volume for his record and use during the instruction period.

6.3.25 Instruction of Operating Personnel

- Make arrangements and ensure that Department's operating personnel is properly instructed on the operation of all services and systems using the final manuals as reference.
- Consultant to provide training sessions, as required, on the subject of design intent and systems operations. Utilize Systems operations manual for training sessions.

6.3.26 Keys

- Ensure that all keys and safe combinations are delivered to the Department and/or the Client Department as applicable.

6.3.27 Final Inspection

- Inform the Department when satisfied that all work under the contract has been completed, including the deficiency items. Inspection and Acceptance as a result of the Interim Inspection. The Department reconvenes the Acceptance Board which makes a final inspection of the project. If everything is satisfactory the Board makes final acceptance of the project from the Contractor.

6.3.28 Final Certificate

- The final payment requires completion and signing, by the parties concerned, of the following documents:
 1. Final Certificate of Completion
 2. Cost Breakdown for Fixed Price Contract
 3. Inspection and Acceptance
 4. Statutory Declaration Final Certificate of Completion
 5. Cost Breakdown for Unit and/or Combined Price Contract
 6. Workmen's Compensation Clearance Certificate
 7. Hydro Certificate
- Verify that all items are correctly stated and ensure that completed documents and any supporting documents are furnished to the Department for processing.
- Completion of full submission for LEED or Green Globes based on project completed.

6.3.29 Take-over

- The official take-over of the project, or parts of the project, from the Contractor is established by the PWGSC Project Team which includes the Consultant and the Client Department. The date of Interim Certificate of Completion and the Final Certificate of Completion signifies commencement of the 12 month warranty period for work completed on the date of each certificate in accordance with the General Conditions of the Contract.
- Provide Department with original copy of Contractor's warranties for all materials and work covered by an extended warranty or guarantee, according to the conditions of the specifications. Verify their completeness and extent of coverage.

6.3.30 As-Built and Record Drawings and Specifications

- Following the take-over, obtain as-built marked-up hard copy from the Contractor:
 - Show significant deviations in construction from the original Contract drawings, including changes shown on Post-Contract Drawings, changes resulting from Change Orders or from On Site Instructions.
- Check and verify all as-built records for completeness and accuracy and submit to PWGSC.
- Produce Record Drawings by incorporating As-Built information into project drawings.
- Submit Record Drawings and Specifications in number and format required by the Consultant Agreement within 8 weeks of final acceptance.
- Provide a complete set of final shop drawings.

6.4 DELIVERABLES:

- Written reports from site visits including persons involved
- Written reports on the progress of the work and the cost of the project at the end of each month
- Additional detail drawings when required to clarify, interpret or supplement the Construction Documents
- Post contract drawings
- Interim or Final certificates
- Debrief of Commissioning Activities
- As built records

RS 7 COMMISSIONING THE FACILITY

As a member of the PWGSC team, the Commissioning Manager represents the Owner's and User's interests, and is responsible for overseeing all commissioning activities during the development, implementation and post construction stages of the project.

Throughout this stage, the Consultant and Consultant's representatives on site will work closely with the Commissioning manager, PWGSC and the Contractor to implement commissioning activities and create useful, well integrated drawings, reports and manuals, in compliance with Contract Documents.

7.1 INTENT

- To define the operational and performance requirements of the Owner and User.
- To ensure that responsibility for meeting these requirements and demonstrating compliance is defined in the design and contract documents
- To ensure that appropriate start-up and checkout procedures are employed for components, subsystems, including meaningful documentation for and certification of Quality Control reports and techniques under the normal or enhanced basic services and contractual procedures.
- To ensure that the final product meets the specified requirements and the criteria set out in the investment analysis report (I.A.R.).
- To document the operations, maintenance and management requirements, and transferring the completed works to qualified facility operators.
- To minimize the life-cycle operating and maintenance costs.
- To verify that the department's functional requirements are correctly interpreted during the design stage, and that the building systems operate consistently at peak efficiencies, under all normal load conditions, and within the specified energy budget.

7.2 GENERAL

Scope and Activities:

- Provide complete documentation on the operations and maintenance requirements
- Prepare Systems Operations Manual (SOM) Manuals and Preventative Maintenance Support System (PMSS)/MMS documentation.
- Co-ordinate staffing, service contracts, and arranging spare parts and special equipment
- Contents of O & M Manual shall be in accordance with CP.4 operating and maintenance (O &

M) Manuals.

- Carry out various checks and tests to determine if the new facilities function in accordance with the contract documents
- Identify contractor and subcontractor commissioning, PV and testing responsibilities.
- Plan the performance verification (PV) activities, develop the installation checklists and PV report forms, and prepare a detailed verification schedule. PV tests will be performed by the contractor. Maintain detailed development reports and review with the contractor for special systems such as EMCS.
- PV inspection forms will be completed for all components, sub-systems, and systems, and a final performance verification report will be submitted to the Commissioning Manager.
- Prepare a training plan for the O&M staff to be trained on the operations of the new facilities. The training plan will recognize both short-term and long term requirements and shall employ both hard copy and audio visual techniques.

7.3 DETAILS

Scope and Activities:

7.3.1 Analysis of Project Requirements and Design Development

O&M (General)

- Submit an O&M report showing how the design will meet O&M requirements including the following subjects:
 1. Spatial requirements for O&M staff (office, lockers, kitchen, showers, washrooms, flow of people and supplies, storage for special tools, spare parts, and maintenance materials.
 2. Cleaning (Janitor closets, receptacle for vacuum, equipment supply and storage).
 3. Capacity of the facility to change in response to program changes over its life expectancy.
 4. Spare equipment, extra material and redundancies needed to operate and maintain this facility over its life expectancy.
 5. System selection based on life cycle cost analysis considering energy, maintenance and operational cost.
 6. Occupancy during construction.
 7. "Phased" construction program.
 8. Assist the Commissioning Manager in preparation of a preliminary O&M budget. The O&M budget will contain detailed breakdown of various items with the assessment of the systems selection.
 9. Assessment of:
 - i. staffing & skill requirements to operate and maintain the facility.
 - ii. the need for service contracts, i.e. elevators, water treatment, controls emergency generators, fire alarm, security, etc.
 10. Input into the Building Management Plan information regarding operational management requirements. The report is submitted at the end of stage 1 and is updated at the end of stages 2 respectively. Respond to all PWGSC comments in writing before proceeding to the next stage.

ADDITIONAL SERVICES

AS 1 WASTE MANAGEMENT REQUIREMENTS

1.1 INTENT

The purpose of the “waste management” audit and work plan is to identify opportunities and actions that will divert materials from disposal. The focus of the work plan will be on identifying reuse opportunities first, recycling opportunities second and finally disposal options if required.

1.2 GENERAL

Scope and Activities:

- Visit the building/site and verify the availability and capacity of services needed for the project.
- Attend project start up meeting.
- Analyze the project requirements/program.
- Review all available existing material related to the project.
- Review the proposed project schedule for verification that all milestone dates are achievable.
- Review the cost plan/budget for verification that the costs are realistic and achievable.
- Identify and verify all authorities having jurisdiction over the project.
- Establish a policy for project to minimize environmental impacts consistent with the project objectives and economic constraints.

1.3 DELIVERABLES

Project Scope of Services; comprehensive summary of the project requirements/program demonstrating understanding of the scope of work including:

- Develop a waste audit for the project.
- Develop a waste management plan for the project.
- Written identification of the problems, conflicts or other perceived information/clarifying assumptions for the acknowledgment of the Project Manager.

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SUBMISSION REQUIREMENTS AND EVALUATION

- SRE 1 General Information
- SRE 2 Proposal Requirements
- SRE 3 Submission Requirements and Evaluation
- SRE 4 Price of Services
- SRE 5 Total Score
- SRE 6 Submission Requirements - Checklist

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))
<u>Price Rating x 10%</u>	=	<u>Price Score (Points)</u>
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 proposals.

- 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)
- Integrity Provisions – Required Documentation
- 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, certified or otherwise authorized to provide the necessary professional services to the full extent that may be required by provincial or territorial law in the province of Ontario.

3.1.2 Consultant Team Identification

The consultant team to be identified must include the following:

Proponent (prime consultant) - Architect

Key Sub-consultants / Specialists - Mechanical Engineer, Electrical Engineer, Structural Engineer, Civil Engineer, Environmental Consultant, Code Consultant, Interior Designer, Cost and Time Specialist/Planner, Security and Controls Specialist, Specification Writer, Elevator Specialist, Commissioning Consultant, Fire Protection Engineer, and Waste Management Consultant.

If the proponent proposes to provide multidisciplinary services that might normally be provided by a sub-consultant, this should be indicated here.

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 – Required documentation

In accordance with the Ineligibility and Suspension Policy (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Proponent must provide, **as applicable**, to be given further consideration in the procurement process, the required documentation as per R1410T (2016-04-04), General instructions 1 (GI1), Integrity Provisions – Proposal, **section 3a**.

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 3 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
- awards received

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 2 projects undertaken within the last 3 years per key sub consultant or specialist. Only the first 2 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
- awards received

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
- Broader goals (federal image, sustainable development, sensitivities)
- The relationship between this commission and any earlier studies completed for PWGSC
- 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	2.0	0 - 10	0 - 20
Achievements of Key Sub-consultants / Specialists	1.0	0 - 10	0 - 10
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 seventy (70) 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 seventy (70) 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 – Required documentation – **as applicable** in accordance with the Ineligibility and Suspension Policy (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>) and as per R1410T (2016-04-04), General instructions 1 (GI1), Integrity Provisions – Proposal, **section 3a**.
Integrity Provisions - Declaration of Convicted Offences – **with its bid, as applicable** in accordance with the Ineligibility and Suspension Policy (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>) and as per R1410T (2016-04-04), General instructions 1 (GI1), Integrity Provisions – Proposal, **section 3b**.
Proposal - one (1) original plus five (5) bound copies
Front page of RFP
Front page(s) of any solicitation amendment

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In a separate envelope:

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

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APPENDIX A

TEAM IDENTIFICATION FORMAT

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:

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

II. Key Sub Consultants / Specialists:

Mechanical Engineer

Firm Name:
.....
.....

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

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III. Key Sub Consultants / Specialists:

Electrical Engineer

Firm Name:
.....
.....

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

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

IV. Key Sub Consultants / Specialists:

Structural Engineer

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

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V. Key Sub Consultants / Specialists:

Civil Engineer

Firm Name:
.....
.....

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

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.....

VI. Key Sub Consultants / Specialists:

Environmental Consultant

Firm Name:
.....
.....

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

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VII. Key Sub Consultants / Specialists:

Code Consultant

Firm Name:
.....
.....

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

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.....
.....

VIII. Key Sub Consultants / Specialists:

Interior Designer

Firm Name:
.....
.....

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

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

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IX. Key Sub Consultants / Specialists:

Cost and Time Specialist/Planner

Firm Name:
.....
.....

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

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

X. Key Sub Consultants / Specialists:

Security and Controls Specialist

Firm Name:
.....
.....

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

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XI. Key Sub Consultants / Specialists:

Specification Writer

Firm Name:
.....
.....

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

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

XII. Key Sub Consultants / Specialists:

Elevator Specialist

Firm Name:
.....
.....

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

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.....

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pwl023

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XIII. Key Sub Consultants / Specialists:

Commissioning Consultant

Firm Name:
.....
.....

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

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

XIV. Key Sub Consultants / Specialists:

Fire Protection Engineer

Firm Name:
.....
.....

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

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

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PWL-3-36066

CCC No./N° CCC - FMS No./N° VME

XV. Key Sub Consultants / Specialists:

Waste Management Specialist

Firm Name:
.....
.....

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

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

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APPENDIX B

DECLARATION /CERTIFICATIONS FORM

Solicitation No. - N° de l'invitation
EQ754-141656/B

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

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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: _____ Sole Proprietorship _____ Partnership _____ Corporation _____ Joint Venture	Size of Organization: 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.

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pwl023

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APPENDIX B

ANNEX BB

INTEGRITY PROVISIONS – REQUIRED DOCUMENTATION

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In accordance with the Ineligibility and Suspension Policy (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Proponent must provide, **as applicable**, to be given further consideration in the procurement process, the required documentation as per R1410T (2016-04-04), General instructions 1 (GI1), Integrity Provisions – Proposal, **section 3a**.

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APPENDIX C

PRICE PROPOSAL

FORM

Solicitation No. - N° de l'invitation
EQ754-141656/B

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

Client Ref. No. - N° de réf. du client
R.050927.001

File No. - N° du dossier
PWL-3-36066

CCC No./N° CCC - FMS No./N° VME

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.

PROPOSERS SHALL NOT ALTER THIS FORM

Project Title:

Name of Proponent:

The following will form part of the evaluation process:

(A) REQUIRED SERVICES

Fixed Fee (R1230D (2016-01-28), GC 5 - Terms of Payment)

SERVICES	FIXED FEE
RS 1 Analysis of Project Requirements	\$.....
RS 2 Design Concept	\$.....
RS 3 Design Development	\$.....
RS 4 Construction Documents	\$.....
RS 5 Tender Call, Bid Evaluation & Construction	
Contract Award	\$.....
RS 6 Construction and Contract Administration	\$.....
RS 7 Commissioning the Facility	<u>\$.....</u>
MAXIMUM FIXED FEES	\$.....

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Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

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(B) ADDITIONAL SERVICES

Fixed Fee (R1230D (2016-01-28), GC 5 - Terms of Payment)

SERVICES	FIXED FEE
AS 1 Waste Management	\$.....

MAXIMUM FIXED FEES \$.....

TOTAL COST OF SERVICES FOR PROPOSAL EVALUATION PURPOSES

A. Maximum Fixed Fees – Required Services RS1 to RS7 \$.....

B. Maximum Fixed Fees – Additional Services AS1 \$.....

Total Evaluated Fee \$.....

Solicitation No. - N° de l'invitation
EQ754-141656/B

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

Client Ref. No. - N° de réf. du client
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CCC No./N° CCC - FMS No./N° VME

APPENDIX C - PRICE PROPOSAL FORM (CONT'D)

The following will NOT form part of the evaluation process

THE FOLLOWING HOURLY RATES MAY BE USED FOR FUTURE CONTRACT AMENDMENTS

Principals

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

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Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
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APPENDIX C - PRICE PROPOSAL FORM (CONT'D)

Staff

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

END OF PRICE PROPOSAL FORM

Solicitation No. - N° de l'invitation
EQ754-141656/B

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

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File No. - N° du dossier
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APPENDIX D

DOING BUSINESS WITH PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Solicitation No. - N° de l'invitation
EQ754-141656/B

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

Client Ref. No. - N° de réf. du client
R.050927.001

File No. - N° du dossier
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CCC No./N° CCC - FMS No./N° VME

APPENDIX E

FEASIBILITY STUDY

Solicitation No. - N° de l'invitation
EQ754-141656/B

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

Client Ref. No. - N° de réf. du client
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APPENDIX F

PWGSC COMMISSIONING MANUAL (CP.1) 4TH EDITION

Solicitation No. - N° de l'invitation
EQ754-141656/B

Amd. No. - N° de la modif.

Buyer ID - Id de l'acheteur
pwl023

Client Ref. No. - N° de réf. du client
R.050927.001

File No. - N° du dossier
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CCC No./N° CCC - FMS No./N° VME

APPENDIX G

SECURITY REQUIREMENTS CHECK LIST (SRCL)



Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
Canada

Canada



Respect • Integrity • Excellence • Leadership

Serving
GOVERNMENT,
Serving
CANADIANS.

Doing Business with Public Works and Government Services Canada (PWGSC)



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Last updated: April 8, 2013

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Appendix 'A'	Checklist for the Submission of Construction Documents
Appendix 'B'	Sample Addendum Format
Appendix 'C'	Sample Index for Drawings and Specifications
Appendix 'D'	User Manual on Directory Structure and Naming Conventions Standards for Construction Tender Documents on CDROM, dated May 2005
Appendix 'E'	Basic Reference Guide on Converting Construction Drawings into Portable Document Format (PDF), dated May 2005

SECTION 1 INTRODUCTION

This document must be used in conjunction with the Terms of Reference (TOR), as the two documents are complimentary. The TOR describes project-specific requirements while this document deals with information common to all projects. In case of a conflict between the two documents, the requirements of the TOR override this document.

SECTION 2 PWGSC NATIONAL CADD STANDARD

Drawings shall be in accordance with PWGSC National CADD Standards and Canadian Standards Association (CSA) B78.3.

Refer to:

<http://www.tpsgc-pwgsc.gc.ca/biens-property/cdao-cadd/index-eng.html>

The above link is subject to change. The Consultant shall check with the Project Manager to ensure that the link and related information are current and relevant with regards to PWGSC National CADD Standards.

SECTION 3 GUIDE TO PREPARATION OF CONSTRUCTION DOCUMENTS FOR PWGSC

1 Purpose

This document provides direction in the preparation of construction contract documents (namely specifications, drawings and addenda) for Public Works and Government Services Canada (PWGSC).

Drawings, specifications and addenda must be complete and clear, so that a contractor can prepare a bid without guesswork. Standard practice for the preparation of construction contract documents requires that:

- 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.
- 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.
- Addenda are changes to the construction contract documents or tendering procedures, issued during the tendering process.

2 Principles of PWGSC Contract Documents

PWGSC's contract documents are based on common public procurement principles. PWGSC does not use Canadian Construction Document Committee (CCDC) documents.

The terms and conditions are prepared and issued by PWGSC as well as other related bidding and contractual documents. For information, the clauses are available on the following web site: <http://sacc.pwgsc.gc.ca/sacc/query-e.jsp>. Any questions should be directed to the Project Manager.

3 Quality Assurance

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

SPECIFICATIONS

1 National Master Specification

The National Master Specification (NMS) is a master construction specification available in both official languages, which is divided into 48 Divisions and used for a wide range of construction and/or renovation projects. In preparing project specifications, the Consultant must use the current edition of the NMS in accordance with the "NMS User's Guide".

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 from conflict and ambiguity.

2 Specification Organization

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

Start each Section on a new page and show Project Number, Section Title, Section Number and Page Number on each page. Specification date, project title, and consultant's name are not to be indicated.

3 Terminology

Use the term "Departmental Representative" instead of Engineer, PWGSC, Owner, Consultant or Architect. "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.

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. Specifications must permit bidders to calculate all quantities and bid accurately. If quantities are impossible to identify (i.e. cracks to be repaired) give an estimated quantity for bid purposes (unit prices). Ensure that the terminology used throughout the specifications is consistent and does not contradict the applicable standard construction contract documents.

4 Dimensions

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

5 Standards

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. The following is a list of some of the Internet websites which provide the most current publications of standards for reference in the construction specification document.

- CSA standards: <http://www.csa.ca>
- CGSB standards: <http://www.pwgsc.gc.ca/cgsb>
- ANSI standards: <http://www.ansi.org>
- ASTM Standards: <http://www.astm.org>
- ULC standards: <http://www.ulc.ca>
- General reference of standards: <http://www.cssinfo.com>

The NMS website (<http://www.tpsgc-pwgsc.gc.ca/biens-property/ddn-nms/index-eng.html>) also links to other documents references in the NMS under its "Links" feature.

6 Specifying Materials

The practice of specifying actual brand names, model numbers, etc., is against departmental policy except for special circumstances. The method of specifying materials shall be by using recognized standards such as those produced by Canadian Gas Association (CGA), Canadian General Standards Board (CGSB), Canadian Standards Association (CSA), and Underwriters' Laboratories of Canada (ULC), or by trade associations such as Canadian Roofing Contractors' Association (CRCA) and Terrazzo, Tile, Marble Association of Canada (TTMAC). Canadian standards should be used wherever possible.

If the above method cannot be used and where no standards exist, specify by a non-restrictive, non-trade name "prescription" or "performance" specifications.

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. Include all known materials acceptable for the purpose intended, and in the case of equipment, identify by type and model number.

Acceptable Materials: set up the paragraph format as follows:

Acceptable Materials:

1. ABC Co. Model [_____].
2. DEF Co. Model [_____].
3. GHI Co. Model [_____].

Alternative materials to those specified may be considered during the solicitation period, however, the onus will be on the Consultant to review and evaluate all requests for approval of alternative materials.

The term "Acceptable Manufacturers" should not be used, as this restricts competition and does not ensure the actual material or product will be acceptable. A list of words and phrases that should be avoided is included in the NMS User's Guide.

Sole Sourcing: Sole sourcing for materials and work can be used for proprietary systems (ie. fire alarm systems, EMCS systems). **Substantiation and/or justification will be required.**

Wording for the sole source of work should be in Part 1 as:

"Designated Contractor

- .1 Hire the services of [_____] to do the work of this section."

Wording for the sole source of EMCS systems should be in Part 1 as

"Designated Contractor

- .1 Hire the services of [_____] or its authorized representative to complete the work of all EMCS sections."

and in Part 2 as "Materials

- .1 There is an existing [_____] system presently installed in the building. All materials must be selected to ensure compatibility with the existing [_____] system.

Wording for the sole source of materials (ie. fire alarm systems) should be in Part 2 as:

"Acceptable materials

.1 The only acceptable materials are [] .”

Prior to including sole source materials and/or work, the Consultant should contact the Project Manager to obtain the approval for the sole sourcing.

7 Unit Prices

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

Use the following wording:

[The work for this section] or [define the specific work if required, e.g. rock excavation] will be paid based on the actual quantities measured on site and the unit prices stated in the Bid and Acceptance Form.

In each applicable NMS section, replace paragraph title "Measurement for Payment" with "Unit Prices”.

Sample of Unit Price Table:

The Unit Price Table designates the Work to which a Unit Price Arrangement applies.

- (a) The Price per Unit and the Estimated Total Price must be entered for each Item listed.
- (b) Work included in each item is as described in the referenced specification section.

Item	Specification Reference	Class of Labour, Plant or Material	Unit of Measurement	Estimated Quantity	Price per Unit GST/HST extra	Estimated Total Price GST / HST extra
TOTAL ESTIMATED AMOUNT						
Transfer amount to subparagraph 1)(b) of BA03						

8 Cash Allowances

Construction contract documents should be complete and contain all of the requirements for the contractual work. Cash allowances are to be used only under exceptional circumstances (ie. utility companies, municipalities), where no other method of specifying is appropriate. 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.

9 Warranties

It is the practice of PWGSC to have a 12 month warranty and to avoid extending warranties for more than 24 months. When necessary to extend beyond the 12 month warranty period provided for in the General Conditions of the contract, use the following wording in Part 1 of the applicable technical sections, under the heading "Extended Warranty":

- "For the work of this Section [], the 12 month warranty period is extended to 24 months.
- Where the extended warranty is intended to apply to a particular part of a specification section modify the above as follows: "For [] the 12 month ... [] months."

Delete all references to manufacturers' guarantees.

10 Scope of Work

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

11 Summary and Section Includes in Part -1 General of Section

Do not use "Summary" and "Section Includes."

12 Related Sections

In every section of the specification at 1.1 "Related Sections": coordinate the list of related sections and appendices. Ensure co-ordination among the sections of the specification and ensure not to reference any section or appendices which do not exist.

13 Index

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

14 Regional Guide

The Consultant should contact the Project Manager to obtain the region's requirements for Division 01 or other short form specifications as might be appropriate. For example, it is required in the National Capital Region that regional Section 01 00 10 - General Instructions be used on all projects.

15 Health and Safety

It is required that all project specifications include "Section 01 35 29.06 - Health and Safety Requirements." Confirm with the Project Manager to determine if there are any instructions to meet regional requirements.

16 Designated Substances Report

Include "Section 01 14 25 - Designated Substances Report"

17 Subsurface Investigation Reports

Subsurface Investigation Report(s) are to be included after Section 31 and the following paragraph should be added to Section 31:

Subsurface investigation report(s)

.1 Subsurface investigation report(s) are included in the specification following this section.

When the Project Manager determines that it is not practical to include the subsurface investigation report(s), alternate instructions will be provided.

Where tender documents are to be issued in both official languages, the subsurface investigation report(s) shall be issued in both languages.

In addition to the provision of the Subsurface Investigation Report, the foundation information required by the National Building Code of Canada 2005 (Division C, Part 2, 2.2.4.6) shall be included on foundation drawings.

18 Experience and Qualifications

Remove experience and qualification requirements from specification sections.

19 Prequalification and Pre-award submissions

Do not include in the specification any mandatory contractor and/or subcontractor prequalification or pre-award submission requirements that could become a contract award condition. If a prequalification process or a pre-award submission is required, contact the Project Manager.

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

20 Contracting Issues

Specifications describe the workmanship and quality of the work. Contracting issues should not appear in the specifications. Division 00 of the NMS is not used for PWGSC projects.

Remove all references within the specifications, to the following:

- General Instructions to Bidders
- General Conditions
- CCDC documents
- Priority of documents
- Security clauses
- Terms of payment or holdback
- Tendering process
- Bonding requirements
- Insurance requirements
- Alternative and separate pricing
- Site visit (Mandatory or Optional)
- Release of Lien and deficiency holdbacks

DRAWINGS

1 Title Blocks

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

2 Dimensions

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

3 Trade Names

Trade names on drawings are not acceptable. Refer to SECTION 3, SPECIFICATIONS, 6.0 Specifying Materials for specifying materials by trade name.

4 Specification Notes

No specification type notes are to appear on any drawing.

5 Terminology

Use the term "Departmental Representative" instead of Engineer, PWGSC, Owner, Consultant or Architect. "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.

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. Specifications must permit bidders to calculate all quantities and bid accurately. If quantities are impossible to identify (i.e. cracks to be repaired) give an estimated quantity for bid purposes (unit prices). Ensure that the terminology used throughout the specifications is consistent and does not contradict the applicable standard construction contract documents.

6 Information to be included

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

7 Drawing Numbers: Number drawings in sets according to the type of drawing and the discipline involved as follows (The requirements of SECTION 2 PWGSC NATIONAL CADD STANDARD will supercede these requirements, where warranted).

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.

- 8 Presentation Requirements:** Present drawings in sets comprising the applicable demolition, architectural, structural, mechanical and electrical drawings in that order. All drawings should be of uniform standard size.
- 9 Prints:** Print with black lines on white paper. Blue prints are acceptable for document submissions at 33%, 66% and 99% stages. Confirm with Project Manager the size of prints to be provided for review purposes.
- 10 Binding:** Staple or otherwise bind prints into sets. Where presentations exceed 20 sheets, the drawings for each discipline may be bound separately for convenience and ease of handling.
- 11 Legends:** 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.
- 12 Schedules:** Where schedules occupy entire sheets, locate them next to the plan sheets or at the back of each set of drawings for convenient reference. *See CGSB 33-GP-7 Architectural Drawing Practices for schedule arrangements.*
- 13 North Points:** On all plans include a north point. Orient all plans in the same direction for easy cross-referencing. Wherever possible, lay out plans so that the north point is at the top of the sheet.
- 14 Drawing Symbols:** Follow generally accepted drawing conventions, understandable by the construction trades, and in accordance with PWGSC publications.

ADDENDA

1 Format

Prepare addenda using the format shown in Appendix B. No signature type information is to appear.

Every page of the addendum (including attachments) must be numbered consecutively. All pages must have the PWGSC project number and the appropriate addendum number. Sketches shall appear in the PWGSC format, stamped and signed.

No Consultant information (name, address, phone #, consultant project # etc.) should appear in the addendum or its attachments (except on sketches).

2 Content

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

DOCUMENTATION

Translation

When required, all documentation included in the construction contract documents shall be in both official languages.

Ensure that English and French documents are equal in all respects. There can be no statement that one version takes precedence over the other.

Consultant shall provide:

- Per construction document submission, a completed and signed Checklist for the Submission of Construction Documents. See Appendix 'A'.
- Specification: originals printed one side on 216 mm x 280 mm white bond paper.
- Index: as per Appendix 'C'
- Addenda (if required): as per Appendix 'B' (to be issued by PWGSC).
- Drawings: reproducible originals, sealed and signed by the design authority.
- Tender information:
 - Including a description of all units and estimated quantities to be included in unit price table.
 - Including a list of significant trades including costs. PWGSC will then determine which trades, if any, will be tendered through the Bid Depository.
 - Government Electronic Tendering System (MERX): Consultants to 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. The electronic copy of drawings and specifications is for bidding purposes only and do not require to be signed and sealed. See Appendix 'D' and Appendix 'E'.

PWGSC shall provide:

- General and Special Instructions to Bidders
- Bid and Acceptance Form
- Standard Construction Contract Documents

SECTION 4 CLASSES OF CONSTRUCTION COST ESTIMATES USED BY PWGSC

DESCRIPTION OF THE CLASSES OF ESTIMATES USED BY PWGSC FOR CONSTRUCTION COSTING OF BUILDINGS PROJECTS

Class 'D' (Indicative) Estimate:

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 all the options being considered.

Submit Class D cost estimates in elemental cost analysis format latest edition issued by the Canadian Institute of Quantity Surveyors with cost per m² for current industry statistical data for the appropriate building type and location. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class D cost estimate shall be such that no more than a 20% contingency allowance is required.

Class 'C' Estimate:

Based on a comprehensive list of requirements and assumptions, including a full description of the preferred schematic design option, construction/design experience, and market conditions. This estimate must be sufficient for making the correct investment decision.

Submit Class C cost estimates in elemental cost analysis format latest edition issued by the Canadian Institute of Quantity Surveyors with cost per m² for current industry statistical data for the appropriate building type and location. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class C cost estimate shall be such that no more than a 15% contingency allowance is required.

Class 'B' (Substantive) Estimate:

Based on design development drawings and outline specifications, which include the 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.

Submit Class B cost estimates in elemental cost analysis format latest edition issued by the Canadian Institute of Quantity Surveyors. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class B cost estimate shall be such that no more than a 10% design contingency allowance is required.

Class 'A' (Pre-Tender) Estimate:

Based on completed construction drawings and specifications prepared prior to calling competitive tenders. This estimate must be sufficient to allow a detailed reconciliation/negotiation with any contractor's tender.

Submit Class A cost estimates in both elemental cost analysis format and trade divisional format latest edition issued by the Canadian Institute of Quantity Surveyors. Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.

The level of accuracy of a class A cost estimate shall be such that no more than a 5% design contingency allowance is required.

SECTION 5 TIME MANAGEMENT

1 Time Management, Planning, and Control

The Time Management, Planning, and Control Specialist (scheduler) shall provide a Project Planning and Control System (Control System) for Planning, Scheduling, Progress Monitoring and Reporting and a Time Management, Planning, and Control Report (Progress Report). It is required that a fully qualified and experienced Scheduler play a major role in providing services in the development and monitoring of the project schedule.

The scheduler will follow good industry practices for schedule development and maintenance as recognized by the Project Management Institute (PMI).

PWGSC presently utilizes the Primavera Suite software and MicroSoft Project for its current Control Systems and any software used by the consultant should be fully integrated with these, using one of the many commercially available software packages.

1.1 Schedule Design

Project Schedules are used as a guide for execution 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).

When building a Control System you must consider:

1. The level of detail required for control and reporting;
2. The reporting cycle- monthly and what is identified in the Terms of Reference, but also includes Exception Reports;
3. That the duration must be in days;
4. What is required for reporting in the Project Teams Communications Plan and
5. The nomenclature and coding structure for naming and reporting requirements of activities, schedules and reports.

1.2 Schedule Development

For purposes of monitoring and reporting of project progress and ease of schedule review it is important to maintain a standard for all schedules and reports starting with the Work Breakdown Structure (WBS), identification of Milestones, naming of activities as well as schedule outputs and paper sizing and orientation.

Work Breakdown Structure

When developing the schedule the consultant needs to use PWGSC standards and practices. Two basic requirements are the National Project Management System

(NPMS) and a Work Breakdown Structure (WBS), structured supporting the NPMS (Levels 1-4).

The WBS is as follows:

- Level 1 Project Title (NPMS)
- Level 2 Project Stage (NPMS)
- Level 3 Project Phase (NPMS)
- Level 4 Processes to meet Deliverables/Control Points Milestones (NPMS)
- Level 5 Sub-Processes and Deliverables in support of Level 4
- Level 6 Discrete activities. (Work Package)

Not all the Stages, Phases and Processes in the NPMS will be required on all the projects, however the structure remains the same.

Major and Minor Milestones

The Major Milestones are standard Deliverables and Control Points within NPMS and are required in all schedule development. These Milestones will be used in Management Reporting within PWGSC as well as used for monitoring project progress using Variance Analysis. The Minor milestones are process deliverables (Level 4) or sub-process deliverables (level 5) also used in Variance Analysis.

Each Milestone will also be assigned appropriate coding for Status Reporting and Management Reporting.

Milestones must have zero duration and are used for measuring project progress.

Milestones may also be external constraints such as the completion of an activity, exterior to the project, affecting the project.

Activities

All activities will need to be developed based on Project Objectives, Project Scope , Major and Minor Milestones, meetings with the project team and the scheduler's full understanding of the project and it's processes.

Subdivide the elements down into smaller more manageable pieces that organize and define the total scope of work in Levels 5-6 that can be scheduled, costed, monitored and controlled. This process will develop the Activity List for the project.

Each activity is a discrete element of work and is the responsibility of one person to perform.

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

Activities should not have durations longer than 2 update cycles, with exception of activities not yet defined in a "Rolling Wave".

Each activity will be assigned at WBS level 6 and appropriately coded for Status Reporting and Management Reporting.

These elements will become activities, interdependently linked in Project Schedules.

Project Logic

Once the WBS, Milestones and Activity List have been developed the activities and milestones can be linked in a logical manner starting with a Project Start Milestone. Every activity and milestone must be linked in a logical manner using either a Finish to Start (FS), Finish to Finish (FF), Start to Start (SS) or Start to Finish (SF) relationship. There can be no open-ended activities or milestones.

A Finish to Start (FS) is the preferred relationship.

When developing relationships avoid the use of lags and constraints in place of activities and logic.

Activity Duration

The activity duration (in days) is the estimated length of time it will take to accomplish a task.

Consideration needs to be taken in how many resources are needed and are available, to accomplish any activity. (Example: availability of Framers during a “Housing Boom”.) Other factors are the type or skill level of the available resources, available hours of work, weather etc.

There will be several types of lists and schedules produced from this process, which will form part of the Progress Report.

Activity List

An Activity List identifies all activities including milestones required to complete the whole project.

Milestone List

A Milestone List identifies all project Major and Minor milestones.

Master Schedule

A Master Schedule is a schedule used for reporting to management at WBS level 4 and 5 that identifies the major activities and milestones derived from the detailed schedule. Cash Flow projections can be assigned at WBS level 5 for monitoring the Spending Plan.

Detailed Project Schedule

A Detailed Project Schedule is a schedule in reasonable detail (down to WBS Level 6 and 7) for progress monitoring and control, this will ensure that the schedule shall be in sufficient detail to ensure adequate planning and control.

1.3 Schedule Review and Approval

Once the scheduler has identified and properly coded all the activities; put them into a logical order and then determined the appropriate durations. The scheduler can then analyze the schedule to see if the milestone dates meet the contractual requirements and then adjust the schedule accordingly by changing durations, resource leveling or changing logic.

When the schedule has been satisfactorily prepared the scheduler can present the detailed schedule to the Project Team for approval and be Baselined. There may be several iterations before the schedule meets with the Project Teams agreement and the contractual requirements.

The final agreed version must be copied and saved as the Baseline to monitor variances for reporting purposes.

1.4 Schedule Monitoring and Control

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

Monitoring is performed by, comparing the baseline activities % complete 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 in report form.

Analyze and report from early start sequence on all activities due to start, underway, or finished for the complete project.

There will be several reports generated from the analysis of the baseline schedule and will form part of the Time Management Report in the Required Services Sections (RS)

Progress Reports

A Progress Report reflects the progress of each activity to the date of the report, any logic changes, both historic and planned, projections of progress and completion the actual start and finish dates of all activities being monitored.

The Progress Report includes:

A Narrative Report, detailing the work performed to date, comparing work progress to planned, and presenting current forecasts. This report should summarize the progress to date, explaining current and possible deviations and delays and the required actions to resolve delays and problems with respect to the Detail Schedule, and Critical Paths.

Narrative reporting begins with a statement on the general status of the project followed by a summarization of delays, potential problems and project status criticality, any

potential delays, outstanding issues and concerns and options for dealing with any serious planning and scheduling issues.

A Variance Report, with supporting schedule documentation, detailing the work performed to date, comparing work progress to planned. This report should summarize the progress to date, explaining all causes of deviations and delays and the required actions to resolve delays and problems with respect to the Detail Schedule, and Critical Paths.

A Criticality Report identifying all activities and milestones with negative, zero and up to five days Total Float used as a first sort for ready identification of the critical, or near critical paths through the entire project.

Included in the Progress Report as attachments are: WBS chart, Activity Lists, Milestone Lists, Master Schedules, Detailed Project Schedule

Exception Report

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.

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.

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.

1.5 Standard Submissions

At each submission or deliverable stage provide a complete and updated Progress Report, the contents of each report will vary with requirements and at each project phase. Typically a Progress Report has:

1. Executive Summary;
2. Narrative Report;
3. Variances Report;
4. Criticality Report;
5. Exception Report (as required)
6. Work Breakdown Structure Chart;
7. Activity List;
8. Milestone List;
9. Master Schedule with Cash Flow Projections;
10. Detail Project Schedule (Network Diagram or Bar Charts);

1.6 Schedule Outputs and Reporting Formats

The sheet sizing and orientation is more a suggestion that a role, changes to the paper format may vary to accommodate the information and column information required.

Progress Reports

Paper Size: Letter

Paper Format: Portrait

Title Format: Project Title; Report Type; Print Date; Data Date; Revision Block

Body Text: Narratives for each report to match other reports generated in the D.S.S.

Variance Report Columns: Activity ID, Activity Name, Planned Finish, Revised Finish, Variance, Activity % Complete,

Criticality Report Columns: Activity ID, Activity Name, Duration, Start, Finish, Activity % Complete, Total Float.

Exception Reports

Paper Size: Letter

Paper Format: Portrait

Title Format: Project Title; Report Type; Print Date; Data Date; Revision

Body Text: Narrative to match other reports generated in the D.S.S.

Paper Size: Letter

Paper Format: Landscape

Title Format: Project Title; Report Type; Print Date; Data Date; Revision

Columns: Activity ID, Activity Name, Duration, Remaining Duration, Start, Finish, Total Float.

Work Breakdown Structure (indent tree):

Paper Size: Letter

Paper Format: Portrait

Columns: WBS Code, WBS Name, Duration, Cost estimate, start and finish dates.

Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block

Activity Lists

Paper Size: Letter

Paper Format: Portrait

Columns: Activity ID, Activity Name, Start, Finish, Predecessor, Successor.

Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block

Sort with Early Start, then Early Finish, then Activity ID and with the WBS.

Milestone Lists

Paper Size: Letter

Paper Format: Portrait

Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block
Columns: Activity ID, Activity Name, Start, Finish.

Sort with Early Start, then Early Finish, then Activity ID and without the WBS.

Master Schedule (Bar Chart)

Paper Size: 11X17
Paper Format: Landscape
Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block
Columns: Activity ID, Activity Name, Duration, Activity % Complete, Start, Finish,
Total Float.

Sort with Early Start, then Early Finish, then Activity ID and with the WBS.

Detailed Project Schedules (Bar Chart)

Paper Size: 11X17
Paper Format: Landscape
Footer Format: Project Title; Report Type; Print Date; Data Date; Revision Block
Columns: Activity ID, Activity Name, Duration, Activity % Complete, Start, Finish,
Total Float.

Sort with Early Start, then Early Finish, then Activity ID and with the WBS.

APPENDIX 'A' - Checklist for the Submission of Construction Documents to PWGSC

Last updated November 21, 2012

Date:		
Project Title:	Project Location:	
Project Number:	Contract Number:	
Consultant's Name:	PWGSC Project Manager:	
Review Stage: <div style="display: flex; justify-content: space-around; width: 100%;"> 66% 99% 100% </div>		

Item	Verified by:	Comments:	Action by:
Specifications:			
1 National Master Specifications			
1a The current edition of the NMS has been used.			
1b Sections have been included for all work identified on drawings and sections edited.			
2 Specification Organization			
2a Either the NMS 1/3 - 2/3 page format or the Construction Specifications Canada full page format is used.			
2b Each Section starts on a new page and the Project Number, Section Title, Section Number and Page Number show on each page.			
2c Specification date and consultant's name are not indicated.			
3 Terminology			
3a The term Departmental Representative is used instead of Engineer, PWGSC, Owner, Consultant or Architect.			
3b Notations such as: "verify on site", "as instructed", "to match existing", "example", "equal to", "equivalent to" and "to be determined on site by" are not used.			
4 Dimensions			
4a Dimensions are provided in metric only.			
5 Standards			
5a The latest edition of all references quoted is used.			

6 Specifications Materials			
6a The method of specifying materials uses recognized standards. Actual brand names and model numbers are not specified.			
6b Materials are specified using standards and performance criteria (if not, the correct form of acceptable materials has been used).			
6c Identify if non-restrictive, non-trade name “prescription” or “performance” specifications are used.			
6d Indicate if a list of acceptable materials have been used.			
6e The term “Acceptable Manufacturers” is not used.			
6f No sole sourcing has been used.			
6g If sole sourcing has been used, the correct wording has been used and a justification provided to RPCD for the sole sourced products.			
7 Unit Prices			
7a Unit prices are used only for work that is difficult to estimate.			
8 Cash Allowances			
8a Indicate if cash allowances have been used.			
9 Warranties			
9a Indicate if warranties extend more than a 12 or 24 months period.			
9b Manufacturers guarantees are not indicated.			
10 Scope of Work			
10 No paragraphs noted as “Scope of Work” are included.			
11 Summary and Section Includes			
11a In part 1 of section, paragraphs “Summary” and “Section Includes” are not used.			
12 Related Sections			
12a The list of related sections and appendices are coordinated.			
13 Index			
13a The index shows a complete list of plans and specification sections with the correct number of pages and correct drawing titles and section names.			
14 Regional Guide Specifications			
14a General Instructions is included (Section 01 00 10 in the NCA).			

15 Health and Safety			
15a Section 01 35 29.06 - Health and Safety Requirements is included.			
16 Designated Substances Report			
16 a Section 01 14 25 - Designated Substances Report is included.			
17 Subsurface Investigation Reports			
17a Subsurface Investigation Reports are included in Division 31.			
18 Experience and qualifications			
18a Experience and qualification requirements do not appear in the specification sections			
19 Pre-qualifications			
19a There are no mandatory contractor and/or subcontractor pre-qualification requirements or references to certificates, transcripts or license numbers of a trade or subcontractor being included in the bid.			
20 Contracting Issues			
20a Contracting issues do not appear in the specifications.			
20b Division 00 of the NMS is not used.			
21 Quality Issues			
21a There are no specification clauses with square brackets “[]” or lines “___” indicating that the document is incomplete or missing information.			

Item	Verified by:	Comments:	Action By:
Drawings:			
1 Title Blocks			
1a The PWGSC title block is used.			
2 Dimensions			
2a Dimensions are provided in metric only.			
3 Trade Names			
3a Trade names are not used.			
4 Specification Notes			
4a There is no specification type notes.			
5 Terminology			
5a The term Departmental Representative is used instead of Engineer, PWGSC, Owner,			

Consultant or Architect.			
5b Notations such as: “verify on site”, “as instructed”, “to match existing”, “example”, “equal to”, “equivalent to” and “to be determined on site by” are not used.			
6 Information to be included			
6a Architectural and Engineering Drawings have been stamped and signed by the design authority.			
6b The project quantity and configuration, dimensions and construction details are included.			
6c References to future work and elements not in contract do not appear or are kept to an absolute minimum and clearly marked.			

I confirm that the plans and specifications have been thoroughly reviewed and that the items listed above have been addressed or incorporated. I acknowledge and accept that by signing, I am certifying that all items noted above have been addressed.

Consultant's Representative: _____

Firm name: _____

Signature: _____ Date: _____

APPENDIX 'B' - Sample of Addendum

Last updated April 22, 2008

ADDENDUM No. _____

Project Number: _____

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

DRAWINGS

SPEC NOTE: indicate drawing number and title, then list changes or indicate revision number and date, and re-issue drawing with addendum.

- 1 A1 Architectural
- .1

SPECIFICATIONS

SPEC NOTE: indicate section number and title.

- 1 Section 01 00 10 - General Instructions

SPEC NOTE: list all changes (i.e. delete, add or change) by article or paragraph

- .1 Delete article (xx) entirely.
 - .2 Refer to paragraph (xx.x) and change ...
- 2 Section 23 05 00 - Common Work Results - Mechanical
- .1 Add new article (x) as follows:

APPENDIX 'C' - Sample of Index

Last updated April 22, 2008

Project No: _____

Index
Page 1 of _____

DRAWINGS AND SPECIFICATIONS

DRAWINGS:

SPEC NOTE: List all Drawings by number and title.

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

SPECIFICATIONS:

SPEC NOTE: List all Divisions, Sections (by number and title) and number of pages.

<u>DIVISION</u>	<u>SECTION</u>	NO. OF PAGES
		<div></div>
DIVISION 01	01 00 10 - General Instructions.....XX
	01 14 25 - Designated Substances Report.....XX
	01 35 30 - Health and Safety.....XX
DIVISION 23	23 xx xx	
DIVISION 26	26 xx xx	

APPENDIX 'D'

USER MANUAL ON DIRECTORY STRUCTURE AND NAMING CONVENTION STANDARDS FOR CONSTRUCTION TENDER DOCUMENTS ON CD ROM

Issued by:

Real Property Contracting Directorate

PWGSC

May 2005

Last Updated: June 3, 2008

Version 1.0

PREFACE

The Government of Canada (GoC) has committed to move towards an electronic environment for the majority of the services it offers. This covers the advertisement and distribution of contract opportunities, including construction solicitations. As a result, it is 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).

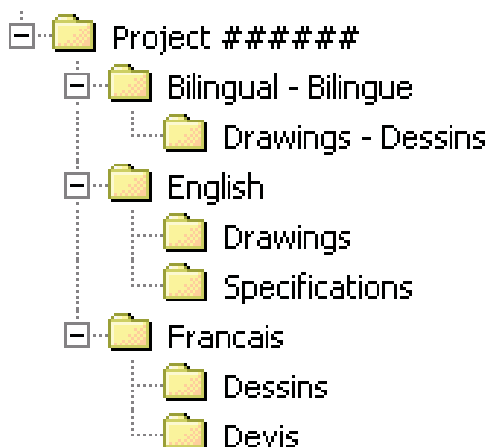
There is therefore a need to adopt a common directory structure and file-naming convention to ensure that the information made available to contractors electronically and in hard (printed) copy is in accordance with the sequence adopted in the real property industries, both for design and construction.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

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. 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.

1. DIRECTORY STRUCTURE

1.1 1st, 2nd and 3rd Tier Sub-Folders

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:



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

- The “*Project #####*” folder is considered the 1st Tier of the Directory Structure where *#####* represents each digit of the Project Number. The Project Number must always be used to name the 1st Tier folder and it is always required. Free text can be added following the Project Number, to include such things as a brief description or the project title;
- 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;
- 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.

IMPORTANT:

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

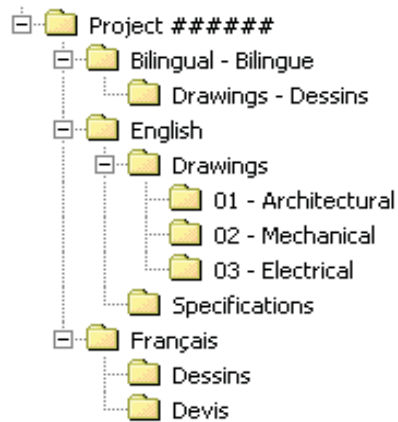
1.2 4th Tier Sub-Folders for Drawings

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

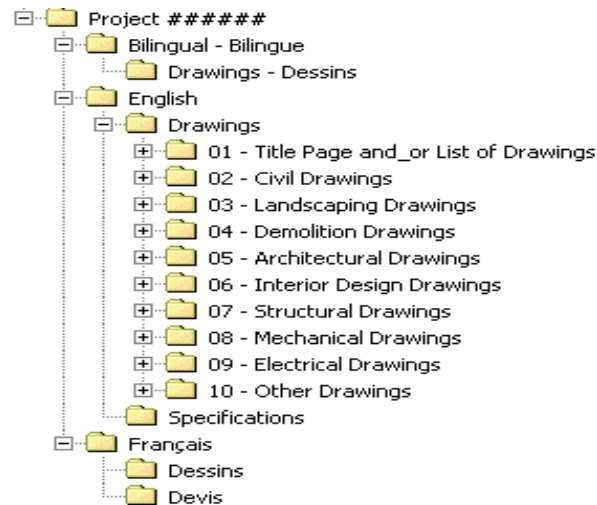
Because the order of appearance of the sub-folders on the screen will also determine the order of printing, it is necessary to start with a number the identification name of the sub-folders in the “Drawings – Dessins”, “Drawings” and “Dessins” folders.

Note: 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.

Examples of 4th Tier sub-folders for drawings:



or



1.2.1 Naming Convention

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

For the “*Drawings*” and “*Dessins*” folders:

- Y

Where:

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

Y = The title of the folder

Example: 03 – Mechanical

For the “*Drawings - Dessins*” folder:

- Y - Z

Where:

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

Y = The English title of the folder

Z = The French title of the folder

Example: 04 - Electrical - Électricité

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.

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:

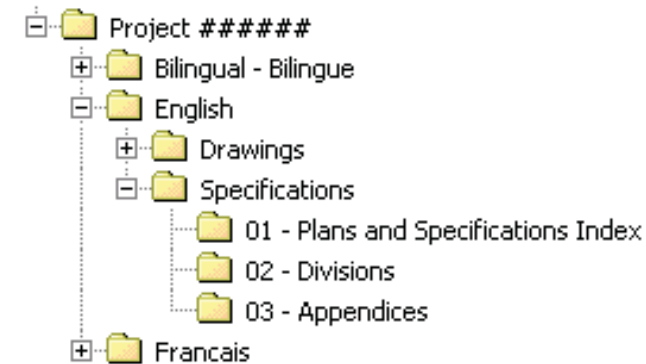
- The alphanumerical sorting is done on an ascending order;
- The alphanumerical order of the sub-folders determines the order of appearance on the screen as well as the order of printing (as an example: all the drawing PDF files in the 01 sub-folder will be printed in alphanumerical order before the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

1.3 4th Tier Sub-Folders for Specifications

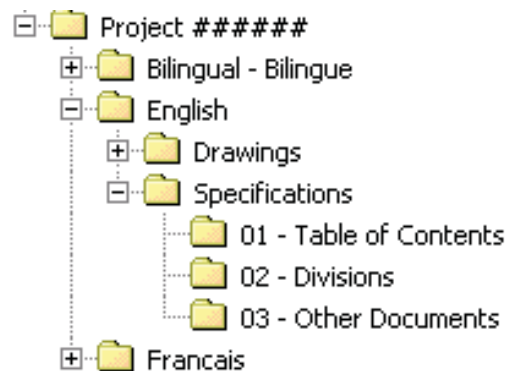
The “*Specifications*” and “*Devis*” folders must have 4th Tier sub-folders created to reflect the various elements of the specifications.

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.

Examples of 4th Tier sub-folders for specifications:



or



1.3.1 Naming Convention

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

For the “Specifications” and “Devis” folders:

- Y

Where:

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

Y = The title of the folder

Example: 02 – Divisions

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.

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:

- The alphanumerical sorting is done on an ascending order;
- 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...);
- Each specifications 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. Division 01 will be printed before Division 02, 01 - Appendix A before 02 - Appendix B, etc...).

2. NAMING CONVENTION FOR PDF FILES

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.

2.1 Drawings

Each drawing must be a **separate single page** PDF file. The naming convention of each drawing must be:

X### - Y

Where:

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

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

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

Example: A001 - First Floor Details

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. 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).

The following important points about drawings are to be noted:

- 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. 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);

- If drawing PDF files are included in the “*Bilingual - Bilingue*” folder, these cannot be included as well in the “*English*” and/or “*Français*” folders;
- If drawings not associated with a particular discipline are not numbered (Title Page or List of Drawings for example), these will be sorted alphabetically. 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.

- Y

Where:

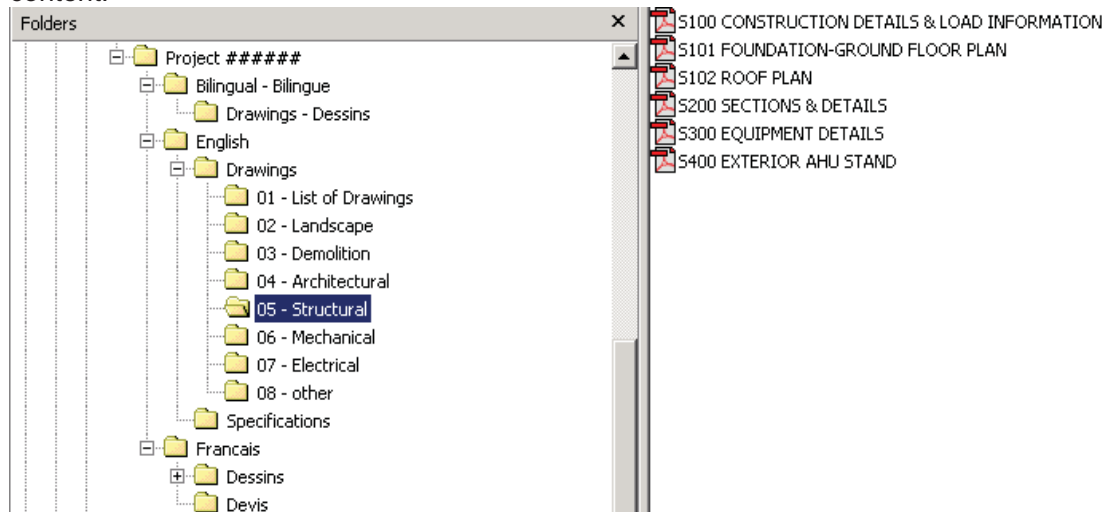
= A two digit number ranging from 01 to 99 (leading zeros must be included)

Y = The name of the drawing

Example: 01 - Title Page
02 - List of Drawings

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.

Example of a 4th Tier Drawings sub-folder's content:



2.2. Specifications

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). The Plans and Specifications Index must

also be a separate PDF file. 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.

2.2.1 Documents other than Specifications Divisions

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:

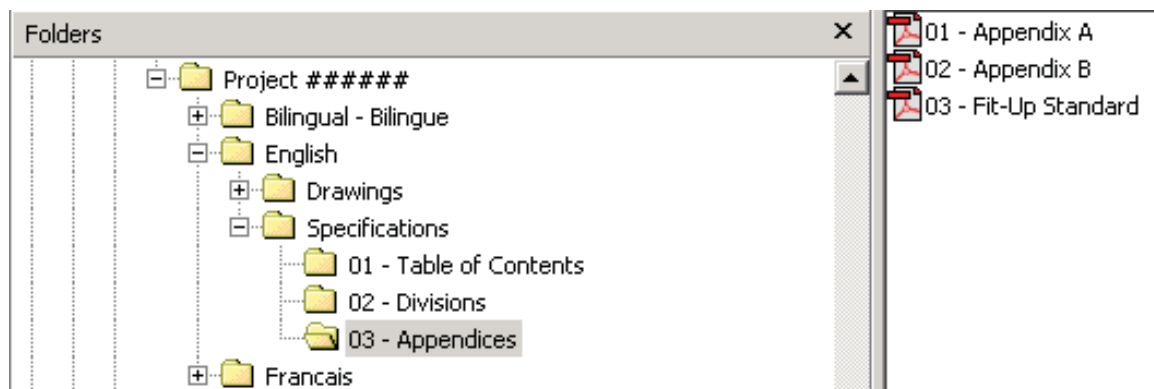
- Y

Where:

= Two digit number ranging from 01 to 99 with leading zeros required
Y = Name of the document

Example: 01 - Plans and Specifications Index

Example of a sub-folder content (sub-folder other than “*Divisions*”):



2.2.2 Specifications Divisions

The Specifications Divisions must be named as follows:

Division ## - Y

Where:

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

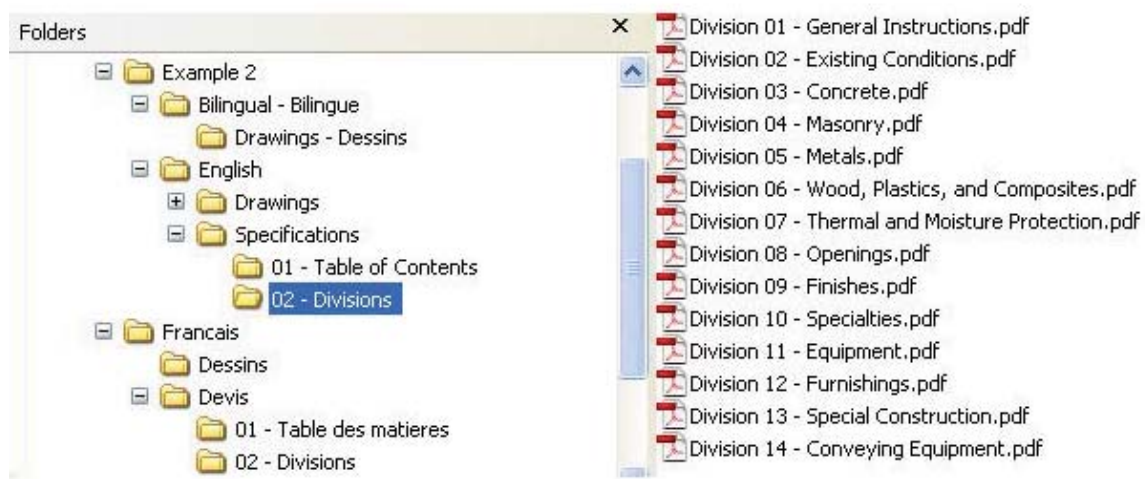
Y = Name of the Specifications Division as per **CSC/CSI MasterFormat™**

Example: Division 05 – Metals

The following important point about specifications is to be noted:

- The Numbering of the Divisions **cannot** be altered from **CSC/CSI MasterFormat™** even if some Divisions are not used in a given project. For example, Division 05 will always remain Division 05 even if Division 04 is not used for a given project.

Example of a “Divisions” sub-folder content:



3. CD-ROM LABEL

Each CD-ROM is to be labeled with the following information:

Project *Number* / *Numéro de projet*

Project *Title* / *Titre du projet*

Documents for Tender / Documents pour appel d'offres

CD X of/de X

Example:

Project 123456 / Projet 123456

Repair Alexandra Bridge / Réparation du pont Alexandra

Documents for Tender / Documents pour appel d'offres
CD 1 of/de 1

APPENDIX 'E'

BASIC REFERENCE GUIDE ON CONVERTING CONSTRUCTION DRAWINGS INTO PORTABLE DOCUMENT FORMAT (PDF)

Issued by:
Real Property Contracting Directorate
PWGSC

May 2005 Last Updated: May 3, 2005

Version 1.0

PREFACE

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

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.

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. It actually should not take any longer than it would take to create a plot file or to send a drawing to a printer. 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. The conversion of specifications is not covered in this basic reference guide since it does not require any special configuration or setting.

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. 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.

1. PRINTER DRIVERS

Adobe Acrobat provides two different printer drivers that are able to convert CADD drawing into PDF format, Acrobat PDF Writer and Acrobat Distiller. Before creating a PDF file from a CADD drawing, a choice must be made as to which one will be used.

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

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

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.

2. PRINTER CONFIGURATION

Before converting a CADD drawing to PDF, an Acrobat printer configuration file for the PDF paper size needs to be created. This function can be done in the CADD software rather than using a custom paper size defined for the Acrobat distiller feature. 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. The configuration can then be re-used to simplify the conversion process for future files that use the same page size.

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

3. CREATING PDF FILES

Once the printer configuration has been done in the CADD software, open up Acrobat Distiller and make the necessary settings in the *preferences* and *job options* sub-menu. Ensure that the page size match the sheet size selected in the CADD software to create the file. Particular settings can be saved under different names for future use.

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.

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

4. PDF FILES SETTINGS

4.1 Security

Adobe Acrobat contains security features that can be used to secure the files by restricting any changes to the files. However, since the files will be posted on GETS and will be used for printing copies, the files **must not** be password protected and **must** allow printing.

4.2 Drawing Orientation

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.

4.3 Font Type

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.

4.4 Resolution

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).

4.5 Scale

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.

5. SCANNING

Scanning is not recommended and should be done only when the drawing is not available electronically. 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. It is recommended that each scanned drawing be opened and verified to ensure that the resolution, scale and border are of an acceptable quality.

6. FINAL CHECKLIST

When the drawing file has gone through the PDF conversion, it is recommended to open it and verify the following:

- That the sheet size displayed is what was intended to be created (the size is viewable in the lower left corner of the drawing).
- That the orientation of the sheet is correct.
- That the line types, line weights and fonts match the CADD drawing.
- That the PDF file is in black and white.
- That each drawing is a single PDF file.
- That the PDF file is not password protected and printable.

If all the items are verified, the PDF file is useable

7. ADDITIONAL INFORMATION

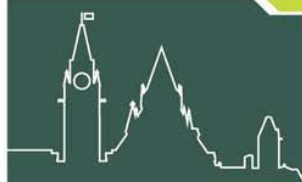
For more information about the creation of PostScript and EPS files please refer to the User's Guide of the CADD software being used to produce the drawings. For more information about creating PDF file please refer to the Acrobat Distiller User's Guide and/or visit the Adobe Web site at www.adobe.com.



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CANADIANS.

PWGSC Commissioning Manual (CP.1)

**4th edition
November 2006**

Prepared by
National Commissioning Committee

Issued by
Real Property Branch

GENERAL

Development

This document has been developed under the direction of Mechanical and Maintenance Engineering, AES with the participation and contributions of the following members of the National Commissioning Committee:

Edward Durand	NCA
Paul Sra	NCA
Mike Cavan	NCA
Ralph Collins	NCA
John Hutchins	Pacific Region
Stuart Davison	Western Region
John Lee	Ontario Region
Yvon Rajotte	Quebec Region
Michael Devine	Atlantic Region

Feedback

Corrections, recommendations, suggestions for modifications or additional information and instructions that will improve this document are invited. For this purpose the attached form entitled "*Request for change to this manual*" may be used and mailed or faxed to the address shown. E-mail or other forms of electronic transmission may also be used for this purpose.

Conflicts

Any area of conflict between this document and the Project Brief must be brought to the attention of the Project Manager as soon as it is noted.

PWGSC COMMISSIONING MANUAL (CP.1)

4th edition

November 2006

Request for changes to this manual

Return this form to :

National Manager
Mechanical and Maintenance Eng. Group
Architectural and Engineering Resources
Professional and Technical Program
Real Property Branch
PWGSC
Tel: (819) 956-3972 FAX: (819) 956-4441

Type of change suggested: Please indicate which applies:

1. Correction of information
2. Deletion of information
3. Additional information to be added

Details of suggested changes: If necessary, make the suggested changes to a photocopy of the relevant page(s) of this manual and attach to this sheet.

Page: Chapter: Paragraph no:

Details of suggested changes

(Use additional sheets if necessary)

Signature: _____ Date: _____

Preface to the 4th edition - November 2006

In 1977, a Building Commissioning Section was established in the Facilities Maintenance Division of the former Property Administration Branch of the former Public Works Canada (now Public Works and Government Services Canada [PWGSC]). This Building Commissioning Section recognised the need for early involvement in the Project Delivery System (PDS) but faced two big obstacles. On its own part, there was a lack of practical experience in commissioning; on the part of the design community, there was a certain resistance to change in the status quo.

In 1987 a Buildings Commissioning Working Group was formed in the, then, Architectural and Engineering Services Branch (AES) at Headquarters and included representatives from the Facilities Maintenance Division. Its mandate was to establish a clear understanding of commissioning, to define its objectives, and to establish the technical requirements for commissioning mechanical and electrical systems in buildings for inclusion in project briefs. This working group was determined to provide a "seamless" approach to commissioning. Research on the subject included examination of source documents and practices from the United States (including ASHRAE), the United Kingdom and Australia. When the working group examined current practices in Canada, it became clear that commissioning, as it was then defined in the PWGSC six-phase Project Delivery System, was rarely carried out. One reason for this was that responsibility and accountability for commissioning had not been clearly identified.

In February 1989, the working group produced a series of draft commissioning documents. In 1991 these documents were further refined, developed to cover all disciplines and consolidated into one manual - *The Project Commissioning Manual*, produced in 1993.

A continuation of this initiative resulted in further refinements, the development of generic commissioning briefs and commissioning specifications and the release of CP.1 - *"The Project Commissioning Manual - Revised January 2000"*.

In 2000, a National Commissioning Committee was established. Its membership included representatives from AES and AFMS and was co-chaired by the Director/Manager of these groups. Its terms of reference included, among other things:

1. To review, improve and update commissioning documents
2. To develop new commissioning practices
3. To create, maintain and update commissioning information database.
4. To promote commissioning in PWGSC
5. To prepare "Lessons Learned" documentation
6. To organize annual commissioning workshops
7. To receive, evaluate and share information and experiences with the Regions.

As a result of the work of this committee, further changes were made to the manual in order to make it even more easily referenced by Project Managers, Commissioning Managers and others. The Commissioning Manual now consists of two binders:

- ***PWGSC Commissioning Manual*** - addresses the requirements of the Commissioning Policy and includes issues which are of major concern to the PWGSC Project Manager and the Project Leader.
- ***PWGSC Commissioning Guidelines*** - contains the remaining documents and is generally for the benefit of in-house designers, consultants and their sub-consultants and Commissioning Managers.

In 2006, the PWGSC Project Delivery System (PDS) was changed to the National Project Management System (NPMS). The Commissioning Manual and Guidelines were subsequently modified to suit the NPMS and its terminology.

The PWGSC Commissioning Manual and the *PWGSC Commissioning Guidelines* have been structured so that each Region is able to adapt them to suit regional requirements, since it is recognized that each Region has a different approach to the practice of commissioning and that this will affect how each uses the *PWGSC Commissioning Manual*. It is suggested that each Region select from the *PWGSC Commissioning Guidelines* those elements which are most applicable to the Region's requirements and that will enable each Region to develop a quality deliverable which is acceptable to the Client.

It is also recognized that the organizational structure of each Region is unique and subject to change. *The PWGSC Commissioning Manual (CP.1)* has therefore been written around commissioning activities and is not reliant upon the reporting organizational structures of the PWGSC Regions.

It is suggested that each Region develop its own partnership agreement between the relevant branches of PWGSC relating to roles and responsibilities throughout the commissioning process so as to reflect the distinctive organizational structure of each Region. It will also promote commissioning as a tool for enhancement of client satisfaction.

Partnership between all branches of PWGSC

The role of PWGSC in commissioning and in the production of the PWGSC Commissioning Manual and the accompanying PWGSC Commissioning Guidelines has always been fully recognized by all branches of PWGSC.

Architectural and Engineering Resources will continue to provide national leadership for commissioning, while AFM will continue to provide management of the overall commissioning activities as it relates to specific projects.

It is also recognized that PWGSC, through its Design Quality Review Team, has a very important role to play in the identification of Design Criteria, Design Intents, Design

Assumptions and Design Solutions to meet these Design Criteria. It is also recognized that commissioning can be properly delivered only by combining the design expertise of Architectural and Engineering Resources and the operational expertise of Maintenance and Operational Assurance (MOA) Commissioning Manager in NCA, and the Maintenance Management Commissioning Manager in the Regions.

Future Developments

As noted above, the National Commissioning Committee will continue to direct and advise on all matters relating to commissioning.

Future editions of this manual will include experiences gained from commissioning activities in PWGSC Regions, as well as knowledge gained from the professional community and from the construction industry. This is essential to the provision of an up-to-date, viable and useful Project Commissioning Manual.

Since the issuance of this manual, generic Installation/Commissioning Checklists and Product Information (PI) and Performance Verification (PV) Report Forms have been developed and proven by use on a number of projects. These are currently being reviewed to improve format and content. This is a long process and will form part of future developments.

Regional Commissioning Contacts

For specific commissioning services in your region, please contact SNGP.NPMS@tpsgc-pwgsc.gc.ca.

Acknowledgements

This manual has been based on many consultations with all branches of PWGSC, many other government departments, organizations such as ASHRAE, the private sector, and many private individuals having a great deal of expertise in commissioning. We wish to thank all those who responded and to assure them that all comments and suggestions provided were carefully examined and, where deemed appropriate, incorporated into the manual. It is only through such co-operation that the best possible document can be produced.

PWGSC Commissioning Manual (CP.1)

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- 1.8 Costs of commissioning
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PWGSC Commissioning Guidelines (in separate binder)

<i>CP.3 Guide to the development of the Commissioning Plan</i>	3rd Edition Nov.2003
<i>CP.4 Guide to the development of Building Management Manuals</i>	3rd Edition Nov.2003
<i>CP.5 Guide to the preparation of Training Plans</i>	3rd Edition Nov.2003
CP.6 Reserved for future development	
<i>CP.7 Design guideline for facility operation and maintenance</i>	3rd Edition Nov.2003
<i>CP.8 Guide to the preparation of Commissioning Reports</i>	3rd Edition Nov.2003
<i>CP.9 Guide to the development and use of Check lists</i>	3rd Edition Nov.2003
<i>CP.10 Guide to the development and use of Report Forms and Schematics</i>	3rd Edition Nov.2003
<i>CP.11 Guide to the preparation of Commissioning Briefs</i>	3rd Edition Nov.2003
<i>CP.12 Guide to the development and use of Generic Commissioning Specifications</i>	3rd Edition Nov.2003
<i>CP.13 Facility Maintenance Policy, Guidelines and Requirements</i>	3rd Edition Nov.2003

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PWGSC Commissioning Manual (CP.1)

Chapter 1 General requirements

1.1 Introduction

This manual is for the use of the PWGSC Project Leader, Project Manager, Commissioning Manager and designers in order to give them a clear understanding of commissioning and to provide guidance in the implementation of commissioning to all PWGSC projects.

In addition, this manual will assist members of the Project Team and personnel from client departments representing the occupants' interests in applying the principles of commissioning as described in this manual.

In addition to this manual, there are various commissioning guidelines for the implementation of commissioning. These guidelines are referenced in the preface to this document.

The PWGSC Commissioning Manual provides detailed information on commissioning as an integral part of the National Project Management System (NPMS) and outlines a clear and consistent approach to commissioning for all members of the Project Team in all stages of NPMS.

Commissioning applies to all PWGSC projects including new projects and renovations, leased premises, AFD-managed facilities, Design-build projects and fit-ups.

1.2 Commissioning (Cx)

Commissioning is a planned program of activities that advances built works from the earliest phases of the project identification stage to a condition of full operation, meeting all objectives of commissioning as defined herein. The commissioning process starts in NPMS Project Identification stage with the production of the Investment Analysis Report (IAR) and ends when the delivered, fully occupied facility has been proven to operate satisfactorily under all weather and occupancy conditions and the Evaluation Report has been written and accepted. Commissioning addresses not only technical systems requirements and the functional and operational needs of the occupants and the Owner including health and safety, security, comfort, and cost effectiveness of operations and maintenance but also protection of the architectural character of new buildings and the heritage character of historical buildings.

Much like the commissioning of ships, commissioning of buildings ensures that when the built works are handed over to its owner occupant or operator as an operating entity it will meet all requirements as described in the Request for Proposal (RFP) or the Project

Brief. It requires coordinated efforts on the part of the Project Planning Team, the Design Team, the Commissioning Team, the Construction Team and the Project Management Team.

During construction, **commissioning** applies to the implementation phase of the NPMS Project Delivery stage in which system and environmental performances are verified, and the project is moved from a static form to a dynamic state and the facility is accepted for occupancy. Commissioning:

- provides a bridge between construction activities and ongoing operation and maintenance,
- provides the necessary technology transfer (training) tools for O&M activities to be performed properly for the entire service life of the facility,
- focuses on the operation of all systems as an integrated whole and verifies the performance and interaction of all systems operating together under a full range of operating conditions with simulated full occupancy.

1.3 Commissioning requirements

All PWGSC construction projects shall undergo a commissioning process as outlined in this manual.

1.4 Objectives of commissioning

The objectives of commissioning are to:

- .1 document the design intent of the overall project, including the architectural characteristics (in the case of new buildings), protection of the heritage features and character (in the case of historical buildings) and the proposed building systems and components and to verify and demonstrate that all functional and operational requirements have been correctly interpreted in the design solution.
- .2 minimize O&M costs through the careful selection of design solutions (for economy, reliability, durability, accessibility, maintainability, etc.), construction materials, installation practices and performance verification procedures.
- .3 verify that selected design solutions and the resultant built works protect the safety, health, welfare and comfort of occupants and O&M personnel.
- .4 define responsibility areas for meeting these operational requirements in the contract documents and include a process to demonstrate compliance.
- .5 demonstrate that the client's and the department's requirements are met during the project implementation and commissioning phases of the project and to support quality management of construction and installation through verification of building components, systems and environments.
- .6 verify and demonstrate that all systems operate consistently at peak efficiencies, under all normal load conditions, and within the specified energy budget.
- .7 provide comprehensive documentation of the operational, maintenance and building management.
- .8 implement a comprehensive training program.
- .9 transfer the completed works to qualified and trained facility operators.

1.5 Risks of inadequate commissioning

There is an inherent risk that certain penalties are likely to result from a poorly commissioned facility. The Owner/Investor, represented by the Project Leader, must weigh the costs of good commissioning practices against the risks of inadequate commissioning. Such risks and penalties might include:

Impact on heritage character of historical buildings: *Inadequate training and information could result in inadequate attention to protection of heritage character and design intent.*

Unclear design criteria and design intents: These lead to inability to meet project and client requirements and failure to meet federal government objectives.

User discontent: Facility occupants may suffer discomfort or inconvenience as a result of inadequate commissioning. This can lead to complaints to the Owner/Investor, costly remedial measures or loss of clientele.

High O&M costs: Inadequate training of O&M staff, poor system documentation or limited performance verification procedures may result in higher utility and O&M costs over the life of the facility (a factor of significant proportions to the Property Manager.)

Inappropriate maintenance practices: Maintenance is likely to be inappropriate when O&M staff have not been fully involved in commissioning activities, resulting in under- or over-maintenance. Either of these will cause unnecessary higher life-cycle costs.

Possible injury: Insufficient protection of system components, not revealed in thorough commissioning, could expose O&M personnel to unnecessary danger.

Expensive corrective measures: High costs and/or major difficulties in retrofitting so as to correct problems which could have been small (or avoided altogether) if addressed during planning or design.

1.6 Benefits of commissioning

Protection of heritage character: The training and documentation provided and involvement of O&M staff in commissioning is the basis for informed maintenance that is sensitive to the needs of heritage materials and assemblies.

Reduced life-cycle costs: In the long term, the projected life-cycle costs of buildings and facilities will be reduced as a result of the integrated efforts of the Designer and the building operators to meet commissioning requirements. When building quality is translated into higher productivity and reduced absenteeism of the occupants, the overall savings become even more significant.

More cost-effective maintenance: Involvement of O&M staff in commissioning, plus the training and documentation provided, is the basis for more effective operation, maintenance and management throughout the life of the facility.

Knowledge transfer:

- .1 Systematic development of commissioning documentation facilitates knowledge transfer from one phase of delivery to the next and from the delivery process to the ensuing ongoing operation of the facility.
- .2 Feedback through project management and report mechanisms can provide benefits to other projects by reporting on experience gained through the Validation and Acceptance Process.

Occupant satisfaction: The primary and immediate beneficiaries of a properly designed, constructed and commissioned facility are the occupants. They will enjoy the advantages of living or working in comfortable, safe, pleasant and properly functioning surroundings that meet their everyday needs. Further benefits will accrue to the Owner/Investor as a result of having satisfied tenants in a quality building that complies with the requirements of the investment plan.

Quality assurance: The Owner/Investor is assured that a quality facility and a "surprise-free" product/environment have been provided. This will be achieved by ensuring that:

- .1 the contract documents include all commissioning specifications,
- .2 the requirements of these specifications will be met,

Fully documented tests and inspections will prevent minor errors from developing into serious operational flaws.

System documentation: Provision of accurate and useful historical records is assured. Such records provide important data for O&M efforts as well as for future renovations, upgrades or repairs. Technical reports and other commissioning documents serve as benchmarks for future system testing, re-commissioning and for maintenance or renovation activities.

System performance verification: Commissioning extends into the project delivery stage, close-out phase, in order to verify performance under a full range of operating conditions. This practice aims to provide a "no-surprises" operation cycle for both Owners and O&M staff. A thorough process will help to avoid unforeseen or hidden O&M expenses later.

LEED and BREEAM certification: Commissioning as performed in accordance with the *PWGSC Commissioning Manual (CP.1)* and its associated *PWGSC Commissioning Guidelines* will meet or exceed the fundamental and additional requirements of various programs such as Leadership in Environmental and Energy Design (LEED), Building Research Establishment Environmental Assessment Method (BREEAM), Quality Guideline C2000 and enable the project to obtain the appropriate certification.

1.7 Extent of commissioning

The extent of commissioning is determined through discussions among all stakeholders such as the Project Leader, Project Manager and Commissioning Manager and is then defined in the Commissioning Brief and the Request for Proposal (RFP) document.

On the other hand, there is a cost associated with insufficient commissioning (refer to 1.5 "*Risks of Inadequate Commissioning*", above).

A detailed guideline relating to the extent of commissioning is contained in CP.11: "*Guide to the preparation of Commissioning Briefs*".

1.8 Costs of commissioning

Many commissioning activities detailed in this manual and the supporting documentation are already being performed as normal standard practice and do not constitute extra costs. Other commissioning activities, traditionally not provided by the design and construction industry, represent additional responsibilities for the Project Manager, Designer and Contractor.

In balance, there will undoubtedly be some additional initial costs to carrying out commissioning procedures. These will depend upon the degree of risk of non-compliance with the occupant's requirements or the life-cycle quality and cost plan the Owner is prepared to undertake. Experience to date indicates that full commissioning adds between 1% and 4% to the mechanical and electrical construction cost of projects. These extra costs can be attributed to the provision of services not usually included in design and construction projects, such as consultations between design and property management personnel; more intensive site services; more extensive systems documentation; and enhanced O&M documentation and training.

It has often been observed that O&M costs during the first year of operation are 50% to 150% higher than during following years. Experience, however, also indicates that the cost of commissioning is more than recovered through reduced O&M costs during this initial year of operation.

Increases in project costs attributable to commissioning may be summarized as follows:

1. Costs due to the Designer's involvement in:
 - a. Preparation of a Commissioning Plan,
 - b. Preparation of enhanced O&M documentation,
 - c. Preparation of test protocols for inclusion in project specification,
 - d. Increased involvement in site inspections and testing during construction,
 - e. Greater involvement in commissioning,
 - f. Responsibilities for, and involvement in, training,
 - g. Prolongation of involvement during the warranty period.

2. Costs due to the involvement of PWGSC Design Quality Review Team and the PWGSC Project Commissioning Team in:
 - a. Activities related to preparation and review of commissioning briefs,
 - b. Review of Commissioning Plan,
 - c. O&M design reviews,
 - d. Review of commissioning specifications,
 - e. Installation and commissioning inspections,
 - f. Performance verification testing,
 - g. Review of Building Management Manual and other commissioning documentation,
 - h. Commissioning.
- 3 Costs to the Contractor due to:
 - a. Refinement of Commissioning Plan and preparation of Commissioning Schedule
 - b. Greater involvement in training of O&M personnel,
 - c. Temporary instrumentation for commissioning,
 - d. More intensive involvement in performance verification for commissioning,
 - e. The hiring of a qualified Commissioning Agent,
 - f. Prolongation of involvement during the Warranty Period.

The exact amount will depend on a variety of factors such as the size, location and complexity of the facility and its systems and the extent of commissioning required. For instance, a research laboratory with stringent air quality and ventilation requirements will necessitate more extensive and costly commissioning than a general-purpose warehouse. Early involvement of the Commissioning Manager to help prepare the Commissioning Plan and Budget will be instrumental in achieving control over the costs of commissioning.

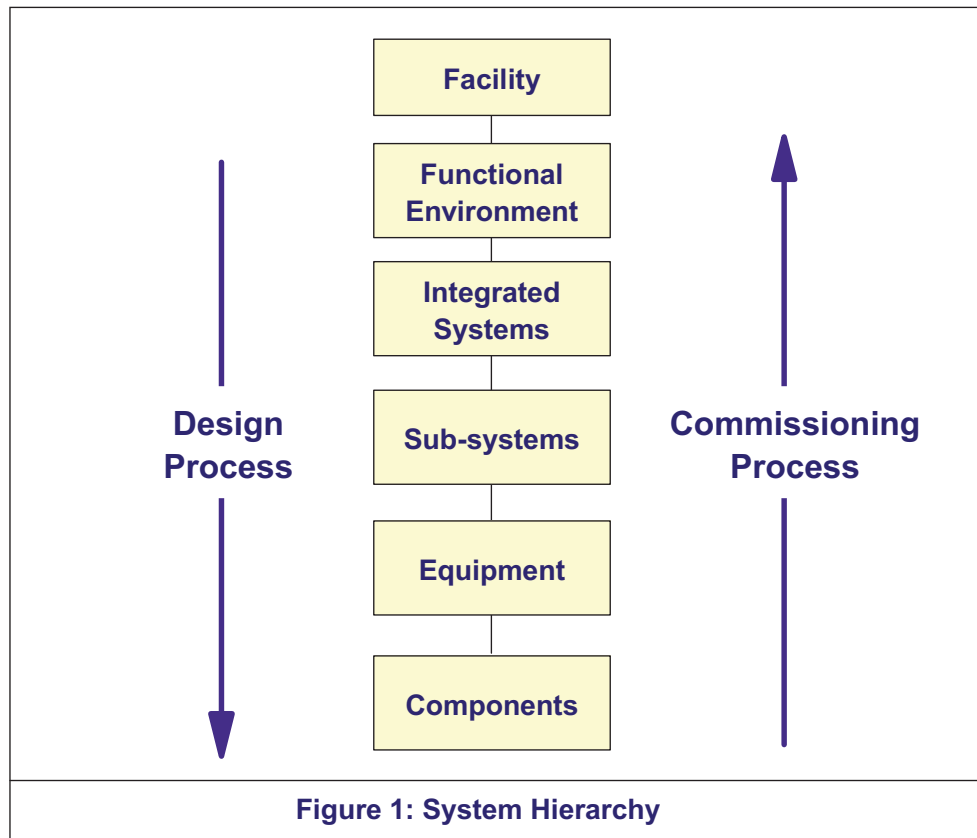
1.9 Commissioning of a facility

An operational facility can be regarded as the architectural building (including, if necessary, its heritage characteristics) a number of integrated systems, each of which delivers a functional environment such as indoor air, visual environment, operational services, security, or emergency services. Each integrated system and its resultant environment is achieved through the proper operation of systems, subsystems, equipment and components which, together, form the integrated system.

The functional environment referred to in Figure 1 below should include any special environmental goals such as those required by Heritage buildings.

The interaction of the system hierarchies is illustrated in Figure 1.

1.10



Project teams

The team structure for a typical moderate to large project may be comprised of the following project teams.

The make-up of each team varies according to the type, size and complexity of the project. Project team members may participate in one or more teams.

1. ***The Project Planning Team*** is assembled for the purpose of developing an Investment Analysis Report (IAR) and consists of the Project Leader, Project Manager and others involved in the preparation of the IAR.

2. ***The Project Design Team*** consists of the Design Coordinator, the PWGSC Design Quality Review Team, the Commissioning Manager and Architectural, Structural, Mechanical and Electrical Designers. The PWGSC Design Quality Review Team consists of engineers and specialists from all disciplines within PWGSC and is selected by the Project Manager. The Project Design Team is usually engaged by the Project Manager through business agreements, usually (but not always) at the end of the NPMS project identification stage, and usually continues to work as a team until the end of the project delivery stage, close out phase.
3. ***The Project Commissioning Team*** consists of (as appropriate during project delivery) the Project Design Team, the Project Construction Team, the Property Management Team and the Commissioning Manager. The Project Commissioning Team is usually represented by the Commissioning Manager starting during the project identification stage, analysis phase, or, the project delivery stage, planning phase. As design and construction proceeds, other players form part of the team insofar as their responsibilities relate to commissioning. The Project Commissioning Team reaches peak involvement at the project delivery stage, implementation phase.
4. ***The Project Construction Team*** consists of the Contractor, sub-trades, manufacturers and suppliers. The Project Construction Team is usually engaged following successful bidding on the project and being awarded the construction contract. This team usually completes its work at the end of the project delivery stage, implementation phase, when the completed project is passed to the Property Management Team for operation. The services of the Project Construction Team is required during the project delivery stage, close out phase for post- construction commissioning and to address all deficiencies.
5. ***The Property Management Team*** receives the facility and operates it throughout its useful life, consists of (as appropriate during project delivery) the Property Manager, the O&M staff, Service Contractors, the Project Design Team, the Project Construction Team and the Commissioning Manager.
6. ***The Evaluation Team***, is assembled for the purpose of conducting post-occupancy evaluation as defined in the project delivery stage, close out phase, and shall include, but not necessarily be limited to the Project Leader, the Project Manager and the Commissioning Manager..

1.11 Roles and responsibilities - General comments

Commissioning is an integrated team effort among all parties involved in the project. It demands full cooperation in all stages of planning, design, construction, installation, activation and performance verification and operation. It also requires clear communications among all parties to achieve understanding of all requirements. This includes full documentation of major decisions and activities.

Successful delivery of a satisfactory project will be achieved only by a well-informed project management group. Similarly, successful delivery of accommodation satisfying User needs can only be achieved by a properly trained property management team that has all the tools to operate and maintain the facility.

The following paragraphs provide roles and responsibilities for the four major types of construction projects used by PWGSC:

** 1.12 Roles and responsibilities - Traditional Design Capital Construction Projects

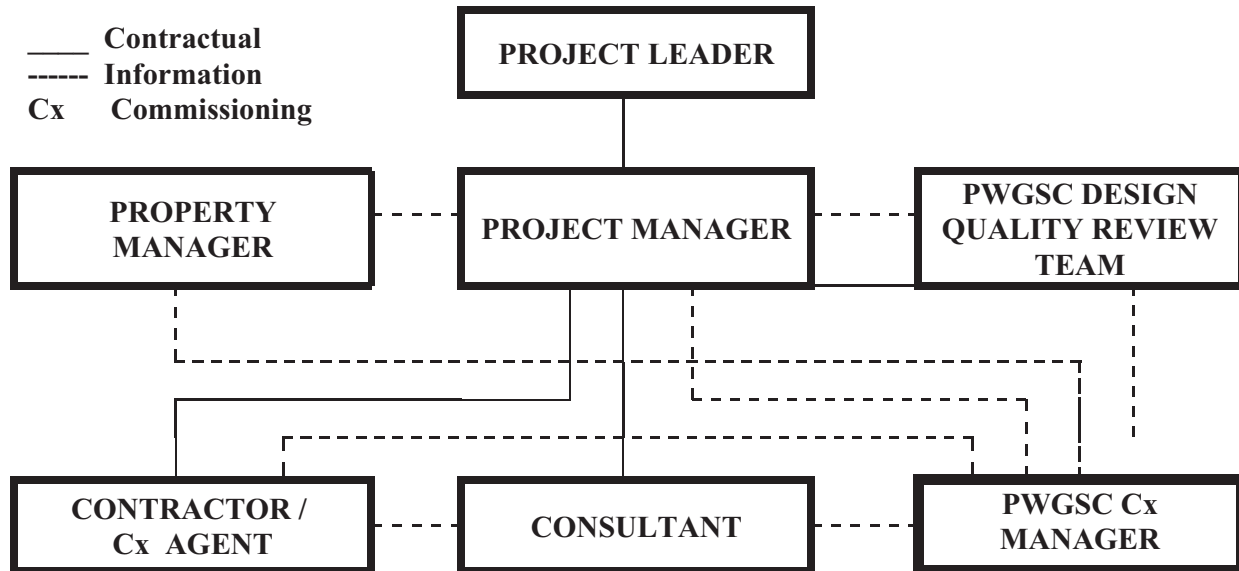
** 1.13 Roles and responsibilities - Smaller Design Construction Projects

1.14 Roles and responsibilities - Design-Build Projects

1.15 Roles and responsibilities - AFD Managed Facilities - Projects over \$200K.

** The decision as to which of these shall apply depends upon discussions relating to the type, size, and complexity of the project.

1.12 Roles and responsibilities - Traditional design capital construction projects



NOTE: The above is an example ONLY. Stakeholders should refer to the project-specific communications and organization structure as established by the Project Manager.

Definition:

Traditional Design Capital Construction Projects may be defined as new projects, renovations and fit-ups for the installation of components, equipment, subsystems, systems and/or integrated systems which are complex and large in scope.

The Project Leader is responsible for initiating the project on behalf of the Owner/Investor, for accepting the facility from the Project Manager and for handing it over to the Property Manager for operation. The Project Leader is also responsible to securing approved project funding.

The Project Manager has overall responsibility for managing the project, and for demonstrating to the Project Leader that the installed systems and overall facility meet the requirements defined in the Project Brief.

PWGSC Design Quality Review Team: reviews all aspects of design from development of the RFP to Conceptual Design Report, agreement with proposed design solutions, quality assurance, quality control, quality management, detailed design, working documents, and the final evaluation including value for money, adherence to standards.

PWGSC QA Commissioning Manager: provides planning and technical advice on O&M matters, coordinates commissioning activities from project identification to close out phase; ensures O&M concerns are addressed, provides quality assurance and reviews commissioning

documentation at all stages of project delivery including accuracy of Product Information (PI), Performance Verification (PV) and commissioning reports. Communications between the Commissioning Manager, the Designer and the Contractor is through the Project Manager. The Project Manager may delegate authority to the Commissioning Manager in matters relating to commissioning, while retaining overall responsibility for the project.

Consultant (Designer): refers to the private sector consultant with its internal commissioning resources or a firm having experience in commissioning and to in-house designers. The Consultant develops the Commissioning Plan, design intent, proposed design solutions, prepares commissioning specifications, building management manual, and other commissioning documentation, develops training plan, witnesses and certifies performance of all commissioning activities and organizes and monitors all activities as per the Contract Agreement, and is responsible for its contractual design, construction, and warranty-related commitments. The appointment of a Commissioning Manager does not permit the Consultant to abrogate traditional contracted professional responsibilities (e.g. site supervision and ensuring that construction conforms to the design intent).

The Contractor/Commissioning Agent: carries out many start-up and performance verification activities and carries out demonstrations and acceptance tests and related procedures. He acts as a coordinator only in matters relating to commissioning, refines the Commissioning Plan develops the Commissioning Schedule, coordinates all commissioning activities in accordance with contract documents, including all tests for equipment, systems and integrated systems and provides required documentation. The Contractor identifies both the site coordinator and the Commissioning Agent.

The Property Manager represents the Operator and is responsible for the day-to-day management and operation of the completed facility after it has been accepted from the Project Leader. During commissioning, he consults with the Project Manager on the acceptability of the facility, including training and documentation, before accepting the project for operation.

SAMPLE1**Commissioning services - Traditional Design Capital Construction Projects**

Designer may be either in-house Designer or private sector Consultant with his own commissioning resource person or a commissioning firm

NOTE: All stakeholders must follow communications plan as established by the Project Manager

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Commissioning services - TRADITIONAL DESIGN CAPITAL CONSTRUCTION PROJECTS					
Project Leader (PL) Project Manager (PM) responsibilities	PWGSC Design quality review team responsibilities	Designer - (Consultant responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities	Deliverables
NPMS Project Identification Stage, Analysis Phase					
Project Leader prepares IAR					IAR
PL identifies & BUDGETS FOR Cx in IAR			Provides input into Commissioning Budget		Commissioning budget
NPMS Project Delivery Stage, Planning Phase					
Project Mgr., develops RFP including commissioning	Provides design input into RFP		Provides input into RFP		Request for Proposal (RFP) and Project Brief
NPMS Project Delivery Stage - Design Phase					
	Reviews DESIGN CRITERIA, FUNCTIONAL REQ'TS	Establishes Design Criteria, functional & Operational requirements	Reviews OPERATIONAL REQUIREMENTS		Design Criteria, Functional Req'ts, Operational Req'ts
		Establishes PRELIMINARY O&M BUDGET	Reviews Preliminary O&M budget		Preliminary O&M budget
	Reviews Design Energy Budget	Establishes DESIGN ENERGY BUDGET	Reviews Design Energy Budget		Design Energy Budget
PM Reviews & accepts CONCEPTUAL DESIGN REPORT	Reviews Conceptual Design Report	Produces CONCEPTUAL DESIGN REPORT Submits to Project Manager Develops commissioning plan	Provides input re O&M items to Concept. Design Reviews Conceptual Design Report Co-ordinates and reviews commissioning plan		Conceptual Design Report Preliminary commissioning plan
NPMS Project Delivery Stage - Implementation Phase - Working Documents					
PM accepts working documents	Reviews DETAILED DESIGN at all stages of development	Develops WORKING DOCUMENTS including schematic, line diagrams, using new or generic Cx documentation, Identifies factory, on-site tests	Reviews detailed Design at all stages of develop't - from operational perspective as required Provides generic Cx documentation Reviews Cx specs		Working documents Cx specifications, PI and PV Report forms, Installation/Start-up Check Lists Cx specifications added to Construction specs

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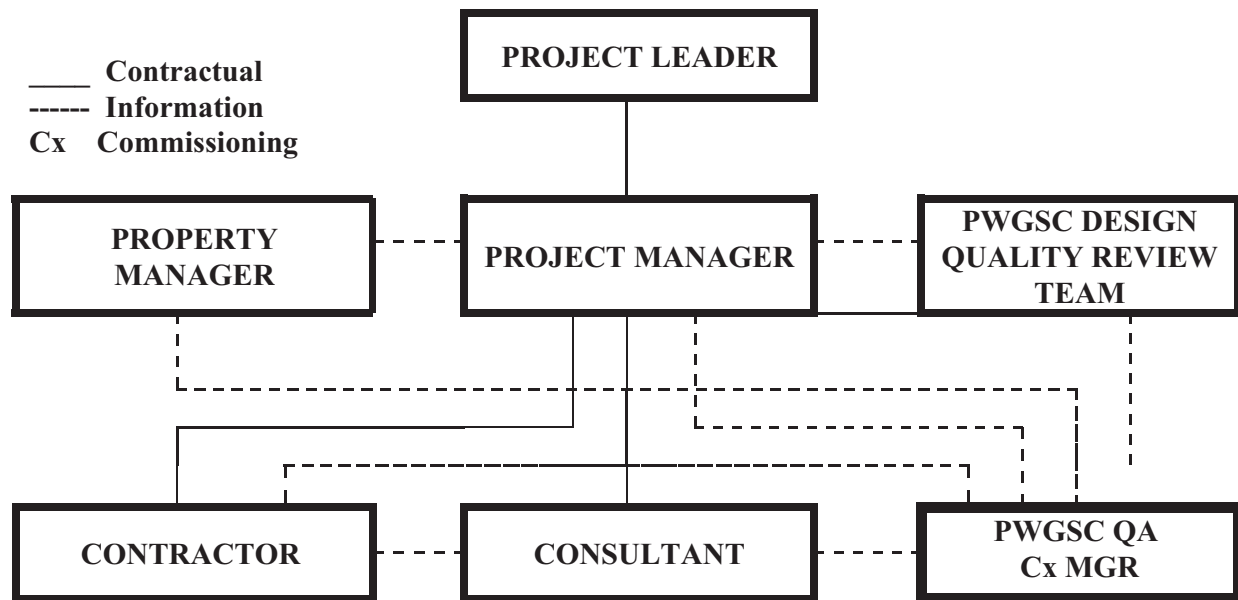
Commissioning services - TRADITIONAL DESIGN CAPITAL CONSTRUCTION PROJECTS					
Project Leader (PL) Project Manager (PM) responsibilities	PWGSC Design quality review team responsibilities	Designer - (Consultant responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities	Deliverables
		Prepares Cx SPECS for subsystems, systems, integrated systems Develops CHECK LISTS, PI & PV REPORT FORMS	Reviews Check Lists Reviews & accepts PI & PV forms		
	Reviews Design data on PI forms	Develops TRAINING PLAN Applies MMS to working documents Develops BUILDING MANAGEMENT MANUAL Adds DESIGN DATA TO PI FORMS INTER - DISCIPLINARY COORDINATION Updates COMMISSIONING PLAN	Reviews & accepts Training Plan Reviews application of MMS to Working Doc'ts Reviews Building Management Manual Reviews design data on PI forms		Training Plan 90% completed Building Management Manual
PM accepts Commissioning Plan			Coordinates & reviews updated Commissioning Plan		Updated Commissioning Plan
		Prepares DETAILED O&M BUDGET	Reviews & validates detailed O&M Budget		Detailed O&M Budget
	Reviews updated Design Energy Budget	Updates DESIGN ENERGY BUDGET	Reviews updated Design Energy Budget		Updated Design Energy Budget
Reviews updated Commissioning Budget		Updates COMMISSIONING BUDGET	Reviews updated Commissioning Budget		Updated Commissioning Budget
		Studies DE-Cx req'ts of present facilities			
NPMS Project Delivery Stage, Implementation Phase - Construction					
PM accepts Commissioning Schedule		Reviews COMMISSIONING SCHEDULE	Reviews & recommends acceptance of comm'g sch	Develops Cx schedule Refines Cx Plan	Commissioning Schedule
	Reviews selected shop drawings for MAJOR EQUIPMENT for design	Reviews and accepts SHOP DRAWINGS	Reviews selected shop drawings for O&M	Submits SHOP DRAWINGS	Accepted shop drawings
		Reviews completed PI forms	Accepts completed PI forms	Inputs data on to PI forms	Completed PI report forms
	Witness FACTORY TESTS if required				

Commissioning services - TRADITIONAL DESIGN CAPITAL CONSTRUCTION PROJECTS					
Project Leader (PL) Project Manager (PM) responsibilities	PWGSC Design quality review team responsibilities	Designer - (Consultant responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities	Deliverables
		Develops INSTALLATION /START-UP CHECK LISTS Witnesses & verifies TAB. Reviews TAB REPORTS for acceptance	Review Installation/ Start-up Check Lists Reviews & validates TAB REPORTS	Verifies, utilizes Installation/ Start-up Check Lists Conduct TAB. Prepare TAB REPORTS	Installation/Start-up Check lists Approved TAB Reports
NPMS Project Delivery Stage, Implementation Phase - Commissioning					
PM accepts completed Building Management Manual	Reviews completed Building Management Manual	Completes OPERATING MANUAL (part of BMM). Completes BUILDING MANAGEMENT MANUAL	Reviews, recommends acceptance of completed BLDG MANAGEMENT MANUAL (BMM)	Assemble MAINTENANCE MANUAL (part of BMM) Assists in completion of OPERATING MANUAL	Completed Building Management Manual (BMM)
PM accepts Approved System & Integrated system PV reports	Participates in selected SYSTEMS and INTEGRATED SYSTEMS tests for performance verification	Monitors COMMISSIONING ACTIVITIES Certifies SYSTEMS and INTEGRATED SYSTEMS TESTS .	Witnesses selected systems & integrated systems tests & reviews test reports Monitors contract commissioning activities	Conducts component, equipment, subsystem, systems & integrated systems tests. Prepares PV Reports Coordinates all commissioning activities	Approved System & Integrated system PV reports
Conditional acceptance (if necessary		Provides TRAINING on design intent & on system design,	Coordinates participants for training, monitors training	Coordinates & implements Training	
Conditional acceptance (if necessary		Agrees to witness and certify DEFERRED TESTS	Approves DEFERRED COMMISSIONING TESTS due to seasonal or occupancy requirements	Identifies deferred commissioning tests due to seasonal or occupancy requirements	
		Certifies rectification of OUTSTANDING DEFICIENCIES	verifies rectification of OUTSTANDING DEFICIENCIES	Addresses OUTSTANDING DEFICIENCIES	
		Assists in RESOLVING ALL ISSUES RELATING TO COMMISSIONING	Review all issues relating to commissioning	Address all issues relating to commissioning	
PM accepts and distributes “As-Built” plans & specifications		Produces “AS-BUILT” PLANS & SPECIFICATIONS from project records	Reviews & recommends acceptance of “As-Built” plans & specifications	Maintains accurate project records & assists in production of “As-Built”	o “As-Built” plans & specifications
PM issues CERTIFICATE		Recommends to PM interim	Recommends INTERIM	Requests Issuance of	Certificate of Interim

Commissioning services - TRADITIONAL DESIGN CAPITAL CONSTRUCTION PROJECTS					
Project Leader (PL) Project Manager (PM) responsibilities	PWGSC Design quality review team responsibilities	Designer - (Consultant responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities	Deliverables
OF INTERIM ACCEPTANCE for occupancy		acceptance	ACCEPTANCE to Designer	Interim Acceptance	Acceptance
NOTE: Successful completion of commissioning (except for deferred commissioning, fine-tuning, trend logging and adjustment of ventilation rates to promote good IAQ is a requirement for issuance of the Interim Certificate					
PM accepts and distributes final commissioning documentation		Provides FINAL COMMISSIONING DOCUMENTATION	Accepts & recommends use of final commissioning documentation	Assists in prep'n of final comm'g documentation	Final Commissioning documentation
PM issues FINAL CERTIFICATE OF COMPLETION		Signs off & recommends FINAL ACCEPTANCE to Project Manager	Recommend final acceptance to Designer		Final Certificate of completion
NPMS Project Delivery Stage, Close Out Phase					
	Assists as required	Assists in FINE-TUNING of systems & equip't as req'd.	Assists in fine-tuning as required	Fine-tunes systems & equipment as required	
PM accepts DEFERRED COMMISSIONING TEST REPORTS		WITNESSES DEFERRED Cx TESTS. Reviews and accepts test reports	Witnesses deferred Cx as required. Reviews & accepts deferred Cx test reports	Performs deferred commissioning tests	Deferred commissioning test reports
	Reviews report of ENVIRONMENTAL & SYSTEMS CHECKS	Assists in systems & environmental checks	Assists in systems & environmental check. Reviews report.	Performs systems & environmental checks. Prepares Report	Systems & Environmental Checks Report
Initiates POST- WARRANTY REVIEW		Performs POST- WARRANTY REVIEW	Participates in POST- WARRANTY REVIEW	Addresses WARRANTY ISSUES	
PM reviews, accepts FINAL COMMISSIONING REPORT		Provides input into FINAL COMMISSIONING REPORT	Prepares FINAL COMMISSIONING REPORT	Provides input into FINAL COMMISSIONING REPORT	Final Commissioning Report
PM prepares FINAL EVALUATION REPORT for PL	Provides input to PM in prep'n of Final Evaluation Report	Assists PM in prep'n of Final Evaluation Report	Provides input to PM in prep'n of Final Evaluation Report	Provides input to PM in prep'n of Final Evaluation Report	Final Evaluation Report

**SYSTEMS FOUND TO BE UNCOMMISSIONABLE DUE TO DESIGN ERRORS AND/OR OMISSIONS
SHALL BE REDESIGNED BY THE DESIGNER AND RE-COMMISSIONED AT HIS OWN EXPENSE**

1.13 Roles and responsibilities - Smaller design construction projects



Definition:

NOTE: The above is an example ONLY. Stakeholders should refer to the project-specific communications and organization structure as established by the Project Manager.

SMALLER DESIGN CONSTRUCTION PROJECTS may be defined as projects for the installation of equipment, subsystems, systems and/or integrated systems having a limited scope and complexity. It also includes renovations and fit-ups

The scope of commissioning is identified by the stakeholders on a project-by-project basis..

The Project Leader is responsible for initiating the project on behalf of the Owner/Investor, for accepting the facility from the Project Manager and for handing it over to the Property Manager for operation. The Project Leader is also responsible to securing approved project funding.

The Project Manager has overall responsibility for managing the project after PDS Phase 1, and for demonstrating to the Client that the installed systems and overall facility meet the requirements defined in the Project Brief.

PWGSC Design Quality Review Team: reviews all aspects of design from development of the RFP to detailed design documents, agreement with proposed design solutions, quality assurance,

quality control, quality management, and the final evaluation including value for money and adherence to standards.

PWGSC QA Commissioning Manager: provides planning and technical advice on O&M matters, coordinates commissioning activities from project identification to close out phases, ensures O&M concerns are addressed, provides quality assurance and reviews commissioning documentation at all stages of project delivery including accuracy of Product Information (PI), Performance Verification (PV) and commissioning reports. Communications between the Commissioning Manager, the Designer and the Contractor is through the Project Manager. The Project Manager may delegate authority to the Commissioning Manager in matters relating to commissioning, while retaining overall responsibility for the project.

Consultant (Designer): refers to private sector consultant with its internal commissioning resources and to in-house designers. Develops Commissioning Plan, design intent and proposed design solutions, prepares commissioning specifications and other commissioning documentation, develop the Training Plan, witnesses and certifies performance of all commissioning activities, organizes and monitors all activities as per the Contract Agreement, and is responsible for its contractual design, construction, and warranty- related commitments. The appointment of a Commissioning Manager does not permit the Consultant (Designer) to abrogate traditional responsibilities (e.g. site supervision and ensuring that construction conforms to the design intent).

Contractor/Commissioning Agent carries out many start-up and performance verification activities, and carries out demonstrations and acceptance tests and related procedures. He acts as a coordinator only in matters relating to commissioning, refines the Commissioning Plan, develops the Commissioning Schedule, coordinates all commissioning activities in accordance with contract documents, including all tests for equipment, systems and integrated systems, and provides required documentation. The Contractor shall identify both the coordinator and the Commissioning Agent.

The Property Manager represents the Operator and is responsible for the day-to-day management and operation of the completed facility after it has been accepted from the Project Leader. During commissioning, he consults with the Project Manager on the acceptability of the facility, including training and documentation, before accepting the project for operation.

SAMPLE 2

Commissioning services - SMALLER DESIGN CONSTRUCTION PROJECTS

Designer may be either in-house Designer or private sector Consultant with his own commissioning resource person

NOTE: All stakeholders must follow communications plan as established by the Project Manager

Commissioning services - SMALLER DESIGN CONSTRUCTION PROJECTS				
Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - (Consultant) responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities
Deliverables				
NPMS Project Identification Stage, Analysis Phase				
PL identifies COMMISSIONING BUDGET			Provides input to Commissioning Budget	Commissioning Budget
NPMS Project Delivery Stage, Planning Phase				
PM develops CX REQ'TS and SCOPE OF WORK	Reviews CX REQ'TS and SCOPE OF WORK		Develops Cx REQ'TS and SCOPE OF WORK	Scope of Work Document or Terms of Reference
NPMS Project Delivery Stage, Design Phase				
	Reviews DESIGN CRITERIA, FUNCTIONAL REQUIREMENTS	Establishes DESIGN CRITERIA, FUNCTIONAL & OPERATIONAL REQ'TS	Reviews Design Criteria, operational requirements	Design Criteria Functional & Operational requirements
	Reviews Design Energy Budget if required	Establishes DESIGN ENERGY BUDGET if req'd	Reviews impact of Design energy budget on O&M if req'd	Design Energy Budget if required
Reviews & accepts CONCEPTUAL DESIGN REPORT	Reviews Conceptual Design Report	Produces CONCEPTUAL DESIGN REPORT Submits to Project Manager Develops commissioning plan	Provides input re O&M items. Reviews Conceptual Design Report Co-ordinates and reviews commissioning plan	Conceptual Design Report Preliminary commissioning plan
NPMS Project Delivery Stage, Implementation Phase - Working Documents				
PM accepts working documents	Reviews DETAILED DESIGN at all stages of development	Develops WORKING DOCUMENTS for sub-systems, systems, integrated systems	Reviews working documents at all stages of design from operational & mtce perspective	Working documents

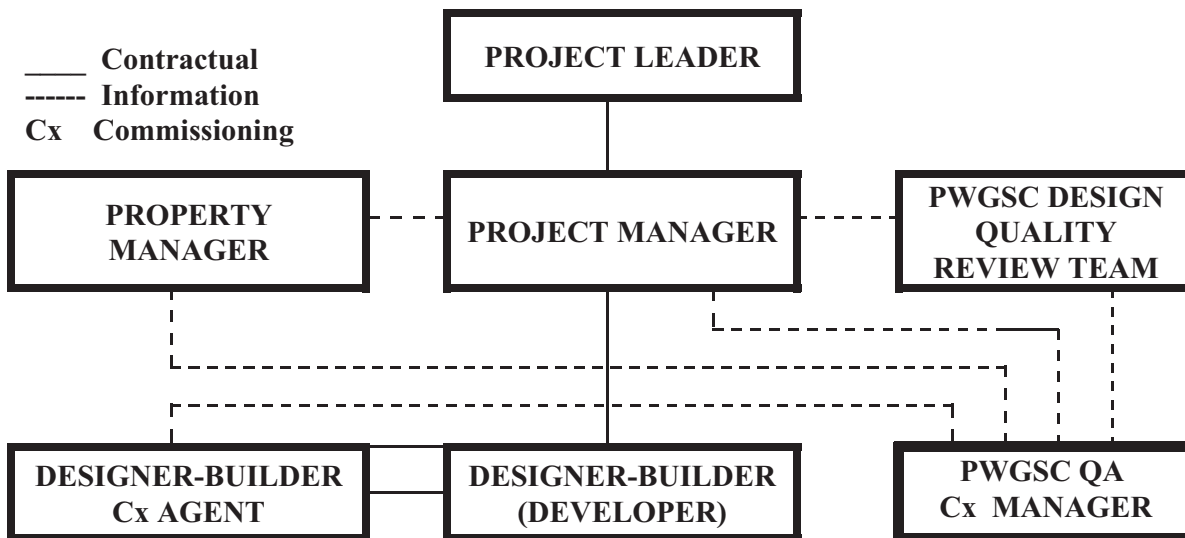
Commissioning services - SMALLER DESIGN CONSTRUCTION PROJECTS					
Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - (Consultant) responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities	Deliverables
PM accepts Commissioning Plan		Develops PI & PV REPORT FORMS	Reviews, accepts PI & PV Forms		PI and PV Report forms
		Develops TRAINING PLAN	Reviews training plans		Training Plan
		Updates COMMISSIONING PLAN	Coordinates & reviews updated commissioning plan		Updated Commissioning Plan
		INTER- DISCIPLINARY COORDINATION			
		Updates BUILDING MANAGEMENT MANUAL	Reviews Building Management Manual		Updated Building Management Manual
		Prepares O&M BUDGET	Validates impact of O&M Budget		O&M Budget
NPMS Project Delivery Stage, Implementation Phase - Construction					
PM accepts Commissioning Schedule	Reviews shop drawings for selected major equipment for design Witnesses FACTORY TESTS if required	Reviews COMMISSIONING SCHEDULE Reviews and accepts SHOP DRAWINGS	Reviews Cx schedule Reviews selected shop drawings from O&M perspective	Develops Cx Schedule. Refines Cx Plan Submits shop drawings. Inputs data on to PI forms	Commissioning Schedule Accepted shop drawings Completed PI forms
	Reviews TAB REPORTS if required	Witnesses & verifies TAB Reviews & accepts TAB reports	Reviews & validates TAB reports	Conducts TAB Prepares TAB reports	Approved TAB Reports
NPMS Project Delivery Stage, Implementation Phase - Commissioning					
PM accepts PV Reports	Reviews PV REPORTS Participate in selected system & integrated system tests for PV	Verifies & accepts SYSTEMS and INTEGRATED SYSTEMS TESTS Reviews PV Reports	Reviews and verifies PV Reports	Conducts component, equipment, subsystem, system and integrated system tests and performance verification. Prepares PV REPORTS	Approved PV Reports
PM accepts completed O&M Manual		Reviews COMPLETED OPERATING & MAINTENANCE MANUAL	Reviews Operating & Maintenance Manual	Completes assembly of Operating & Maintenance Manual	Approved Operating & Maintenance Manual

Commissioning services - SMALLER DESIGN CONSTRUCTION PROJECTS					
Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - (Consultant) responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities	Deliverables
PM accepts Systems and Integrated systems PV reports		Witnesses SYSTEMS & INTEGRATED SYSTEMS TESTS , reviews & accepts test reports Monitors COMMISSIONING ACTIVITIES	Witnesses selected systems & integrated systems tests & reviews test reports Monitors comm'g activities	Conducts systems & integrated systems tests Coordinates all commissioning activities	Approved System & Integrated system test reports
		Provides TRAINING on design intent & on system design,	Coordinates participants monitors training	Coordinates & implements Training	
PM accepts and distributes “AS-BUILT” PLANS & SPECS		Produces “AS-BUILT” PLANS & SPECS from project records	Reviews “As-Built” records	Maintains accurate project records & assists in production of “As-Built”	◦ “As-Built” plans & specs
	Assists in fine-tuning as required	Assists in FINE-TUNING of systems & equip't as req'd.	Assists in fine-tuning as required	Fine-tunes systems & equipment as required	
		Identifies DEFICIENCIES	Verifies rectification of deficiencies	Rectifies all deficiencies	
PM Produces CERTIFICATE OF INTERIM ACCEPTANCE FOR OCCUPANCY		Recommends to PM interim acceptance	Signs-off systems and recommends interim acceptance to Designer	Requests issuance of Interim Acceptance	Certificate of Interim Acceptance
NOTE: Successful completion of commissioning (except for deferred commissioning, fine-tuning, trend logging and adjustment of ventilation rates to promote good IAQ is a requirement for issuance of the Interim Certificate					
PM accepts and distributes “As-Built” plans & specifications		Produces “AS-BUILT” PLANS & SPECIFICATIONS from project records	Reviews & recommends acceptance of “As-Built” plans & specifications	Maintains accurate project records & assists in production of “As-Built”	◦ “As-Built” plans & specifications
PM issues FINAL CERTIFICATE		Signs off & recommends final acceptance to Project Manager	Signs off, recommends final acceptance to PM		Final Certificate of completion
NPMS Project Delivery Stage, Close Out Phase					
		Address WARRANTY ISSUES	Comments on warranty issues	Addresses warranty issues	

Commissioning services - SMALLER DESIGN CONSTRUCTION PROJECTS					
Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - (Consultant) responsibilities	PWGSC QA Cx Manager responsibilities	Contractor responsibilities	Deliverables
PM reviews, accepts FINAL COMMISSIONING REPORT		Provides input into FINAL COMMISSIONING REPORT	Prepares FINAL COMMISSIONING REPORT	Provides input into FINAL COMMISSIONING REPORT	Final Commissioning Report
PM prepares EVALUATION REPORT for PL	Provides input to PM in preparation of EVALUATION REPORT	Assists PM in preparation of EVALUATION REPORT	Provides input to PM in prep'n of EVALUATION REPORT	Provides input to PM in prep'n of EVALUATION REPORT	Evaluation Report

SYSTEMS FOUND TO BE UNCOMMISSIONABLE DUE TO DESIGN ERRORS AND/OR OMISSIONS SHALL BE REDESIGNED BY THE DESIGNER AND RE-COMMISSIONED AT HIS OWN EXPENSE

1.14 Roles and responsibilities - Design-build projects



NOTE: The above is an example ONLY. Stakeholders should refer to the project-specific communications and organization structure as established by the Project Manager.

The Project Leader is responsible for initiating the project on behalf of the Owner/Investor, for accepting the project from the Project Manager and for handing it over to the Property Manager for operation. The Project Leader is also responsible for securing approved project funding.

The Project Manager has overall responsibility for managing the project, and for demonstrating to the Project Leader that the installed systems and overall facility meet the requirements defined in the Project Brief.

PWGSC Design Quality Review Team: reviews all aspects of design from development of the RFP to Conceptual Design Report, agreement with proposed design solutions, quality assurance, quality control, quality management, detailed design, working documents, and the final evaluation including value for money and adherence to standards.

PWGSC QA Commissioning Manager: provides planning and technical advice on O&M matters, coordinates commissioning activities from project identification to close out phase, ensures O&M concerns are addressed, provides quality assurance and reviews commissioning documentation at all stages of project delivery including accuracy of PV and commissioning reports. Communications between the Commissioning Manager, the Designer and the Contractor is through the Project Manager. The Project Manager may delegate authority to the Commissioning Manager in matters relating to commissioning, while retaining overall responsibility for the project.

Designer-Builder (Developer): is responsible to develop design solutions meeting the requirements of the Client, prepare commissioning specifications and other commissioning

documentation and to develop the Training Plan. As the Builder: is responsible for the construction / installation of the project and for all commissioning activities including witnessing of performance testing.

Design-Builder's Commissioning Agent: is responsible to fulfill the commissioning program, prepare and submit a Commissioning Plan, develop Commissioning Schedules, for detailed coordination of commissioning activities, executing all commissioning activities in accordance with the contract documents, providing direction for all matter relating to commissioning including tests of systems, integrated systems and equipment and providing all required documentation.. The Design-Builder's Commissioning Agent acts as a coordinator in all matters relating to commissioning. He coordinates all commissioning activities, making sure that commissioning activities are implemented in accordance with the Commissioning Schedule. On major projects, the Contractor shall identify both the coordinator and the Commissioning Agent.

The Property Manager represents the Operator and is responsible for the day-to-day management and operation of the completed facility after it has been accepted from the Project Leader. During commissioning, he consults with the Project Manager on the acceptability of the facility, including training and documentation, before accepting the project for operation.

SAMPLE 3**Commissioning services - DESIGN-BUILD PROJECTS**

Designer may be either in-house Designer or private sector Consultant with his own commissioning resource person

NOTE: All stakeholders must follow communications plan as established by the Project Manager

Commissioning services – DESIGN-BUILD PROJECTS					
Project Leader (PL) Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - Builder (Developer) responsibilities	PWGSC QA Commissioning Manager responsibilities	Design-Builder / Design- Builder’s Commissioning Agent responsibilities	Deliverables
NPMS Project Identification Stage, Analysis Phase					
Project Leader prepares IAR					IAR
PL identifies & BUDGETS for COMMISSIONING in IAR			Provides input to Commissioning Budget		Commissioning budget
NPMS Project Delivery Stage, Planning Phase					
Project Mgr. develops RFP including commissioning	Provides design input into RFP		Provides commissioning input into RFP		Request for Proposal (RFP)
PM develops DESIGN-BUILD SPECS Incorporates into RFP	Provides design input into DESIGN-BUILD SPECS		Reviews design input into DESIGN-BUILD SPECIFICATIONS Reviews Comm’g specs & documentation to suit RFP		Design-Build specifications
NPMS Project Delivery Stage, Design Phase					
	Reviews DESIGN CRITERIA and FUNCTIONAL REQ'TS	Reconfirms Design Criteria, functional & Operational requirements from RFP Establishes O&M BUDGET	Reviews & coordinates OPERATIONAL & MTCE REQ'TS Reviews O&M budget		Design Criteria, Functional & Operational req'ts O&M budget
	Reviews Design Energy Budget	Establishes DESIGN ENERGY BUDGET	Review impact of Design Energy Budget on O&M		Design Energy Budget
Reviews & accepts CONCEPTUAL DESIGN REPORT	Reviews Conceptual Design Report	Produces CONCEPTUAL DESIGN REPORT Submits to Project Manager Develops commissioning plan	Reviews Conceptual Design Report for O&M issues. Co-ordinates and reviews commissioning plan		Conceptual Design Report Preliminary Commissioning Plan
NPMS Project Delivery Stage, Implementation Phase - Working Documents					
PM accepts working documents	Reviews DESIGN DEVELOPMENT at	Develops WORKING DOCUMENTS including schematics, line diagrams,	Reviews DESIGN DEVELOPMENT at all		Working documents

Commissioning services - DESIGN-BUILD PROJECTS

Project Leader (PL) Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - Builder (Developer) responsibilities	PWGSC QA Commissioning Manager responsibilities	Design-Builder / Design- Builder's Commissioning Agent responsibilities	Deliverables
	all stages of development from functional perspective		stages from operational & Mtee. perspectives		
		Prepares Cx SPECS for subsystem, system, integrated system	Review commissioning specifications		Commissioning specifications
		Develops PI & PV Report Forms and Check Lists	Reviews PI & PV Report Forms		PI & PV Report Form and Check Lists
PM accepts Commissioning Plan		Updates COMMISSIONING PLAN	Coordinates & Reviews updated Commissioning Plan		Updated Commissioning Plan
		Prepares TRAINING PLAN	Reviews and accepts Training Plan		Training Plan
	Provides input to Building Management Manual	Develops BUILDING MANAGEMENT MAN'L	Coordinates & Reviews Bldg Manage't Manual		Building Management Manual
		INTER-DISCIPLINARY COORDINATION			
		Prepares DETAILED O&M BUDGET	Validates impact of detailed O&M Budget		Detailed O&M Budget
	Reviews updated Design Energy Budget	Updates DESIGN ENERGY BUDGET	Reviews impact of Design Energy Budget on O&M		Updated Design Energy Budget
Reviews updated Commissioning Budget		Updates Cx BUDGET	Reviews updated Commissioning Budget		Updated Commissioning Budget
NPMS Project Delivery Stage, Implementation Phase - Construction					
PM accepts Commissioning Schedule	Reviews shop dgrs for MAJOR EQUIP'T for design Witnesses FACTORY TESTS as required	Reviews Cx SCHEDULE Reviews and accepts SHOP DRAWINGS Reviews completed PI forms Develops INSTALLATION /START-UP CHECK LISTS	Reviews commissioning schedule Reviews selected shop drawings for O&M Witnesses FACTORY TESTS as req'd. Submits report to Project Mgr. Accepts completed PI forms Reviews & accepts Check Lists	Develops Cx schedule. Refines Cx Plan. Submits shop drawings Inputs data on to PI forms Utilizes Installation/ Start-up Check Lists	Commissioning Schedule Approved shop drawings Completed PI Forms Installation/Start-up Check Lists
	Reviews TAB REPORTS ; if required	Witnesses & verifies TAB.	Reviews & verifies TAB reports	Conduct TAB Prepare TAB REPORTS	Approved TAB Reports

Commissioning services - DESIGN-BUILD PROJECTS

Project Leader (PL) Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - Builder (Developer) responsibilities	PWGSC QA Commissioning Manager responsibilities	Design-Builder / Design- Builder's Commissioning Agent responsibilities	Deliverables
		Reviews TAB reports for acceptance			
NPMS Project Delivery Stage, Implementation Phase - Commissioning					
	Witnesses FACTORY TESTS as required	Monitors all Cx ACTIVITIES	Monitors contract commissioning activities	Coordinates all commissioning activities	
PM accepts approved System PV Reports	Reviews PV REPORTS if required	Verify & approve SYSTEMS TESTS	Witnesses selected systems tests	Conducts component, equip't subsystem & system START-UP, PERFORMANCE VERIFICATION	Completed PV reports
	Reviews COMPLETED BLDG MANAGEMENT MANUAL	Reviews, accepts PV reports	Reviews test PV Reports	Prepares PV REPORTS	Completed Building Management Manual
PM accepts approved integrated system PV Reports		Reviews completed BUILDING MANAGEMENT MANUAL (BMM)	Reviews completed Building Management Manual	Assists in completion of Building Management Manual	Completed Building Management Manual
		Witnesses INTEGRATED SYSTEMS TESTS	Witnesses selected integrated systems tests & reviews test reports	Conducts integrated systems tests	Approved System & Integrated system test reports
		Provides TRAINING on design intent & on system design.	Coordinates participants for training, monitors training	Coordinates & implements Training	
		Compiles list of deferred commissioning tests	Approves DEFERRED COMMISSIONING TESTS due to seasonal or occupancy	Identifies deferred comm'g tests due to seasonal or occupancy requirements	
		Assists in RESOLVING ALL ISSUES RELATING TO COMMISSIONING	Reviews all issues relating to commissioning	Addresses all issues relating to commissioning	
		Identifies DEFICIENCIES	Verifies rectification of deficiencies	Rectifies all deficiencies	
Conditional acceptance of deferred commissioning (if necessary)		Agrees to review DEFERRED Cx	Reviews results of DEFERRED Cx	Agrees to perform DEFERRED Cx	
Conditional acceptance of O/S deficiencies (if necessary)		Agrees to verify OUTSTANDING DEFICIENCIES	Verifies completion of OUTSTANDING DEFICIENCIES	Agrees to rectify OUTSTANDING DEFICIENCIES	

Commissioning services - DESIGN-BUILD PROJECTS

Project Leader (PL) Project Manager (PM) responsibilities	PWGSC DESIGN QUALITY REVIEW TEAM responsibilities	Designer - Builder (Developer) responsibilities	PWGSC QA Commissioning Manager responsibilities	Design-Builder / Design- Builder's Commissioning Agent responsibilities	Deliverables
PM issues CERTIFICATE OF INTERIM ACCEPTANCE for occupancy		Requests interim acceptance	Recommends sign-off of systems		Certificate of Interim Acceptance
NOTE: Successful completion of commissioning (except for deferred commissioning, fine-tuning, and adjustment of ventilation rates to promote good IAQ) is a requirement for issuance of the Interim Certificate					
PM accepts & distributes FINAL COMMISSIONING DOCUMENTATION	Reviews final commissioning documentation	Provides FINAL COMMISSIONING DOCUMENTATION	Accepts final commissioning documentation	Assists in prep'n of final Cx documentation	Final Commissioning documentation
PM issues FINAL CERTIFICATE OF COMPLETION		Signs off & recommends final acceptance to Project Manager	Signs off & recommends final acceptance to Designer-Builder		Final Certificate of completion
NPMS Project Delivery Stage, Close Out Phase -					
	Assists as required	Assists in FINE-TUNING of systems & equip't as req'd.	Assists in fine-tuning as required	Fine-tunes systems & equipment as required	
PM accepts DEFERRED COMMISSIONING TEST REPORTS		Witnesses DEFERRED COMMISSIONING TESTS . Reviews and accepts test reports	Witnesses DEFERRED COMMISSIONING as required. Reviews test reports	Performs DEFERRED COMMISSIONING TESTS	Deferred Commissioning reports
		Assists in RESOLVING ALL ISSUES RELATING TO Cx	Review all issues relating to commissioning	Address all issues relating to commissioning	
	Reviews report of ENVIRONMENTAL & SYSTEMS CHECKS	Assists in systems & environmental checks. Reviews & accepts reports	Assists in systems & environmental check. Reviews report.	Performs systems & environmental checks. Prepares Report	Systems & Environmental Checks Report
		Identifies DEFICIENCIES	Verifies rectification of deficiencies	Rectifies all deficiencies WARRANTY ISSUES	
Initiates POST WARRANTY REVIEW		Performs POST WARRANTY REVIEW	Participates in POST WARRANTY REVIEW		
PM reviews and accepts FINAL COMMISSIONING REPORT		Provides input into FINAL COMMISSIONING REPORT	Develops FINAL COMMISSIONING REPORT	Provides input into FINAL COMMISSIONING REPORT	Final Commissioning Report

1.15 Roles & responsibilities - AFD managed facilities - Projects over \$200K

.1 General

The contractual and information movement organizational chart and all information regarding the participants to commissioning shall be in full accordance with the *"AFD Management Handbook - Standard Operating Procedures for Commissioning Projects over \$200K in AFD Managed Buildings"* - latest edition.

.2 Commissioning services

Commissioning Services for projects in AFD - Managed facilities shall be in accordance with Table 1 forming part of the *"AFD Management Handbook - Standard Operating Procedures for Commissioning Projects over \$200K in AFD Managed Buildings"* (latest edition).

Chapter 2 Commissioning documentation

2.1 Introduction

Commissioning documentation is a complete set of data and information fully describing the completed project as a built, finished, functional and operational facility presented in a form in which it can be operationally-occupied, maintained, updated and used over the life of the building. The transfer of a completed facility to the Project Leader must include appropriate documentation on how the facility is designed and constructed, and how to operate, maintain, repair, clean, manage and modify it.

A comprehensive set of system documents serves as a common database for all project team members from all disciplines. Quality documentation of all components, systems and environments as commissioned is also essential for use in the training of O&M personnel and for the operation, maintenance, servicing and repair of all systems, components and equipment in the facility. It serves as a project archive for future reference base data for operations and maintenance, renovations and inspection purposes. It can provide a valuable record of experience for feedback to other projects.

Commissioning documentation maintain a paper trail of design decisions, trade-offs, etc., made during the entire project, commencing at the NPMS project identification stage, analysis phase provides:

- .1 a record of user requirements for use by the Design Team,
- .2 a description of the Design Intent and limitations of various systems,
- .3 design decisions, design assumptions, trade-offs necessary to arrive at the approved design solution,
- .4 a complete record of each system and building component,
- .5 changes made to the design prior to hand-over and acceptance,
- .6 a documented measure of quality control throughout the progress of the project,
- .7 a record of performance levels and acceptance tests,
- .8 information on how to operate the building,
- .9 estimated costs for operating the building,
- .10 heritage character statement and conservation guidelines (for heritage buildings).

2.2 Project archives

An archival operation needs to be defined and set up by the Commissioning Manager in conjunction with the Project Manager in the project delivery stage, planning phase. The Project Archives should include all commissioning documents that contain data deemed essential to a comprehensive record of the project and its component systems. The purpose is to provide:

- .1 a complete historical record of the project
- .2 procedures and performance levels for re-commissioning

- .3 documentation control
- .4 feedback mechanism for knowledge transfer

Provision shall be made for the controlled storage of all commissioning documentation within the project archive.

2.3 Commissioning documentation package

The intent is to maintain a paper trail of design decisions, trade-offs, etc., made during the entire project, commencing at the project identification stage, analysis phase. It should include:

- 1. design decisions, design assumptions, trade-offs necessary to arrive at the approved design solution,
- .2 changes made to the design prior to hand-over and acceptance.

The whole package of commissioning documentation comprises the following documents, each of which is described in detail in subsequent paragraphs of this chapter:

- .1 The Investment Analysis Report
- .2 The Request for Proposal containing the Commissioning Brief
- .3 Design Criteria and Design Intent
- .4 Working Documents revised to show all work as actually constructed and installed
- .5 Building Management Manual (BMM) for the complete building. BMM for heritage buildings require additional information on how to maintain (standards, methods, materials, skills) and a technical maintenance manual for the property.
- .6 Training documentation
- .7 Commissioning Reports, produced at the end of the project delivery stage, implementation phase and close out phase.
- .8 Final Commissioning Report

2.4 Investment Analysis Report (IAR)

This is the document from which the Request for Proposal (RFP) or the Project Brief is developed.

2.5 Request For Proposal (RFP)

This is the outcome of the IAR . It must include sections describing:

- .1 the Client's FUNCTIONAL and OPERATIONAL requirements - see item 2.6, below,
- .2 O&M requirements,
- .3 commissioning requirements in the form of a Commissioning Brief. See item 2.8, below.

2.6 Functional requirements and operational requirements

These form the very foundation of the entire design. If these are given the very serious consideration that they deserve from the outset, there is every possibility that the entire project will be effectively commissioned and client satisfaction is assured. Functional requirements and operational requirements must not be open to any misinterpretation or misunderstanding. If these are not established by the client they may be established by the Project Manager or the designer.

FUNCTIONAL REQUIREMENTS include:

1. design criteria, design intents, design assumptions, design issues, design solutions,
2. issues of health, welfare, comfort and safety of the occupants and operating personnel,
3. indoor environmental space requirements, IAQ, acoustical privacy, physical security,
4. and other special requirements of the user. These could include client's specific requirements for systems' commissioning.

OPERATIONAL REQUIREMENTS include:

1. spatial requirements for O&M personnel,
2. cost-effective O&M,
3. provisions for re-commissioning, adjustment and fine-tuning of the facility during its entire life,
4. provisions for complete documentation, including ease of addressability, storage facilities,
5. training of O&M personnel (and user),
6. Life Safety Systems.

2.7 Design criteria

Design Criteria are identified in the RFP or Project Brief and may be established by the Client, or by various codes, standards and regulations (enforced by an authorities having jurisdiction, to be identified). These may include, but are not necessarily limited to:

- .1 conservation guidelines, heritage character statements,
- .2 various PWGSC standards,
- .3 environmental standards including ASHRAE Standards 90.1, 62, and 55.
- .4 Security and access requirements as established by the Authority Having Jurisdiction,
- .5 Accessibility standards.
- .6 Operational characteristics such as:
 - .a Spatial requirements for O&M facilities and services,

- .b O&M and life cycle costs, reliability, durability, operability, maintainability, accessibility, serviceability
- .7 Partial and phased occupancy,
- .8 Disruption of normal environmental conditions,
- .9 Life support systems, security, access, power, vertical transportation, etc., for present occupants (this would apply particularly to renovation projects),
- .10 Hours of occupancy - normal, and extended.

For existing buildings, design criteria should be based upon considerations such as age and condition of the building, architectural and structural considerations, exterior environmental conditions, previous usage, etc.

Design criteria must include:

- .1 **design tolerances** (eg. design margins, safety factors, standby and redundancy, etc.)
- .2 **application tolerance** for each system which must be realistic and attainable. Both of these items must be the result of careful examination of the functional and operational requirements contained in the RFP.

If design criteria are not established by the client, they may be established by the Project Manager in the RFP. In this case, they must be approved by the PWGSC Design Quality Review Team during the development of the Conceptual Design Report. They must be based upon considerations such as building age, heritage value, architectural and structural considerations, condition, of the existing building, exterior environmental conditions, previous usage, etc.

Design criteria for Design-build projects: These are especially important because of the limited involvement and opportunity for defining project requirements by A&ES and Property and Facilities Management (PFM) during the project identification stage, planning phase. It is therefore critical that, without limiting the freedom of the designer-builder to develop innovative design solutions, that all the appropriate design criteria, performance criteria, etc., be clearly established in the RFP. All commissioning roles and commissioning activities must be clearly defined within the design-build Request For Proposal (RFP).

2.8 Commissioning Brief

This is the section of the Project Brief in which commissioning requirements are clearly defined. The Commissioning Brief identifies the Owner's/Investor's/ Client's expectations – what needs to be done together with estimated costs for commissioning; the Commissioning Plan identifies the systems and delineates the procedures and schedules.

The Commissioning Brief defines the deliverables from an O&M perspective and describes the scope of commissioning and associated budget (normally established in the IAR).

2.9 Conceptual Design Report

The Conceptual Design Report contains the designer's proposed solutions to the requirements contained in the RFP and must include all design intents (i.e. the methodology by which the designer proposes to meet the design criteria).

The designer must be very careful and judicious in the practice of adding "safety factors" to design calculations. Unless strictly controlled, these accumulated factors will often lead to over-sizing of equipment and systems, resulting in difficulties in commissioning.

The Conceptual Design Report for mechanical systems must include decisions relating to the introduction of good quality outside air in well-controlled and measurable quantities into HVAC systems in order to maintain satisfactory IAQ at all times. Unless considered at the outset of the project this may well be forgotten, or squeezed out for want of the small amount of additional space in the Mechanical Equipment Room.

The Conceptual Design Report for heritage buildings must include the documents which define the heritage character of the property and a description of the conservation approach which outlines how this will be balanced with functional goals.

2.10 Detailed design development

This must include very careful attention to details including:

- .1 what system and equipment must be connected to emergency power.
- .2 the impacts of standby capacity and redundancy.
- .3 careful and appropriate selection of construction materials, installation practices and performance verification procedures, etc. WHMIS data sheets for all materials to be incorporated into the project must be carefully examined at this stage of the project's development.
- .4 Specifications must reflect this concern for quality assurance in design. They must be complete, and include requirements for commissioning.

Increasing complexity of control systems requires that DDC, EMCS and BAS systems, fire alarm systems and life safety systems receive special consideration when preparing specifications.

The insistence on quality assurance in design must flow into the insistence on quality control during construction. All parties to a construction project take much great care in all aspects of project management. Once design solutions have been established, and system selection with its associated equipment selection have been accepted, it is very often difficult, if not impossible to change to a design that will more readily comply with the requirement to minimize O&M costs.

2.11 Working documents

The working documents consist of the plans and specifications developed by the designer to describe the built works. They set out the quality control and quality assurance for the project. Plans and specifications are used by the Project Commissioning Team to verify that the built works conform to all commissioning deliverables.

2.12 Commissioning specifications

Although these form an integral part of the working documents, they are listed separately because of their importance in commissioning the built works. They must include sufficient details to enable the contractor to understand all requirements clearly and to submit an accurate price for commissioning and must include:

1. The Commissioning Plan which has been agreed with the PWGSC Commissioning Manager. For detailed description, refer to *CP.3: "Guide to Development of the Commissioning Plan"*.
2. All required performance verification procedures if not already covered in the Commissioning Procedures Manual of the discipline involved.
3. The Building Management Manual: to include all design intent and design criteria, objectives of commissioning and manner of operation of all systems, equipment and components, desired results and functions to be performed.
4. All requirements for preparation of the Maintenance Manual, including maintenance materials, spare parts, special tools, together with instructions for identification, inventory, storage and instructions for use.
5. A list of all factory and on-site performance tests; all to be witnessed and certified.
6. List of activities to be performed by the contractor as part of the Add-on Contract during the Warranty Period.
7. All conditions under which installed equipment may be temporarily operated by the Contractor and all refurbishing requirements.
8. Training requirements.
9. Requirements for preparation of O&M documentation.

2.13 Commissioning Plan

This is the project-specific document which has been approved by the PWGSC Commissioning Manager and which describes the process for verifying that all built works meet the Investor's requirements within the limits of the working documents.

The Commissioning Plan may, with the approval of the PWGSC Commissioning Manager, have to be amended by the contractor, then reviewed by the designer, at the commencement of construction in the light of the systems and equipment approved for installation, the contractor's construction/completion schedule and the occupancy schedule.

2.14 Installation/Start-up Check Lists

These are the lists to ensure that the equipment and systems as installed are complete, ready for start-up and for commissioning. The lists prepared by PWGSC must be considered as generic and illustrative only, and must be tailored to suit the project requirements.

2.15 Product Information (PI) and Performance Verification (PV) report forms

These forms are used throughout the commissioning phase and indicate the basic requirements expected from the PV procedures. The samples provided by PWGSC should be considered as generic only and may need to be tailored to suit requirements of the project.

2.16 Commissioning of heritage buildings

When changes are made to interior environments, commissioning should allow for ramping up to new set points over a period of weeks or months, rather than sudden start for new temperature and humidity levels. This allow for the building and its contents to adjust slowly to the changed conditions.

2.17 Building Management Manual

Is fully described in *CP.4: Guide to the development of Building Management Manuals*. It consists of five discrete sections:

- Section 1: Containing names of participants, functional and operational requirements, description of the project and its systems, accessibility, any FHBRO statements.
- Section 2: Design criteria, design intents, design philosophy, applicable codes and standards.
- Section 3: Standard Operating Procedures and Operation and Maintenance (O&M) manuals.
- Section 4: Maintenance and service contracts.
- Section 5: Supporting appendices such as: architectural, structural, fire protection and fire prevention, mechanical, electrical, appendices, WHMIS information manual, O&M budget, “as-built” construction documents.

2.18 Commissioning reports

These documents describe the commissioning processes used during the delivery cycle and provides assessment of the facility as to its compliance with the requirements identified in the IAR and the Project Brief.

2.19 Final Commissioning (Evaluation) Report

The Final Commissioning, or Evaluation, Report is prepared by the PWGSC QA Commissioning Manager at the end of the project delivery stage, close out phase.

It is essentially a debriefing report and building evaluation summary and includes:

1. a complete assessment of the project.
- .2 lessons learned from this project and any necessary recommendations.
- .3 variances between the actual and planned levels of performance as defined in the IAR and Project Brief.
- .4 an evaluation of the validation and acceptance process and of the commissioning phase.
- .5 what components and systems which were not commissioned reasons for this
- .6 a remedial work plan outlining recommended follow-up actions or projects to be undertaken by PWGSC.
- .7 other related information.

2.20 Other documents

The Project Leader may identify in the Project Brief other documents to be delivered. This may occur more often on projects for special purpose facilities.

END

**PWGSC
COMMISSIONING MANUAL
(CP.1)**

Project Commissioning

Appendix A

Samples of Commissioning Documentation

Rather than being typical of what will be produced, with a few exceptions, this Appendix contains a number of sample commissioning documentation that has been prepared for projects that have been undertaken in NCA.

The items listed include:

Tab A:	Sample of Commissioning Brief
Tab B:	Sample of Commissioning Plan
Tab C	Sample of Standard Operating Procedures Manual
Tab D:	Sample of Training Plan
Tab E:	Sample of Installation / Start-up Check List
Tab F:	Sample of MMS input into working documents
Tab G:	Sample of Product Information (PI) and Performance Verification (PV) Forms
Tab H:	Schematics used in Manuals and Commissioning Reports
Tab I:	Sample of Commissioning Schedules
Tab J:	Sample of Equipment Performance Verification specification
Tab K:	Sample of Integrated System specification

Sample of Commissioning Brief

NOTE: *This is a sample (only) of the type of Commissioning Brief which might be used with a traditional type of Consultant Design / Contractor construct project.*

A model generic Commissioning Brief may be found in CP.11: Guide to the preparation of Commissioning Briefs.

IMPORTANT NOTES TO WRITER OF COMMISSIONING BRIEFS:

1. This model Commissioning Brief has been developed **specifically for use with the traditional Consultant Design / Contractor construct type of project.**
2. This model Commissioning Brief shall be used in the preparation of project-specific Commissioning Briefs for new projects, existing installations where systems have to be substantially modified or for remaining existing systems as appropriate.
3. Material in this Commissioning Brief that is in **ITALICS** is for the benefit of the writer of the Commissioning Brief and is **NOT** intended to be incorporated into the Commissioning Brief.

1. Commissioning objectives

The objectives of commissioning are:

- .1 To document the design intent of the overall project and the proposed building systems and components and to verify and demonstrate that all functional and operational requirements have been correctly interpreted in the Design solution.
- .2 To document the operational, maintenance and building management requirements.
- .3 To minimize O&M costs through the careful selection of design solutions (for economy, reliability, durability, accessibility, maintainability), construction materials, installation practices, performance verification procedures.
- .4 To verify that selected design solutions and the resultant built works protect the safety, health, welfare and comfort of occupants and O&M personnel.
- .5 To define responsibility areas for meeting these operational requirements in the contract documents and include a process to demonstrate compliance.
- 6 To demonstrate that the Client's and the Department's requirements are met during the project implementation and commissioning phases of the project and to support quality management of construction and installation through verification of building components, systems and environments.
- .7 To verify and demonstrate that all systems operate consistently at peak efficiencies, under all normal load conditions, and within the specified energy budget.
- .8 To provide comprehensive documentation of the operational, maintenance and building management.
- .9 To implement a comprehensive training program.
- .10 To transfer the completed works to qualified facility operators verifying that the building systems operate consistently at peak efficiencies, under all normal load conditions, and within the specified energy budget.
- .11 To ensure the heritage character of the building is protected through appropriate maintenance schedules, methods, materials and procedures.

2. General description of commissioning

- .1 Commissioning shall be carried out in accordance with the **PWGSC Commissioning Manual (CP.1)**, current edition, and all associated Guidelines but suited to the specific requirements of the project. These documents consist of:
CP.1: Project Commissioning Manual
CP.2: Commissioning Glossary (forms Appendix B of CP.1)
CP.3: Guide to development of the Commissioning Plan
CP.4: Guide to the development of the Building Management Manual
CP.5: Guide to preparation of Training Plans
CP.7: Commissioning for Facilities Management and Operation
CP.8: Guide to the preparation of Commissioning Reports
CP.9: Guide to the development and use of Check Lists
CP.10: Guide to the development and use of Report Forms and Schematics
CP.11: Guide to the preparation of Commissioning Briefs
CP.12: Guide to the development and use of Commissioning specifications
CP.13: Facility Maintenance Policy, Guidelines and Requirements
- .2 The **PWGSC Commissioning Manual (CP.1)** and all associated PWGSC Guidelines are available from the Project Manager.
- .3 Commissioning includes architectural, structural, interior and landscape systems, as well as the usual mechanical and electrical systems.
- .4 The Designer must deliver concise and comprehensive information and reports on commissioning to PWGSC.
- .5 A enhanced commissioning program is required and will apply to all construction phases, base building and fit up work.

3. Roles and responsibilities:

- .1 **PWGSC Project Manager:** Has overall responsibility for managing the project and delivering the project to the Project Leader on time and on budget. Upon completion, the Project Manager hands the facility over to the Project Leader.
- .2 **PWGSC Commissioning Manager:** As a member of the PWGSC Technical Advisory Team, the Commissioning Manager:
 - .1 represents the Project Manager during the commissioning process;
 - .2 maintains overall responsibility for representing the Client's interests in the implementation of commissioning, including:
 - .1 assuring that all program issues have been addressed,
 - .2 reviewing all documentation at all stages of project development and delivery,
 - .3 monitoring of all commissioning activities,
 - .4 verification of the accuracy of all reported results.
 - .3 ensures that all O&M aspects are addressed to the satisfaction of the Department,
 - .4 reviews Designer's submissions,
 - .5 monitors the Designer's commissioning services during the commissioning process,
 - .6 witnesses and certifies with the developer's designer all integrated systems test results,

- .7 in consultation with the Designer, review staffing, service contracts and requirements for supply and storage of spare parts, special tools and maintenance materials.

.3 Designer (Consultant): The Designer shall:

- .1 establish Design Criteria, functional and operational requirements, if not already established in the RFP or Project Brief,
- .2 establish a Design Energy Budget and, if necessary, revise and update with each submission,
- .3 prepare a preliminary O&M budget and revise and update with each submission, containing detailed breakdowns of various items such as estimated electrical, mechanical, or specialty equipment annual energy consumption and systems maintenance, operation and/or service contract costs,
- .4 prepare a preliminary Commissioning Budget and revise and update with each submission,
- .5 prepare a preliminary Commissioning Plan in accordance with *CP.3: Guide to development of the Commissioning Plan*,
- .6 prepare commissioning specifications for components, equipment, systems and integrated systems in accordance with *CP.12: Guide to the development and use of Commissioning Specifications* and incorporate same into the construction specifications,
- .7 prepare a complete maintenance management documentation in accordance with *CP.4: Guide to the preparation of Building Management Manuals*, to be sufficiently complete for use during training, and to include:
 - .1 explanation of the purpose of the facilities, what the building is meant to do,
 - .2 outline of the design intent of all systems,
 - .3 provide a narrative description of the project's conceptual framework,
 - .4 document all design decisions made throughout the project,
 - .5 description of each building system; including architectural, structural, mechanical, electrical, civil, fire protection, acoustical and other building as well as site systems,
 - .6 include all relevant documentation.
- .8 plan the commissioning and performance verification (PV) activities, processes and their output, including development of project-specific:
 - .1 Installation / Start-up Check Lists prepared in accordance with *CP.9: Guide to the development and use of Check Lists*,
 - .2 Product Information (PI) Report Forms and Performance Verification (PV) Report Forms prepared in accordance with *CP.10: Guide to the development and use of Report Forms and Schematics*,
 - .3 Add all design data to PI and PV report forms.
- .9 prepare a detailed Training plan in accordance with *CP.5: Guide to preparation of Training Plans*,
- .10 incorporate PWGSC MMS identification codes to all components, equipment and systems into all working documents; all in accordance with *CP.13: Facility Maintenance Policy, Guidelines and Requirements*,
- .11 review the **CONTRACTOR'S** detailed commissioning schedule for components, equipment, systems, and integrated systems. (PV tests will be performed by the Contractor),
- .12 identify Contractor and subcontractor commissioning, PV and testing responsibilities,

- .13 review shop drawings and product data and accompanying Product Information (PI) as completed by the Contractor,
 - .14 monitor commissioning activities, provide quality control reports to the PWGSC commissioning Manager throughout the construction, commissioning and operational phases of the work, including but not necessarily limited to:
 - .1 inspection and verification of as installed components, sub system and systems on a regular basis during construction,
 - .2 witnessing tests, as required by PWGSC,
 - .3 reviewing and verifying testing, adjusting and balancing (TAB) reports,
 - .4 reviewing and verifying Performance Verification (PV) Reports prepared in accordance with *CP.8: Guide to the preparation and use of Commissioning Reports*,
 - .5 witness and certifying systems and integrated systems tests,
 - .6 any test which cannot be commissioned due to design errors or omission has to be redesigned and recommissioned.
 - .15 participate in the Training Plan by providing training on design philosophy, design intent and systems designs,
 - .16 witness and certify deferred tests, commissioning activities, PV, review and accept reports,
 - .17 identify and verify the rectification of all outstanding deficiencies,
 - .18 assist in the resolution of all issues relating to commissioning,
 - .19 prepare “as-built” documentation (plans and specifications) as described elsewhere in the RFP or Project Brief,
 - .20 assist in fine-tuning of systems and equipment as required during the warranty period,
 - .21 coordinate with the PWGSC Commissioning Manager to ensure that O&M requirements are addressed,
 - .22 assist in systems checks and environmental checks during the warranty period,
 - .23 participation in warranty inspections and production of warranty inspection reports and address all warranty issues that may arise,
 - .24 ensure that the final product meets the Design Criteria, functional and operational requirements, the project objectives and all requirements of the RFP and Project Brief,
 - .25 recommend acceptance of the completed project,
 - .26 assist the PWGSC project manager in the preparation of a debriefing (Evaluation) report. To include, but not necessarily be limited to:
 - .1 a building evaluation summary with recommendations,
 - .2 lessons learned from the project.
- .4 Designer’s commissioning resource:** To assist in fulfilling a fully integrated and comprehensive commissioning program, the Designer shall appoint a full-time commissioning resource with proven expertise in implementing commissioning programs, and who shall be responsible for detailed coordination of commissioning and provide direction for all matter relating to commissioning as described herein. The name of this resource shall be provided to the PWGSC Project Manager and Commissioning Manager.
- .5 Contractor:** In accordance with the commissioning requirements specified in the Construction Documents, the Contractor:
- .1 develops a critical path commissioning activities schedule for review and approval of the Designer, PWGSC Commissioning Manager and Project Manager,
 - .2 executes all commissioning activities in accordance with the Contract Documents, such as:

- .1 input data from drawings on to Product Information (PI) Report Forms,
 - .2 assemble maintenance sections of the Building Management Manual as described in *CP.4 - Guide to the preparation of Building Management Manuals*,
 - .3 assist in assembly of section relating to operation of components, equipment, sub-systems, systems and integrated systems as described in *CP.4: Guide to the preparation of Building Management Manuals*,
 - .4 utilize Installation/Start-up Check Lists when conducting pre-start-up inspections,
 - .5 coordinate all commissioning activities,
 - .6 perform testing, adjusting and balancing (TAB), prepare TAB reports,
 - .7 conduct performance verification (PV) tests of components, equipment, sub-systems, systems and integrated systems, complete PV Report Forms, prepare PV Reports,
 - .8 coordinate and implement training as described in *CP.5: Guide to preparation of Training Plans*,
 - .9 address all issues relating to commissioning,
 - .10 assist the Designer in the preparation of commissioning documentation,
 - .11 assist the Designer in the preparation of "as-built" documentation,
 - .12 fine-tune components, equipment, sub-systems, systems and integrated systems during the warranty period,
 - .13 perform systems and environmental checks during warranty period and prepare reports,
 - .14 address all warranty issues,
 - .15 provide input to the Designer in the preparation of a debriefing (Evaluation) report.
- .6 Contractor's commissioning resource**, assigned by the Contractor, qualified and experienced in the implementation of all commissioning, to coordinate, direct and verify all commissioning activities and procedures. The name of this resource shall be provided to the PWGSC Project Manager and PWGSC Commissioning Manager for approval.

4. Occupancy requirements

Identify facility management requirements, including move-in procedures; security systems; staffing; signage; safety and accessibility for persons with disabilities.

User occupancy requirements include consideration of the need for and implications of:

- .1 early, late and/or phased completion, take-over, acceptance and occupancy, including the effects upon the User's present accommodation (such as early decommissioning, need for extension etc.).
- .2 requirements for initial, interim and substantial occupancy including, for reasons of health and safety, full commissioning of all life safety systems. It may also include some form of "interim commissioning" of all non-life safety systems.

- .3 overlapping of construction, commissioning and initial occupancy. This requires consideration of the effects of partial commissioning, delay of commissioning activities, the effects on insurance, warranties, certification, repetition of commissioning activities after full occupancy, and/or completion of fit-up contracts.
- .4 post-occupancy commissioning activities during Operation which will often be necessary for certain systems and equipment under these circumstances.

5. Operational criteria

NOTES TO READER :

1. *This paragraph applies mainly to renovation projects.*
 2. *Rewrite this paragraph to suit project requirements.*
- .1 [This building will be decommissioned during the renovation and construction process and the Contractor will bear the full responsibility for the base building.]
or
[This building will be occupied during the demolition, construction and fit-up process. Part of the building will be decommissioned during the first construction (demolition) contract. The Contractor will bear full responsibility for the base building].
or
[This building will be partially occupied during the demolition, construction and fit-up process. Part of the building will be decommissioned during the first construction (demolition) contract].
 - .2 The Contractor may use base building systems, utilities and steam from the Central Heating Plant during renovation stages. The cost for energy used will be borne by [PWGSC] [the Contractor].
 - .3 [Start-up, PV and acceptance will include phased activities (both within individual contracts and involving several contracts). Testing, PV, commissioning and training must be developed bearing these variables in mind. Cooperate and coordinate testing procedures and schedule with user. Once the renovated building has been occupied, further testing activities will be subject to User's approval and may be refused during normal working hours].
or
[Start-up, PV and acceptance will include phased activities (both within individual contracts and involving several contracts). Testing, PV, commissioning and training must be developed bearing these variables in mind. For example:

NOTE TO READER: Modify this table to suit the project

Nominal hours of operation/occupancy:	0600 - 1800, [5] days/week
Extended hours of operation/occupancy:	1800 - 0600, [5] days/week
Nominal hrs. of operation (presence) of O&M staff:	0830 - 1600, 5 days/week
Security staff presence:	24 hours/day, 7 days/week
Cafeteria and meeting rooms:	[0700 - 2100] [varies], 7 days/week
Restrictions to testing:	Life-support: Off-hours Emergency power: Off-hours
Ventilation for off-gassing:	[During occupied periods and] during off-hours for first [8] weeks after completion of installation of furnishings].

Once the renovated building has been occupied, further testing activities will be subject to User's approval and may be refused during normal working hours.

6. Life cycle costing criteria

If not prescribed within the RFP or Project Brief, when developing life cycle cost analyses for each option, use the following criteria:

1. [25] years to next refit,
2. [50] year investment horizon,
3. costs of utilities (e.g. Central Heating and Cooling Plant (CHCP) steam, hot water heating, chilled water, electricity), fuel consumption, potable water and sewage),
4. reliability, durability, operability, maintainability, accessibility and serviceability,
5. systems selection and staffing in response to annual operating cost criteria.

7 Cooperation and coordination

Throughout the Commissioning Process, the Project Design Team, the Project Construction Team, the Project Commissioning Team, and the Property Management Team, all as defined in *The PWGSC Commissioning Manual (CP.1)*, will work closely together to implement all commissioning activities.

8 Training

In consultation with the PWGSC Commissioning Manager, prepare a comprehensive training plan for the training of the Facility Management personnel, User (where deemed necessary) and operations and maintenance staff.

If required by the RFP or the Project Brief, training shall be in English and French.

The training plan which will enable O&M personnel to identify repair and maintenance needs that might otherwise go undetected for long periods with possibly serious consequences.

Training shall enhance monitoring and diagnostic capabilities and result in more efficient, cost-effective operation of the facility.

The training plan shall be in accordance with the requirements of *CP.5 Guide to preparation of Training Plans*. Training plans shall be reviewed, revised, updated and resubmitted as required.

The names of all trainees (obtained from the PWGSC Project Manager) and all training personnel shall be submitted to the PWGSC Project Manager for review, comment and approval at least two (2) weeks prior to the proposed training dates.

Training must clearly relay:

- .1 A clear understanding of the intent of the design,
- .2 All limitations of the systems,
- .3 Reasons for the choice of systems.

Coordinate the dates of all training sessions with the PWGSC Project Manager. Update the training plan as required to reflect the project schedule. The PWGSC Project Manager will organize the location

The training plan shall recognize both short-term and long-term requirements.

Upon completion, prepare a summary of the training sessions, indicating dates, subject matter, all training personnel and all trainees present and submit to the Project Manager.

9 Correction of deficiencies

The Designer, in consultation with the PWGSC Commissioning Manager, shall:

- .1 instruct the contractor to correct all the deficiencies identified and recorded during the performance verification,
- .2 provide solutions during the PV process with respect to the variances from the design parameters,
- .3 adjust or alter the systems to achieve the design parameters. This shall include re-testing,
- .4 immediately notify the PWGSC Project Manager when tests fail to meet project requirements and when corrective work and re-tests affect construction and completion schedule,
- .5 report in writing to the PWGSC Project Manager and the PWGSC Commissioning Manager indicating compliance or anomalies regarding witnessed events. The consultant is to investigate and recommend in writing any corrective actions to be taken to facilitate compliance with design intent and design criteria.

10 Facility maintenance policy, guidelines and requirements

For full details, the Designer shall refer to *CP.13: Facility Maintenance Policy, Guidelines and Requirements*.

11. Acceptance of the project

The project will be accepted and the Interim Certificate of Completion will be issued only after:

1. successful completion of all integrated systems tests, life safety support systems tests and after all other requirements of the authority having jurisdiction are satisfied,
2. all test certificates, commissioning reports and commissioning documentation have been approved and accepted by the PWGSC Project Manager.

12. Commissioning documentation

Commissioning documentation is a complete set of data and information fully describing the completed project as a built, finished, functional and operational facility and presented in a form that can be maintained, updated and used over the life of the building.

In preparing project-specific commissioning documentation, use all existing generic commissioning documentation to the maximum extent possible. However, the Designer retains over-riding responsibility for the content of all project-specific commissioning documentation and for editing, amending and supplementing as required and as is appropriate for the project.

Produce in accordance with the requirements of *The PWGSC Commissioning Manual (CP.1)* in consultation with PWGSC centre of expertise and the PWGSC Commissioning Manager as appropriate.

Comply with all requirements contained in the RFP relating to electronic production of commissioning documentation.

Commissioning documentation shall include:

- .1 The Commissioning Plan**, the master planning document for all commissioning activities and deliverables, revised, refined, updated and reviewed at each stage of design development and re-submitted for review by the PWGSC Commissioning Manager. Use the PWGSC Model Commissioning Plan (see CP.3) as a reference model.
- .2 The Building Management Manual**, containing all documentation for the project and providing a complete “paper trail” relating to project delivery. Responsibilities for development and timing of delivery are described in *CP.4: Guide to the development of Building Management Manuals*.
- .3 Commissioning specifications**. For details of requirements, refer to *CP.12 - Guide to the development and use of Commissioning Specifications*.
- .4 Training Plans**. Refer to *CP.5 Guide to the preparation of Training Plans*. For more details refer to relevant paragraph below.
- .5 Installation Check Lists** for use during pre-start-up and pre-commissioning inspections. Refer to *CP.9 Guide to the development and use of Check Lists*.
- .6 Product Information (PI) report forms** to document all details of equipment, components and systems - refer to *CP.10 Guide to the development and use of Report Forms and Schematics*.
- .7 Performance Verification (PV) report forms** and include thereon all Design Criteria, Design Intents and other relevant design information. Refer to *CP.10 Guide to the development and use of Report Forms and Schematics*.
- .8 MMS requirements**, Apply to all drawings before Tender call . Refer to *CP.13 Facility Maintenance Policy, Guidelines and Requirements*.
- .9 "As-built" drawings and specifications:** to be completed prior to, and available for, pre-start-up inspections and to include:
 - .1** amendments to show all measured and approved results of PV procedures, settings of all controls, systems and equipment as finally set upon completion of commissioning,
 - .2** project specifications amended by insertion of addenda, change notices, etc.,
 - .3** flow diagrams and piping schematics as installed at each major item of equipment complete with valves controllers, etc., identified with numbered tags.
- .10 Occupants' Comments/Complaints Audit System** for use during the Warranty Period.
- .11 TAB and commissioning reports** to be prepared in accordance with *CP.8: Guide to the preparation and use of Commissioning Reports*.
- .12. Final evaluation report**,. in accordance with *CP.8: Guide to the preparation and use of Commissioning Reports*.
- .13 Any other documents and reports**

13 Commissioning deliverables:

- .1 First technical submission by the Designer:** Provide following:
 - .1 Conceptual Design Report:** From the commissioning perspective, the Conceptual Design Report shall include:
 - .1 description of the design** describing the Design Criteria, Design Intent, the design philosophy, the rationale for system selection based on life cycle cost analysis, the functional and operational requirements and the conceptual framework for the operation and use of the proposed building, its components and systems, how the proposed design meets the Client's requirements, corporate and project objectives. To be updated at each stage of project development.
 - .2 design criteria, Design intents,**
 - .3 O&M Report.** To include:
 - .1 O&M budget including projected utility consumption
 - .2 spatial requirements for O&M staff (office, lockers, kitchen, showers, washrooms, flow of people and supplies, storage for special tools, spare parts, and maintenance materials),
 - .3 cleaning requirements (janitor closets, receptacle for vacuum, equipment supply and storage),
 - .4 other requirements associated with O&M aspects including, but not necessarily limited to:
 - .1 operating standards and operator requirements,
 - .2 equipment and system reliability requirements,
 - .3 delivery, content and form of O&M documentation,
 - .4 tools, equipment, spare parts and maintenance materials,
 - .5 emergency procedures,
 - .6 identification and other similar needs,
 - .7 waste management requirements,
 - .8 preventive maintenance tasks.Further information may be obtained from *CP.7: "Commissioning for Facility Management and Operation"*.
 - .4 Comprehensive documentation, design information/data** and comments to allow the PWGSC Commissioning Manager to:
 - .1 prepare service and staffing contracts,
 - .2 prepare a list of spare parts, special tools, maintenance materials and other special equipment to be provided by the Contractor.
 - .5 capacity of the facility to change in response to program changes over its life expectancy,**
 - .6 requirements for operation and maintenance of the project over its life expectancy,**
 - .7 occupancy during construction,**
 - .8 "phased" construction program,**

- .9 assessment of staffing and skill requirements to operate and maintain the project,
- .10 preliminary commissioning plan,
- .11 sample of PI/PV report forms and tracking software,
- .12 preliminary building management manual,
- .13 define project archives and how these archives will be managed, updated, and submitted at the end of the project.

.2 33% Submission:

- .1 Extent of commissioning determined,
- .2 Factory and on-site tests of components, sub-systems, systems and integrated systems during construction, installation and commissioning determined,
- .3 Outline commissioning specifications using PWGSC generic commissioning specifications PLUS outline project-specific commissioning specifications,
- .4 Updated Commissioning Plan,
- .5 Updated Building management manual,
- .6 Updated Design Intent Document,
- .7 Updated O&M Budget,
- .8 Outline PI and PV forms. Provide for all components, equipment and systems to be tested,
- .9 Maintenance management system (MMS) codes identified for all equipment shown on the construction documents,
- .10 Preliminary Training Plan.

.3 66% Submission:

- .1 Factory and on-site tests of components, sub-systems, systems and integrated systems during construction, installation and commissioning defined and detailed in commissioning specs,
- .2 Commissioning activities to be deferred to Operational Phase and Warranty Period identified,
- .3 Detailed commissioning specifications,
- .4 Updated Commissioning Plan, etc.,
- .5 Detailed Building management manual,
- .6 Updated Design Intent Document,
- .7 Updated O&M Budget,
- .8 Updated Training Plan,
- .9 Maintenance Management System (MMS) codes identified for all equipment shown on the construction documents, schematics and line diagrams,

- .10 Complete PI and PV forms. Provide for all components, equipment and systems to be tested.

.4 99% Submission:

- .1 Commissioning specifications integrated into project specifications,
- .2 90% Commissioning plan,
- .3 90% complete Building Management Manual,
- .4 90% Design intent document detailing each building system, including all engineering calculations,
- .5 Final O&M Budget,
- .6 Maintenance Management System (MMS) codes identifiers shown on the construction documents and indicated on each PI and PV form,
- .7 100% Training Plan, indicating scope and duration of training,
- .8 Design information added to PI forms.

.5 100% Submission:

- .1 This submission incorporates all revisions required by the review of the 99% submission,
- .2 Complete Commissioning Plan,
- .3 Update the design intent document to reflect any changes from the 99% submission.

14 Construction and Commissioning:

.1 General:

- .1 Upon Contract award, review and Update the PI and PV Forms, installation/start-up Check Lists, Commissioning Plan, Training Plan, commissioning specifications, and Commissioning Schedule to ensure relevance to construction changes to the work. Refer to *CP.9 - Guide to the development and use of Check Lists*, and *CP.10 - Guide to the development and use of Report Forms and Schematics*.
- .2 In consultation with the Contractor, review/select the test instruments to be used and instrument calibration.
- .3 Incorporate relevant data from approved shop drawings and installed component data immediately upon approval.
- .4 Review contractors compliance with the contract documents.
- .5 Witness and certify tests, including those tests conducted before concealment and start up.
- .6 Verify that each system is completed, safe to operate and ready for start-up.
- .7 Review all test reports and take necessary action with Contractor when work fails to comply with contract.
- .8 Immediately notify the PWGSC Project Manager when tests fail to meet project requirements and when corrective work will affect schedule.

- .9 Ensure that all deficiencies are rectified and acknowledge that the installation of components and systems is ready for the commissioning phase.
- .10 Assist Departmental Representative in evaluating testing firm's invoices for services performed.
- .11 Review all maintenance management nomenclature and submissions prepared by the contractor. Ensure completion of on-site implementation and tagging of systems and equipment.

.2 Manuals and Reports - Refer to *CP.4 - Guide to the development of Building Management Manuals*:

- .1 4 weeks before training is due to commence, assemble, review and approve:
 - .1 All commissioning documentation, including PV documentation, procedures and expected output.
 - .2 In consultation with the Contractor, review/select the test instruments to be used and instrument calibration.
 - .3 Revise the Building Management Manual as construction progresses, ensuring that it reflects the installed systems.
 - .4 Finalize the SOP Manual: Verify, and certify, completeness, relevance and accuracy. Produce [4] sets and submit to the PWGSC Project Manager prior to implementation of Training Plan. The Contractor shall retain one copy of each volume for his record and for use during the implementation of the Training Plan.
 - .5 Review the O&M Manual: Verify for, and certify, completeness, accuracy, relevance and format. Submit [4] sets to the PWGSC Project Manager in accordance with Section [01730][01732][01007] of project specification prior to interim acceptance or implementation of Training Plan. Ensure Contractor assembles all certified tests results and incorporates into the O&M manuals. The Contractor shall retain one copy of each volume for his record and use during the instruction period.

.3 Training: Implement the Training Plan. Refer to *CP.5 - Guide to the development of Training Plans*.

- .1 Submit the Training Plan to the PWGSC Project Manager for review and comment at least two weeks prior to the proposed training dates. Update and resubmit as required. Include an agenda and a course outline summarizing the content and duration of training. The training provided must clearly relay:
 - .1 An understanding of the intent of the design.
 - .2 Limitations of the systems.
 - .3 Reasons for the choice of systems.
- .2 Coordinate the date(s) of the training session(s) with the PWGSC Project Manager. The PWGSC Project Manager to organize the location and provide the lists of participants.

- .3 Prepare a summary of the training sessions. Indicate dates, subject matter, and all personnel present for training. After training, submit the training summary to the PWGSC Project Manager.
- .4 Make necessary arrangement for site O&M staff familiarization during construction/ installation.
- .5 Consultant to provide training sessions on design intent and operational philosophy of each building system, including architectural systems, and the integrated building systems (all together). Utilize the O&M Manual and design intent document for training sessions.
- .6 Contractor to provide training sessions on the operations and maintenance of components, equipment, sub-systems, systems and integrated systems.
- .7 Record the time, date and subject matter of training sessions as they occur. Indicate all those who are present at each training session.

.4 Spare Parts:

- .1 Finalize the delivery, inventory and storage of all specified spare parts, special tools, maintenance materials.

.5 Component, sub-systems, Systems, and Integrated System Performance Verification (PV)

- .1 Test all the components, subsystems, systems and integrated systems in accordance with the provisions of the contract documents, Ensure the work meets the design intent and requirements of ULC and TB Guidelines on Life Safety and Health. The Designer shall witness, certify and approve all tests.
- .2 Certify and date all PV procedures and test results.
- .3 Report in writing to the PWGSC Project Manager and PWGSC Commissioning Manager indicating compliance or anomalies regarding witnessed events. The consultant is to investigate and recommend in writing any corrective actions to be taken to facilitate compliance with design intent and design criteria.
- .4 Provide solutions during the PV process with respect to the variances from the design parameters.
- .5 In consultation with the PWGSC Commissioning Manager, instruct the contractor to rectify all deficiencies identified and recorded during the performance verification and adjust or alter the systems to achieve the design parameters. Re-test to verify compliance.
- .6 In consultation with the PWGSC Commissioning Manager, and PWGSC Project Manager, recommend take over of the facility subject to performance of PV and commissioning which were previously agreed to be deferred until the operational phase.
- .7 Prior to interim inspection, debrief the PWGSC Project Manager and the PWGSC Commissioning Manager on the commissioning process including training; problems; required changes to systems (with costs) which are outside the contractor's responsibility, but which are deemed necessary to meet project requirements; commissioning procedures and other information, experiences and suggestions for future projects. Submit a

report to the PWGSC Commissioning Manager. Repeat this process when 80% occupancy is achieved.

.6 Design intent document and Building Management Manual:

- .1 Update the design intent document and Building Management Manual. Immediately prior to the issuance of the Interim Certificate of Acceptance develop this document so as to become the complete “Building Management Manual” to reflect the final as-built works. Reflect all changes, modifications, revisions and adjustments. This may include the incorporation of reports such as *the Area Measurement and Space Usage Report*, Fire protection Manual, etc.

END

CP.11: MODEL COMMISSIONING BRIEF

Sample of Commissioning Plan

NOTE: *This is a sample (only) of the type of Commissioning Plan which might be used with the normal type of Consultant Design and Contractor construct project for upgrading, extending, and replacing existing laboratory facilities.*

PWGSC Project no. xxx xxx [project title] [date]

Contents

1. Importance of the Commissioning Plan
2. Roles and responsibilities
3. Revisions to this Commissioning Plan
4. Risk assessment
5. Objectives of commissioning
6. Extent of commissioning
7. Deliverables relating to O&M perspectives
8. Deliverables relating to the commissioning process
9. Deliverables relating to the administration of commissioning
10. Payments for commissioning
11. The commissioning process
12. Training Plan

1. Importance of the Commissioning Plan

The Commissioning Plan is the master planning, management and communications tool relating to commissioning, setting out scope, standards, roles and responsibilities, expectations, deliverables, etc., and is addressed to all members of the Commissioning Team. It provides an overview of commissioning, and sets out the process and the methodology for successful commissioning of the above-mentioned project.

2. Roles and responsibilities

The Commissioning Plan is intended to be used by the:

- .1 **PWGSC Project Manager:** who has the overall responsibility for the project and is the sole point of contact between the Client, the Designer, the PWGSC Commissioning Manager and all other members of the project team.
- .2 **PWGSC design Quality Review Team:** conducts detailed reviews during all stages of the design to ensure appropriate design criteria, design intents, design solutions, that designs are well-developed, commissioning specifications are appropriate to this laboratory, transmits technical design information to the Designer. During construction, may conduct periodic site reviews to observe general progress.
- .3 **PWGSC Commissioning Manager:** ensures that all commissioning activities are carried out so as to ensure the delivery of a fully operational project complete in every respect.. This includes reviews of all commissioning documentation, reviews for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under all conditions of operation, protection of health, welfare, safety and comfort of occupants and O&M personnel.
- .4 **Designer (i.e.. Consultant):** designs the facility to meet the Client's functional and operational requirements and budget, prepares all working documents, including incorporation of commissioning specifications in to construction specifications, monitoring commissioning activities, witnessing and certifying the accuracy of reported results, witnessing and certifying TAB and other tests, develops the PI and PV Report Forms,

develops the Building Management Manual, ensures the implementation of this Commissioning Plan, performing verification of performance of all installed systems, implementation of Training Plan.

- .5 **Construction Team:** consists of Contractor, sub-contractors, suppliers and other support disciplines, and is responsible for construction/installation in accordance with the contract documents, including testing and the delivery of training, required documentation.
- .6 **Contractor's Commissioning Agent:** to implement all commissioning activities required by the specifications, including demonstrations, training, testing, preparation and submission of test reports.. This is a responsibility that is distinct from that of the Contractor's site supervisor. Commissioning Agent to be available for emergency and troubleshooting service during the first year of occupancy by the User for adjustments and modifications outside the responsibility of the O&M personnel.
- .7 **Commissioning Agencies:** will include:
 - .1 **The installing contractor** or installing sub-contractor.
 - .2 **Equipment manufacturer:** e.g.. elevators, emergency generators.
 - .3 **Specialist sub-contractor:** e.g.. EMCS.
 - .4 **Specialist commissioning agency:** e.g., environmental space conditions, indoor air quality and other installations providing environments which are essential to the Client's program but are outside the scope or expertise of other Commissioning Agencies on this project. If not specified in the commissioning specifications, the identity of this specialist will be provided at a later date.
 - .5 **TAB agency:** equipment and systems involving the measurement and adjusting of flow rates and pressures to meet indicated or specified values (e.g. ducted air and hydronic systems, fans, pumps).

All Commissioning Agencies will be available for emergency service during the first year of occupancy by the User for adjustments and modifications outside the responsibility of the O&M personnel. These include changes to ventilation rates to meet changes in off-gassing, changes to heating or cooling loads beyond the ranges of the EMCS, and changes to EMCS control strategies beyond the training level provided to the O&M personnel.

The names of commissioning personnel, details of the instruments which will be used and commissioning procedures which will be followed will be provided at least three months prior to the scheduled starting date so as to permit proper review and approvals.

- .8 **Client's move:** the move from the existing accommodation into the new building, although not part of commissioning should be given serious consideration by the Designer so as to ensure only very minor interruption in his program activities.
- .9 **Property Manager:** has responsibility for receiving the renovated facility and is responsible for day-to-day operation and maintenance of the facility and represents the lead role in the Operation Phase and onwards.

3. **Revisions to this Commissioning Plan**

This Commissioning Plan will be reviewed, revised, refined and updated as detailed design and production of the Working Documents proceeds and, if required, during construction.

Each time it is revised, the revision number and date will also be revised. The revised Commissioning Plan shall be submitted to the PWGSC Project Manager and PWGSC Commissioning Manager for review and approval.

4. Risk assessment

For the construction of Laboratory Buildings, the performance of each system will affect the performance of all other systems, and non-performance places the conclusions of scientific research at very considerable risk (with possible negative impact on confidence by the scientific community in the reliability of such research). It is planned, therefore, to verify the performance of all systems and equipment installed in the new Laboratory building before acceptance by the User.

5. Objectives of commissioning

Commissioning will provide a fully functional facility:

- .1 whose systems, equipment and components have been proven to meet all Client's functional requirements before the date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under all normal loads.
- .2 in which the Client and O&M personnel will have been fully trained in all aspects of all installed systems,
- .3 having optimized life cycle costs,
- .4 having complete documentation relating to all installed equipment and systems.

6. Extent of commissioning

Since this preliminary Commissioning Plan is based upon the RFP and has been prepared prior to the development of the Conceptual Design Report, it is possible at this time to refer to systems only in very general terms. Systems to be commissioned shall include:

.1 Architectural and Structural

- Accessibility and operational safety
- Raised floor systems
- Elevator service **
- Vertical transportation systems **
- Kitchen equipment
- Special doors in laboratories
- Door and window hardware
- Protection of heritage character of this building

.2 Mechanical

- Environmental control systems, indoor space conditions, IAQ, noise & vibration
- Exhaust systems and related make-up systems
- Heat recovery systems
- Smoke control systems **
- Plumbing and other building services
- Fire suppression and fire protection systems **

.3 Electrical

- High voltage switch gear and transformation equipment and distribution systems
- Low voltage (below 750 V) distribution systems
- Emergency power generation, uninterruptible power, battery systems, lighting **
- Lighting equipment and distribution systems **

- Fire exit emergency signage **
- Transfer switches, controllers, fire alarm systems, control panels, enunciators **
- Voice communications and audio/video systems **
- Electronic data and communications information systems
- Intrusion and access security and safety systems **
- Lightning protection systems

** . These systems are identified as life safety systems.

7. Deliverables relating to O&M perspectives

The following list of deliverables is a brief overview. The Designer shall utilize a computer-based data management system. This will include the cost of all labour, material and EDP equipment to deliver the program (e.g. "as-built" drawings and specifications, PV and commissioning documentation, Building Manual, Training Plan). Separate manuals shall be compiled – one in French, one in English. Deliverables will include duplicate discs and [two] hard copies. All documentation shall be required to be transferred to the Property Manager in a computer-compatible format that can be readily inputted for data management.

- .1 Facility Operation and Maintenance Report:** This is a study to show how the facility will be operated. It will include the number of O&M personnel, security staff, janitorial staff, O&M spatial requirements, organization relating to flow of materials into and out of the facility, etc. It will be prepared by the Designer with input from the PWGSC Commissioning Manager and the Property Manager [and User].
- .2 Operation and maintenance budget:** This will be based upon the Facility O&M Report. As the design develops, it will include breakdowns to show the various elements of operations and maintenance (e.g. cleaning, service contracts), etc. It will be prepared by the Designer with input from the PWGSC Design Quality Review Team, the PWGSC Commissioning Manager and Property Manager and Client.
- .3 Design energy budget:** This will be prepared by the Designer with input from the PWGSC Commissioning Manager and the PWGSC Design Quality Review Team, and presented with the Conceptual Design Report. To be updated at the completion of the working documents.
- .4 Building Management Manual:** This will provide comprehensive information relating to the design, implementation, operation and maintenance of the entire project. It will include, but not necessarily limited to the following:
 - .1 Standard Operating Procedures (SOP) Manual:** To include description of each system together with a description of all operating modes. It will be produced by the Designer as the design develops. It shall be 90% complete prior to Tender Call. During the commissioning phase, revisions and refinements will be incorporated by the Designer, so that it will be 100% complete prior to issuance of the Interim Certificate. It will be further refined during the Warranty Period when all systems undergo fine tuning, set-point adjustments are made, etc.
 - .2 Operating and Maintenance (O&M) Manual:** This will be produced by the Contractor as construction/installation proceeds and reviewed by the Designer. It will be 90% complete prior to start-up inspections. During the commissioning stage, all missing data will be added, so that it will be 100% complete prior to issuance of

the Interim Certificate. During the Warranty Period, it will be refined as required. This manual will be organized so that keeping it up-to-date will require minimum time and resources.

- .3 **Life Safety Compliance (LSC):** Emergency information relating to all possible emergencies such as the presence of smoke, fire, floods, gas, failure of electrical power, water supply, heating, cooling, elevators, escalators, emergency evacuation, refrigerant release, chemical spills, heating and cooling generation plant emergencies, failure of fuel supplies and breach of security. Information is to be immediately available and comprehensible to technical and non-technical users. This manual is to be based upon the PWGSC LSC Manual, but enhanced to be made facility specific. Samples of existing LSC Manuals are available from the PWGSC Commissioning Manager for reference purposes.

- .4 **WHMIS information:** separate binder containing all information relating to products used in building operation and maintenance. This manual is to be subdivided by supplier, then by product. A detailed index is to appear at the beginning of the manual.

- .5 **Way-finding signage:** referred to in Part 1: General Project Requirements. To follow the Treasury Board Federal Identity Program Manual.

- .6 **Performance verification tests and inspections conducted at factory:** These will be witnessed by the PWGSC Design Quality Review Team and witnessed and certified by the Designer. The PWGSC Commissioning Manager may elect to participate.

- .7 **Warranties:** A complete inventory will be provided by the Contractor to the Designer who will review same before submission to the PWGSC Commissioning Manager who, in turn, recommends acceptance by the PWGSC Project Manager.

- .8 **Service Contracts** Although service contracts are not part of commissioning, the Designer and the PWGSC Commissioning Manager will assist the Property Manager in development by providing a complete description of all items included in the service contract.

- .9 **"As-built" Drawings and Specifications:** These will be produced by the Designer from the project record documents maintained on the site and kept up-to-date with all changes marked thereon by the Contractor. Accuracy will be verified by the Designer and the PWGSC Commissioning Manager before preparation and after submission by the Designer. They shall be completed in time to be used during pre-start-up inspections.

- .10 **Training Plan:** This will be produced by the Designer and approved by the PWGSC Commissioning Manager to meet project-specific requirements. It will include details provided by the Property Manager relating to numbers and prerequisite qualifications and skills of trainees, type of training (i.e. observation, hands-on, classroom), etc. Instructors will include the Designer, Contractor, specialist sub-contractors, equipment suppliers or manufacturers. Duration of training for each system, instruction aids, etc. will depend on complexity and PFM needs. It will also include provisions for long-term ongoing training needs (e.g. video taping), etc. Training will be under the direction of the Designer and monitored by the PWGSC Commissioning Manager.

- .11 **Inventory of spare parts, special tools, maintenance materials:** Inventory will be identified during the design stage by the Designer with input from the PWGSC Commissioning Manager and the Property Manager, based upon consideration of the complexity of the project and immediacy of availability; specified by the Designer; checked by the Contractor immediately upon delivery to ensure each is complete with instructions for use; inventoried, packaged and identified by the Contractor; and stored by the Contractor in facilities to be designated by the PWGSC Project Manager and the PWGSC Commissioning Manager.

8. Deliverables relating to the commissioning process

- .1 **Description of pre-commissioning activities** and production of related documentation: For every item, the extent of involvement of the members of the Commissioning Team will be determined (e.g. who reviews, performs, monitors, certifies). This schedule will be prepared by the Designer with input from the PWGSC Commissioning Manager and will include items such as:
 - .1 **In-plant performance operational verification tests.** In-plant tests and results (including reports) may be witnessed and reviewed by PWGSC Commissioning Manager, verified by the PWGSC Design Quality Review Team and certified by the Designer.
 - .2 **Pre-start-up tests:** These will include pressure, static, flushing, cleaning, "bumping", etc. conducted during construction and will be performed by the Contractor and witnessed and certified by the Designer. The completed documentation will be included in the Commissioning Report.
 - .3 **Pre-start-up inspections** conducted by the Designer prior to start-up and rectification of deficiencies, using approved installation check lists. The completed documentation will be included with the Commissioning Report.
 - .4 **Start-up:** This will be by the Contractor, equipment manufacturer, supplier and/or installing specialist sub-contractor under the direction of the Designer. It will also include rectification of all start-up deficiencies by the Contractor to the satisfaction of the Designer and PWGSC Commissioning Manager.
 - .5 **TAB and performance verification** will be performed by the approved Commissioning Agencies, repeated where necessary until results are acceptable to the Designer. Procedures may have to be modified to suit project requirements. Reported results will be witnessed and certified by the Designer using approved PI and PV forms. The completed Commissioning Reports will be approved by the Designer and provided to the PWGSC Commissioning Manager who reserves the right to verify up to [30]% of all reported results. Any failure of randomly selected item shall result in the rejection of the TAB report or the report of system startup and testing.
- .2 **Schedule of commissioning of integrated systems** and production of related documentation will be prepared conjointly by the Designer and the PWGSC Commissioning Manager. It will also identify integrated systems to be commissioned over and above those listed herein:
 - Fire alarm systems
 - Fire pumps and controllers

- Voice communications systems
- Emergency power generator
- Transfer switch and controllers
- Emergency lighting systems
- Life safety systems identified above
- Smoke control systems
- Environmental space condition and IAQ

Commissioning will be performed by the Contractor or specified Commissioning Agencies, using procedures developed by the Designer and approved by the PWGSC Commissioning Manager. They will be witnessed by, and results certified by, the Designer. Reported results will be witnessed and certified by the Designer using approved PV forms. Upon satisfactory completion, the Commissioning Agency performing the tests will prepare the required Commissioning Report which will be certified by the Designer and forwarded to the PWGSC Commissioning Manager who reserves the right to verify a percentage of all reported results at no cost to the contract.

- .3 Identification:** The PWGSC Commissioning Manager, in cooperation with the Property Manager, will establish an identification system for all systems and equipment which will reflect final MMS (Maintenance Management System) identification requirements. This will be reflected in the identification system used in the working documents by the Designer. During commissioning and before hand-over and acceptance, the Designer, Contractor, Property Manager and PWGSC Commissioning Manager will cooperate to complete inventory data sheets and provide assistance to PWGSC forces in the full implementation of the MMS identification system.
- .4 Commissioning specifications:** Commissioning specifications will be developed and submitted at the same time as the Design Development Report. Final versions will be prepared by the Designer during the working document stage and inserted into the project specifications. PWGSC generic commissioning specifications will be provided and will be edited by the Designer so as to become project- specific. They may have to be supplemented by project-specific commissioning specifications prepared by the Designer, reviewed by the PWGSC Project Manager and approved by the PWGSC Commissioning Manager. They will also include samples of PI and PV Report forms.
- .5 Installation Start-up Check Lists:** These are required to inform the PWGSC Commissioning Manager of those systems which are ready for commissioning. A generic list is provided by the PWGSC Commissioning Manager to the Designer, who will tailor them to meet the requirements of the project.. Where these are not available, they will be developed by the Designer and approved by the PWGSC Commissioning Manager.
- .6 Product Information (PI) report forms:** All product information relating to equipment and components supplied and installed on this project will be reported on approved PI report forms similar to the samples attached to the commissioning specifications. Some PI report forms already exist. Others will be prepared by the Designer, reviewed by the discipline specialists and approved by the PWGSC Commissioning Manager no later than [10] weeks after approval of shop drawings for the equipment concerned. Instructions for use will be included in the commissioning specifications. All completed PI report forms will be certified by the Designer. After review and verification by the PWGSC Commissioning Manager, these report forms will be included in the Building Management Manual.
- .7 Performance Verification (PV) report forms:** All results of tests and commissioning will be entered on approved PV report forms similar to the samples attached to the commissioning

specifications. Some PV report forms already exist. Others will be prepared by the Designer, reviewed by the discipline specialists and approved by the PWGSC Commissioning Manager no later than [10] weeks after approval of shop drawings for the equipment concerned. Instructions for use will be included in the commissioning specifications. All completed PV report forms will be certified by the Designer. After review and verification by the PWGSC Commissioning Manager, these report forms will be included in the relevant Commissioning Reports.

- .8 Commissioning Reports:** The completed PV report forms will be included in properly formatted Commissioning Reports. Before any reports are accepted, all reported results will be subject to verification by the PWGSC Commissioning Manager.
- .9 Activities during the Warranty Period:** While all commissioning activities must be completed before the issuance of the Interim Certificate, it is anticipated that certain commissioning activities will be necessary during the Warranty Period, including:
 - fine tuning of environmental control systems.
 - adjustment of ventilation rates to promote good indoor air quality and reduce the deleterious effects of VOCs generated by off-gassing from construction materials and furnishings, etc..
 - full-scale emergency evacuation exercises.
- .10 Tests to be performed by the Client:** Will be identified at a later stage in the project development.

9. Deliverables relating to the administration of commissioning

Operating effectiveness of seasonal-sensitive equipment and systems will be significantly affected by changes in temperature, wind speed, humidity and barometric pressure. These variations must be identified during design development.. As detailed design develops, the Commissioning Plan will be revised to include provisions for testing all parameters to the full range of operating conditions and to check responses of all such equipment and systems under all conditions. This is required because the operation of all systems are of paramount importance to health, safety, comfort and welfare of occupants and users.

The completion of the renovations to the existing laboratory facilities within the stipulated time frame is essential to the continuance of Client's operations with minimum interruption.

Since access into secure or sensitive areas will be very difficult after take-over, it is necessary to complete commissioning of occupancy-, weather- and seasonal-sensitive equipment and systems in these areas before the building is occupied. Include 6 months in the completion schedule for verification of performance in opposite seasons and weather conditions.

Detailed requirements relating to the timing of the various commissioning activities relative to the commissioning of other systems will be included in the commissioning specifications.

- .1 Commissioning Schedules:** Commissioning will be organized so that there will be no delays in the review and approvals process. The required milestones in the review, approval and commissioning process will be included in the commissioning specifications.
- .2 Commissioning activities scheduling:** A detailed critical path schedule will be prepared by the Commissioning Agent and submitted to the Designer, PWGSC Commissioning Manager and PWGSC Project Manager for review and approval at the same time as the Construction

and Completion Schedule. After approval, it will be incorporated into the Contractor's Construction and Completion Schedule. The Designer, Commissioning Agent, Contractor and PWGSC Commissioning Manager will monitor progress of commissioning against this schedule.

A separate detailed schedule in day-by-day format will be provided by the Commissioning Agent for commissioning of all systems and equipment. This schedule will include a detailed training schedule so as to demonstrate that there will be no conflicts with testing.

10. Payments for commissioning

This will be developed as detailed design progresses.

11. Commissioning process

- .1 General:** The Contractor shall perform the role of Commissioning Agent. This includes the responsibility for managing the commissioning process including monitoring, training, warranties, etc. The Project Commissioning Team and the Designer will be involved in the process, during their regular reviews, comment on the acceptability of the installations as they are installed, and in particular, witnessing tests of completed systems. The Commissioning Agent is not empowered to determine acceptability of installations. Contractor testing remains the responsibility of the individual sub-trades. However, tests will be witnessed by the Commissioning Agent and, maybe, the Designee. Acceptance of equipment and or systems lies solely with the parties normally granted this authority within the contract.

As defined in the specifications, there are a number of phases to commissioning - documentation, installation, testing and verification of the installed equipment and systems. Static, or pre-start, tests are defined for all equipment. These include duct and pipe pressure test and "megger" testing. Sign-off of the equipment by way of pre-start check sheets is outlined in the specifications. Once individual pieces of equipment or systems have been checked for conformance, start-up will be able to commence.

- .2 Systems to be tested as required by codes:** Where testing is required as part of a regulatory process and where commissioning procedures are fully developed and are appropriate to the project, the PWGSC Commissioning Manager shall ensure that all tests as required by such codes are performed. The PWGSC Commissioning Manager will witness these tests as part of the Quality Assurance role.

- .3 Systems to be commissioned:**

- .1 Architectural:**

- .1 Exterior walls:** Thermographic surveys will be conducted to ensure appropriate level of tightness after the exterior envelope has been completed, the permanent HVAC systems are able to provide appropriate negative or positive pressure, a temperature of at least 20°C can be maintained between inside and outside and the wind speed is less than 10 kph.

.2 Mechanical

- .1 HVAC System Testing:** It is envisaged that each piece of HVAC equipment will be initially started up, "bumped", in their "stand-alone" mode, i.e. without mechanical control and fire alarm interfaces being complete. During this period, pre-start checks will be completed and the relevant documentation completed. In the case of hydronic systems, after the pumps have been bumped and the pre-start checks completed, the cleaning process can commence. Items covered at this stage will be those which might have a detrimental effect on the operation of the particular item of equipment, such as noise and vibration, it is realized that the system balancing can have an effect on some parameters. Once individual pieces of equipment have been started up, the systems will be checked out in parallel with the control systems. System documentation will be completed by the Commissioning Agent before verification or training begins.
- .2 Plumbing Systems:** Will be started up and commissioned in a manner similar to that described for HVAC systems. The majority of the equipment will be started up in the stand-alone mode, automatic operation will be checked on a system-by-system basis in parallel with the control systems. System documentation will be completed by the Commissioning Agent and submitted for review before verification or training begins.
- .3 Controls:** Testing and commissioning is specified in the specifications, and the acceptance of the control system is well defined. It is envisaged that the contractor testing i.e. point-by-point testing will be performed in parallel with contractor start up. A complete point-by-point verification will be done as part of system verification and will be witnessed by the Designer and PWGSC Commissioning Controls Specialist. The PWGSC Commissioning Manager may elect to participate. Demonstration of the controls systems will be witnessed by both the EMCS Commissioning Agent and the Contractor's Commissioning Agent prior to the thirty day Final Acceptance test. The final Commissioning is considered to be performed during these two stages and the only additional testing required at the end of the "Final Operational Test" would be the off seasonal test. System documentation will be completed by the Commissioning Agent and submitted for review before verification or training begins.
- .4 Fume Hood and Bio-Safety Cabinets:** All fume hoods and bio-safety cabinets are to be performance tested as specified and in

accordance with T.B 5. 1 (Guideline for testing fume cabinets). Testing to be done by TAB Contractor as part of the overall balancing of the building and systems. Certification of all the cabinets is to be performed by a qualified, recognized, and independent testing authority after final balancing of the air systems. No integrated system testing should be performed until the cabinets have been certified.

.3 Electrical

- .1 Distribution:** Testing and commissioning of the main distribution system is defined within the specifications, requiring an independent testing company to perform a series of pre-energisation and post-energisation tests. Test reports are to be submitted for review before verification of system takes place. Contractor testing apart from this is restricted to "megger" testing of feeders.
- .2 Low Voltage Systems:** These systems, including Communication Systems, and low voltage lighting controls, will be checked out in accordance with the contract documents. Designer to witness system test.
- .3 Alternate Power Systems:** Emergency lighting level outlined in the specification will be initially checked by switching off normal power fights and checking coverage. Transfer switches will be tested by simulating a loss of power. Power availability will be checked at all required equipment requiring emergency power (e.g.. Lights).
- .4 Elevators and Fans etc.:** Designer to witness all systems test.

.4 Life Safety Systems:

- .1 Sprinkler / Standpipe:** Wet and Dry pipe station and sprinkler flow testing will be performed as part of the Fire Alarm System ULC 537 and 536 checks. Designer and Commissioning Agent to witness all tests.
- .5 Fire Alarm Systems:** Fire Alarm System cannot be fully verified until all aspects of the life safety and security are completed. Contractor testing will include a complete verification in accordance with ULC-CAN-SS37-M90. Once the commissioning Agent has submitted a certification report all devices and zones will be demonstrated as to ULC 536. Designer and PWGSC Commissioning Manager to witness all tests.

- .6 Designer's commissioning verification:** The Designer is to witness all system and integrated system tests.

- .7 Documentation:**
 - .1 Building Management Manual will be compiled as separate manuals in English and French. The Designer will review and accept manuals.
 - .2 Record drawings will be provided for the Designer to produce "As Built" drawings. These drawings will comprise a combination of marked up contracts print information and updated contractor working drawings.
 - .3 Spare parts and maintenance materials: A comprehensive list of all spare parts and maintenance material provided under the contract is to be provided. This will become more detailed as recommended parts/tools are identified by the various manufacturers.

- .8 Training:** A comprehensive training plan will be provided by the Commissioning Agent to the operations staff in the final stages of commissioning. Specific requirements are to be included in the specification.

- .9 Warranty/Service Contracts:** A comprehensive list of all warranties and service contracts will be provided by the Contractor. This list will include standard one year warranties and any non standard warranties.. Information on service contracts will provide a complete description of all items included in the contract.

- .10 Commissioning Schedule:** A critical path Commissioning Schedule to be provided by the Commissioning Agent within three (3) months after award of contract and incorporated in the main construction schedule. It will monitor progress of installation and the sequence of testing, commissioning, documentation, training. A separate detailed schedule in day by day format to be provided by the Commissioning Agent for commissioning of all equipment and systems. Training should be indicated on this schedule to ensure that that training does not conflict with testing.

12. Training Plan

- .1 General:** The following is the preliminary Training Plan and will be developed in greater detail as design progresses and as the working documents are developed. The commissioning schedule will indicate in detail how training will be implemented, the duration of each training session, the trainers, trainees, etc.

.2 Development of the Training Plan: The Training Plan shall be complete [within 3 months after award of Contract] [before construction contract is 50% complete].

.3 Responsibilities: The Designer will be responsible for training and will monitor all training activities including:

1. Preparation of agenda and outlines
2. Videotaping of all sessions

The Contractor will be responsible for implementation of training activities, quality of instruction and training materials and for coordination among the instructors.

.4 Instructors: Instructors and trainers will include the Designer, Contractor, factory-trained and certified equipment suppliers and manufacturers, factory-trained and certified maintenance specialist personnel and the service contractors holding service contracts for the following:

- EMCS including fume hood and BSC controls
- fire alarm systems and emergency systems
- security systems
- lighting control systems
- elevators

and any other service contracts that may be implemented during this project.

.5 Trainees: These will include the Property Manager, building operators, maintenance staff, security staff, technical specialists as necessary and facility occupants as necessary. The following is a list of O&M personnel, property management staff and others requiring requisite training, and the PWGSC Commissioning Manager will coordinate their attendance at agreed-upon times.

	Number
Facility Property Manager (already in place)	1
Operating staff: Building operators (already in place)	7-8
Maintenance staff: Plouffe Park shops	??
Building Maintenance (already in place)	7-8
Service contractors (e.g. cleaning)	??
Security staff: (already in place):	7-24

.6 Prerequisite skills and qualifications: To be identified.

.7 Scheduling of training: Training sessions relating to the design philosophy are to be given by the Designer and shall be presented within three months after award of contract. This will permit all involved in the construction and future operation of this facility to become familiar with all aspects of the design philosophy.

If the O&M personnel have not been identified or are not available at this time, these sessions will be repeated during the Contractor-led training sessions.

All training will be completed prior to issuance of the Interim Certificate.

.8 Details of training: Training will meet all identified qualification requirements of installed equipment and systems. Training will include:

1. all aspects of operation under all normal, emergency and "what-if" modes, over the full range of operating ranges.
2. detailed maintenance, troubleshooting, regular, preventive and emergency maintenance.
3. training will consist of the following elements, to be completed, with demonstration of completeness, before date of acceptance:

- .1 random on-site familiarization and observations during construction, installation, layout of equipment, systems and components, start-up and testing of the work, access to approved shop drawings, equipment operating and maintenance data. On- site observations will include still-photo records as deemed necessary by the O&M personnel – particularly of concealed elements.
- .2 hands-on instruction relating to start-up; shut-down; emergency procedures; features of controls; monitoring; servicing; maintenance; performance verification and commissioning; reasons for, results of and implications on associated systems of adjustment of set points of control, limit and safety devices; interaction among systems during integrated operation; and troubleshooting diagnostics. Other elements will include system operating sequences, step-by-step directions for operation of valves, dampers, switches, adjustment of control settings and other specialized training relating to installed systems. Duration will be as specified in the commissioning specifications.
- .3 formal classroom sessions relating to functional and operational requirements, system philosophy, limitations of each system, and operation and use of Building Management Manual. Duration of these sessions will be as specified in the commissioning specifications, using space to be identified.
- 4. training sessions on design philosophy, organized around the Building Management Manual and will include:
 - 1. overview of how each system is intended to operate
 - 2. description of design parameters and operating requirements
 - 3. description of operating strategies
 - 4. information to assist in troubleshooting system operating problems
- .9 Training materials:** Training materials will be in a form permitting future training procedures to be in the same degree of detail and will include at least the following:
 - .1 "As-built" contract documents
 - .2 Building Management Manual
 - .3 TAB and PV Reports
 - .4 transparencies for overhead projectors and 35 mm slides
 - .5 manufacturers' training videos (after prior screening for suitability)

.6 equipment models

The number of hours for these training sessions must be identified – by equipment, systems, etc.

- .10 Videotaping:** Hands-on and classroom sessions will be videotaped for future reference and retraining but will be held only after all systems have been fully commissioned. Production will be of professional quality and organized into several short modules to permit incorporation of changes. Videotaping shall be in VHS format.
- .11 Standard of training:** Training will be in sufficient detail and of sufficient duration to ensure:

 - .1. safe, reliable, cost-effective, energy-efficient operation of all systems in normal and emergency modes and under all conditions,
 - .2 effective ongoing inspection, measurements of system performance,
 - .3 proper preventive maintenance diagnosis, troubleshooting,
 - .4 ability to update documentation,
 - .5 ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.
- .12 Limitations:** Long-term ongoing training will not be included. However, the training courses and training materials will permit further ongoing training as well as training of new personnel.
- .13 Demonstrations:** Training will include demonstrations by the trained personnel to show their confidence in, and depth of understanding of, all installed systems and equipment and to demonstrate completeness of their training.
- .14 Manufacturers' video-based training:** Video will be used as training tool after Engineer's review of videos and written approval at least three months prior to static completion. To be included in Construction and Completion Schedule.

END OF SAMPLE COMMISSIONING PLAN

Sample Standard Operating Procedures Manual**2.11. VENTILATION SYSTEMS****DELETE NON-APPLICABLE SYSTEMS AS REQUIRED**

(INCLUDES ALL SYSTEMS THAT CONDITION AND DELIVER INDOOR AIR)

30-050-*****AIR HANDLING UNIT****30-030-***:****SPLIT A/C UNIT**

INVENTORY MENU		
MMS. NO.	TYPE/GENERAL INFORMATION / REFERENCE	PAGE

⚠ CAUTION ⚠

IMPORTANT → All control set points and limits outlined in **Table 1** are to be set, calibrated and maintained only by those persons authorized to do so according to the “**OPERATING ENGINEERS ACT**” (1979 or more recent) guidelines and/or service contracts.

VERY IMPORTANT → Should actual set points or limits differ from what is outlined in Table 1, or from what may be outlined throughout the text of this manual, ***it must be brought to the attention of the building operations supervisor immediately for corrective action by authorized personnel.***

SAFETY SHUTDOWNS → Should the system shut down due to tripping of a safety/protection device (e.g. High condenser pressure, motor overload, etc.) verify the cause of the activation of the interlock and, if necessary, request the services of the appropriate personnel to inspect and/or repair accordingly before restarting the system.

IMPORTANT → For your own safety, follow only **PWGSC** established in-house procedures when resetting or restarting the system or any of its components following a safety shutdown.

PROLONGED SHUTDOWNS → Whenever it is necessary to shut down the system for maintenance, repair, or for the season, do so by opening and locking out the main disconnect at the unit before performing any work on the system.

IMPORTANT → Ensure that all equipment lockout and safety practices (including **confined space entry** procedures where applicable) are observed.

SYSTEM	
VENTILATION	
TYPE:	<i>variable air volume</i>
MMS. NO.:	30-050-AHU001
LOCATION	
Room 400	
AREA SERVED	
Building West Wing	



PLENUM TYPE		MANUFACTURER		MODEL		SERIAL NO.				
Galvanized Steel		McQuay		LSL 150		97K054100				
SUPPLY AIR TEMPERATURE		SUPPLY AIR FAN CAPACITY			COMPRESSOR CAPACITY					
12-18		27,945 CFM			70 tons					
COILS (HEATING/COOLING)				FRESH AIR MAKE-UP VOLUME						
One (1) heating Coil One (1) cooling coil										
BURNER CAPACITY: →		N/A								
HUMIDIFICATION: →		Nortec Steam humidifier								
FILTERS: →		PREFILTER:		20-24x24x2mini pleat						
		FILTER:		12-24x24x4 mini pleat						
AUXILIARIES: →		NA								
DRIVE CONTROL: →		e.g. variable speed frequency controller								
CONTROL: →		<input type="checkbox"/>	PNEUMATIC		<input type="checkbox"/>	ELECTRIC		<input type="checkbox"/>	COMPUTER	
SOURCE OF POWER: →		e.g. starter/disconnect switch/stop/stop-start device/mcc								

EQUIPMENT/COMPONENTS	PAGE
FANS	
PUMPS	
HUMIDIFIERS	
GAS DETECTORS	
CONDENSERS	

OPERATION CRITERIA

SCHEDULE OF OPERATION

Units normally operate full time throughout the year, with scheduled downtime for maintenance, and as required for unscheduled repairs.

OPERATION/CONTROL - NORMAL OPERATING MODE

The following safety interlocks are an integral part of the units operation and control. Safety interlocks listed in **Tables 1 and 3** and, highlighted with an asterisk (*), will prevent the unit from functioning if their operating parameters are not satisfied. All safety interlocks listed in **Table 1** are to be maintained within the set point parameters outlined in the table.

TABLE 1. CONTROLS / SET POINTS / INTERLOCKS

	SETPPOINT	CUT-IN	CUT-OUT	RESET (MANUAL/AUTO)
* FREEZE LIMIT (FREEZE-STAT)	5 °C	4.5°C	5.5°C	MANUAL
*LOW OUTSIDE AIR TEMPERATURE LIMIT	-	-	-	-
**HEATING LOOP FLOW SWITCH	-	-	-	-
**OUTSIDE AIR TEMPERATURE	-	-	-	-
* BLOWER FAN INTERLOCK (STARTER)	N/A	-	-	MANUAL
* DAMPER END SWITCH (INTERLOCK)	-	-	-	-
* HEATING PUMP FLOW SWITCH	-	-	-	-
* HIGH/LOW PRESSURE GAS CUT-OUT SWITCH	-	-	-	-

IMPORTANT → ** If outside air temperature is below **°C/**°F, a heating loop failure (flow switch) will cause the unit to shut down)

TABLE 2: THE FOLLOWING NORMAL OPERATING CONDITIONS SHOULD BE OBSERVED

SPACE (ROOM) AIR TEMPERATURE	21.0° - 23.0°C
SPA RETURN AIR HUMIDITY	35% RH
SUPPLY AIR HUMIDITY	< 80% RH
RETURN AIR TEMPERATURE	21.0° - 23.0°C
MIXED AIR TEMPERATURE	10.0° - 17.0°C
SUPPLY AIR TEMPERATURE	12.0° - 18.0°C
SUPPLY STATIC PRESSURE	199 PASCAL

TABLE 3: FIRE SAFETY INTERLOCKS

FIRE ALARM	RESET (MANUAL/AUTO)
SPA * FIRE ALARM SYSTEM INTERLOCK	MANUAL
* SUPPLY AND RETURN AIR SMOKE DETECTORS	AUTO

CONTROL DESCRIPTION - NORMAL OPERATING MODE

AIR HANDLING UNIT 1 is a variable air volume system normally operated and controlled automatically by the Energy Management Control System (EMCS). This system runs based on the following time schedule:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Off	4:30am On	5:00am On	5:00am On	5:00am On	5:00am On	Off
	6:00pm Off	6:00pm Off	6:00pm Off	6:00pm Off	6:00pm Off	

The unit may also be started by an optimization sequence calculated by the EMCS based on outdoor air temperature and the reference room space temperature. In this mode of operation, the dampers remain in full recirculation position.

The discharge air temperature is maintained between 13° and 17°C based on the following reset schedule:

Outdoor Air Temperature	Discharge Air Temperature Setpoint
-20°C	18°C
13°C	12°C

When the outdoor air temperature is below 8°C, the discharge air temperature is maintained by modulating the electric heating coil. A minimum fresh air of 27% at minimum supply air flow and 11% at maximum airflow is calculated by using the outdoor air temperature and return air temperature. The mixing damper modulate to maintain a mixed air temperature setpoint resulting from the previous fresh air calculation.

When the outdoor air temperature is above 8°C but below 12 °C, the discharge air temperature is maintained by modulating the mixing dampers and enabling two (2) of the four (4) stages of cooling in sequence. A delay of six minutes is set between each cooling stage.

When the outdoor air temperature is above 12°C, the discharge air temperature is maintained by sequencing the four (4) stages of cooling. The mixing dampers are locked to an operator adjustable minimum position of 15%. The two last stages of cooling are not permitted to start until the outdoor air temperature is greater than 18°C.

A constant static pressure is maintained in the ducts to ensure an adequate quantity of air is available in all areas at all times. On startup, the supply fan variable speed drive modulates to maintain a static pressure setpoint of 0.8" W.C. in the duct. and the return fan drive tracks the supply fan volume (total of VAV primary flow readings) and is set to deliver at a flow rate of 1400 l/s less than the supply fan.

The return air humidity is maintained at 35%rh by modulating the humidifier in the supply duct. A supply air humidity high limit has been incorporated to override the humidifier control if the supply air humidity exceeds 80%. The humidifier is only permitted to start after a proof of supply fan operation and a ten (10) minute delay.

The return fan is interlocked with the supply fan. A freeze detector will alarm and shut down the fan units. Software acknowledgment of a failed unit is required before they may restart via the EMCS control.

OPERATIONAL PROCEDURES - START-UP

Following a system shutdown, the following procedures must be taken prior to starting the air handling system. In fact, these procedures must be observed and followed at all times to maintain normal building operations. These procedures are applicable when the system is started automatically.

PREPARATION

1. Ensure all air filters are properly installed and acceptably clean. Check for damage to filters (i.e. rips, tears or holes in filter media - replace as required).
2. Verify all cabinet access and clean-out doors are fully closed and secured.
3. Verify fan belt drives are properly tensioned and not obstructed by any debris.
4. Verify water supply valve to the humidifier is *fully open* and power supply is on.
5. Verify power to supply and return fan variable frequency drives are on. Depress reset buttons on each of the respective starters to ensure clearance of any control interlocks.

THE UNIT MAY NOW BE STARTED

1. Start the unit by placing the Hand-Automatic selector switch on the variable frequency drives for the supply and return fans in the "Auto" position.
2. When the system gets a start command from the EMCS, the unit will start.
3. Should the fan fail to start, verify that controls interlocks are satisfied as outlined in the "Operation Criteria" - Table 1 (on page M-5) for this system and that all procedures previously outlined have been taken.
4. After unit operation has stabilized, verify normal operating conditions for this system as outlined in Table 2 (on page M-5). Ensure all system components are operational and check for any unusual vibration or noise.



CONTROL DESCRIPTION - EMERGENCY OPERATING MODE

In the event of damage to the controller or the loss of power to the controller, following procedures should be used. Power must be available to fans, and cooling system (during cooling season).

Note: If the unit must be run in an emergency situation, it should not be left unsupervised for an extended amount of time.

OPERATIONAL PROCEDURES - START-UP

Following a system shutdown, the following procedures must be taken prior to starting the air handling system. These procedures are applicable when the system is started manually.

PREPARATION

The following equipment should be available before starting the following procedure:

- 1- Portable temperature probe. (electronic or mechanical thermometer)
- 2- Magnehelic pressure gauge or incline manometer. (minimum range or 0 to 1.5"W.C.)
- 3- Portable relative humidity probe.
- 4- Variable DC Voltage power source. (Loop Calibrator with a minimum range of 0 to 10 Vdc)
- 5- Variable frequency drive **Operator's Manual** for supply and return fan.

Note: Item 3 and 4 may be optional if humidifiers are not required to operate.

1. Ensure all air filters are properly installed and acceptably clean. Check for damage to filters (i.e. rips, tears or holes in filter media - replace as required).
2. Verify all cabinet access and clean-out doors are fully closed and secured.
3. Verify fan belt drives are properly tensioned and not obstructed by any debris.
4. Verify water supply valve to the humidifier is *fully open* and power supply is on.
5. Verify power to supply and return fan variable frequency drives are on. Depress reset buttons on each of the respective starters to ensure clearance of any control interlocks.
6. Remove power to all damper actuator needed to be operated manually.
7. Remove static pressure sensor tubing from duct and replace with portable pressure gauge (magnehelic or incline manometer) tubing.
8. Remove the supply air temperature sensor from the supply duct and insert the portable temperature probe.
9. Remove return air temperature sensor from the return duct.
10. Remove the humidifier control wire from the controllers terminals 35 (-) and 36 (+) and attach the lead of the variable DC Voltage power source to these wires ensuring proper polarity.
11. Read carefully the instructions for manually operating the fans variable frequency drive.

THE UNIT MAY NOW BE STARTED

1. Start the supply and return fan using the keypad on the variable frequency drives. Ramp the speed of the supply fan gradually while monitoring the supply duct static pressure until desire value outline in Table 2 (on page M-5) is reached. Ramp return fan speed equally with supply fan speed. When static pressure has stabilized, verify that building pressure is adequate (exterior doors operate normally). If doors tend to stay open, increase return fan speed. If doors tend to be difficult to open decrease return fan speed.
2. Should the fan fail to start, verify that controls interlocks are satisfied as outlined in the "Operation Criteria" - Table 3 (on page M-5) for this system.
3. Open fresh air and exhaust air damper between 15 and 20% and open mixed air damper between 85 and 80% using the crank provide with the actuator motors. This will allow minimal fresh air into the building. Monitor supply air temperature and adjust dampers to maintain temperature outlined in Table 2 (on page M-5).

Warning! Actuators may be damaged if power is not removed before manually positioning the actuator with the crank.

4. During the heating season, the heating coil will not be used to maintain supply air temperature. The heating coil circuit requires a 24 Vac modulated timed pulse to modulate the power to the heating coil. It would require constant attention from the operator just to maintain the supply air temperature.
5. During the cooling season, monitor the return air temperature using the thermometer and cycle the cooling stage on and off to maintain the return air temperature within the limits outlined in Table 2 (on page M-5). The cooling stages may be energized by placing a jumper across the normally open contacts of the omron relay located in the condenser unit control panel. Do not start the second compressor if the outdoor air temperature is below 18°C.
6. If humidification is required, set the output of the variable DC Voltage power source to 5 volts. Monitor the return and supply air humidity periodically using the portable relative humidity probe. Make voltage adjustments to maintain the readings at values listed Table 2 (on page M-5).
7. After unit operation has stabilized, continuously verify normal operating conditions for this system. Ensure all system components are operational and check for any unusual vibration or noise.
8. When the problem has been rectified, restore the unit to it's original state.



CONTROL DESCRIPTION - MANUAL *OPERATING MODE*

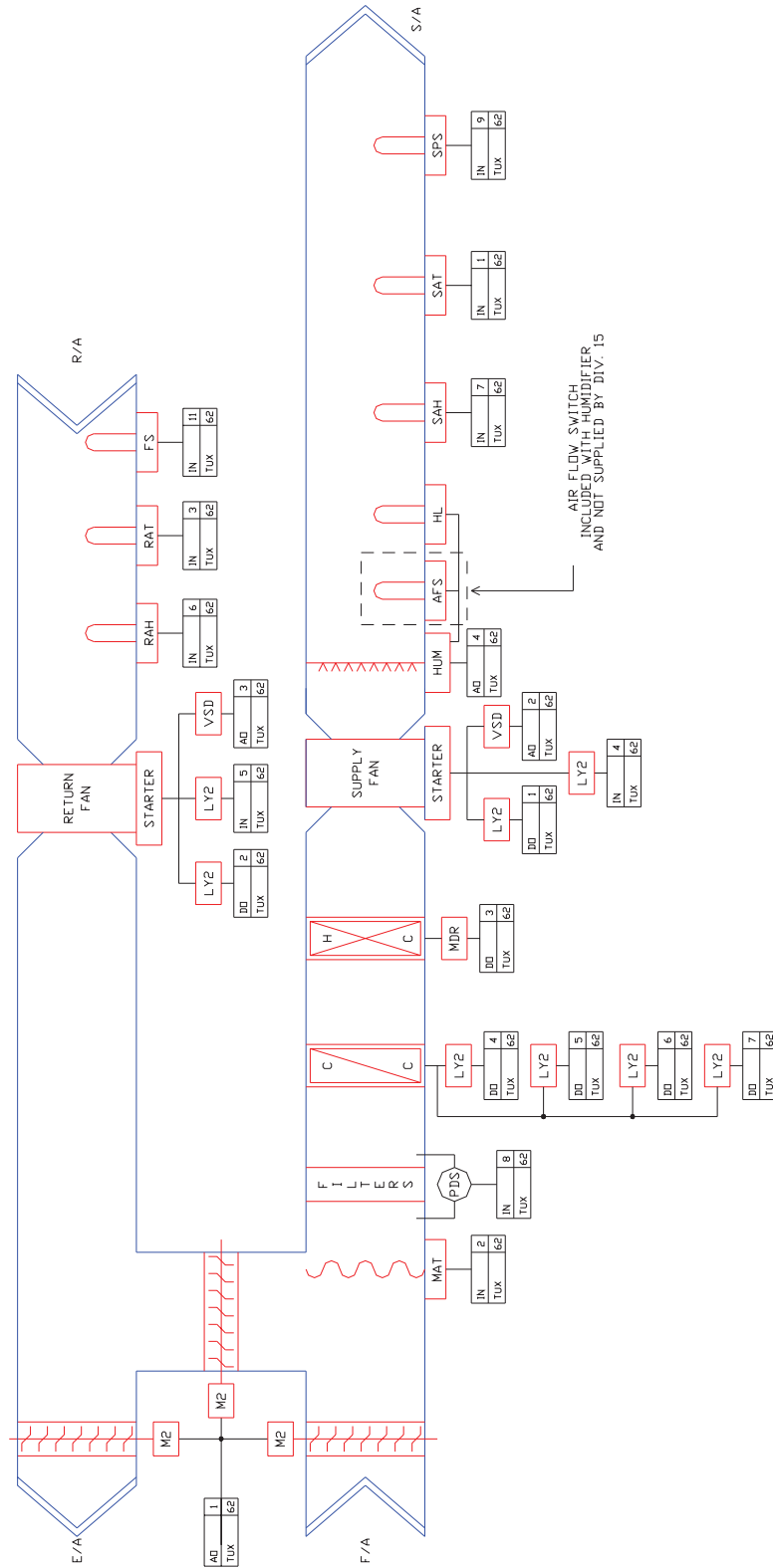
See Emergency Operating Mode.

OPERATIONAL PROCEDURES - START-UP

PREPARATION

THE UNIT MAY NOW BE STARTED

HVAC SYSTEMS CHECKLIST	FREQUENCY
<ul style="list-style-type: none"> CHECK AND RECORD TEMPERATURE OF SUPPLY AIR, RETURN AIR, MIXED AIR AND SPACE(S) SERVED AS APPLICABLE 	DAILY
<ul style="list-style-type: none"> VISUALLY CHECK CONDITION OF PRE-FILTER/MAIN FILTER AND REPLACE AS REQUIRED CHECK AND RECORD STATIC PRESSURE DIFFERENTIAL ACROSS FILTER VISUALLY CHECK DAMPER POSITIONS AND LINKAGES CHECK OPERATION OF FANS FOR VIBRATION AND PROPER BELT TENSION CHECK VARIMARK OR INLET VANES FOR PROPER OPERATION 	WEEKLY
<ul style="list-style-type: none"> IMPORTANT → VISUALLY CHECK HEATING, COOLING AND PREHEAT COIL AND ASSOCIATED PIPING AND VALVES FOR WATER LEAKS CHECK AND RECORD HEATING, COOLING AND PREHEAT COILS, SUPPLY AND RETURN TEMPERATURE AND PRESSURE IMPORTANT → CHECK FOR NORMAL OPERATION OF DEHUMIDIFICATION AND/OR STEAM HUMIDIFICATION SYSTEM CHECK FIRE DAMPER LINKAGE AND DAMPER POSITION ENSURE ALL COMPARTMENT DOORS ARE CLOSED AND LATCHED IMPORTANT → VERIFY ALL NATURAL GAS ISOLATION VALVES ARE FULLY OPENED TO GAS-FIRED HEAT EXCHANGERS (IF APPLICABLE) 	DAILY



End of Sample Standard Operating Procedures Manual

Sample of Training Plan

NOTE: *This is a sample (only) of the type of Training Plan which might be used with a project for upgrading, extending, and replacing existing laboratory facilities.*

1. General

The following is the Preliminary Training Plan and will be developed in greater detail as design progresses and as the Working Documents are developed.

The commissioning schedule prepared by the Contractor will indicate in detail how training will be implemented, the duration of each training session, the trainers, trainees, etc.

2. Development of Training Plan

The Training Plan shall be complete [within 3 months after award of Contract] [before construction contract is 50% complete].

3. Responsibilities

The Designer will be responsible for training and will monitor all training activities including:

1. Preparation of agenda and outlines
2. Videotaping of all sessions

The Contractor will be responsible for implementation of training activities, quality of instruction and training materials and for coordination among the instructors.

4. Instructors

Instructors and trainers will include the Designer, Contractor, factory-trained and certified equipment suppliers and manufacturers, factory-trained and certified maintenance specialist personnel and the service contractors holding service contracts for the following:

- EMCS
- fire alarm systems
- security systems
- lighting control systems
- elevators

and any service contracts that may be implemented during this project.

5. Trainees

These will include the Facility (Property) Manager, building operators, maintenance staff, security staff, technical specialists as necessary and facility occupants as necessary.

The following is a list of O&M personnel, property management staff and others requiring requisite training: the Commissioning Manager will coordinate their attendance at agreed-upon times (typical for Parliamentary Precinct projects):

	Number
Facility Property Manager (already in place)	1
Operating staff: Building operators (already in place)	7-8
Maintenance staff: Plouffe Park shops	??
Building Maintenance (already in place)	7-8
Service contractors (e.g. cleaning)	not known
Security staff (already in place)	

6. Prerequisite Skills and Qualifications of trainees

[to be specified _____].

7. Scheduling of training

Training sessions relating to the design philosophy:

1. These are to be given by the Designer and shall be presented within three months after award of contract. This will permit all involved in the construction and future operation of this facility to become familiar with all aspects of the design philosophy.
2. If the O&M personnel have not been identified or are not available at this time, these sessions will be repeated during the Contractor-led training sessions.

All training will be completed prior to issuance of the Interim Certificate.

8. Details of training

Training will meet all identified qualification requirements of installed equipment and systems.

Training will include:

1. All aspects of operation under all normal, emergency and "what-if" modes, over the full range of operating ranges.
2. Detailed maintenance, troubleshooting, regular, preventive and emergency maintenance. Training will consist of the following elements, to be completed, with demonstration of completeness, before date of acceptance:
 1. Random on-site familiarization and observations during construction, installation, layout of equipment, systems and components, start-up and testing of the work, access to approved shop drawings, equipment operating and maintenance data. On-site observations will include still-photo records as deemed necessary by the O&M personnel – particularly of concealed elements.
 2. Hands-on instruction relating to start-up; shut-down; emergency procedures; features of controls; monitoring; servicing; maintenance; performance verification and commissioning; reasons for, results of and implications on associated systems of adjustment of set points of control, limit and safety devices; interaction among systems during integrated operation; and troubleshooting diagnostics. Other elements will include system operating sequences, step-by-step directions for operation of valves, dampers, switches, adjustment of control settings and other specialized training relating to installed systems. Duration will be as specified in the commissioning specifications.
 3. Formal classroom sessions relating to functional and operational requirements, system philosophy, limitations of each system, and operation and use of Building Management Manual. Duration of these sessions will be as specified in the commissioning specifications, using space to be identified.
 4. Location of training to be determined.
 5. Training sessions on design philosophy will include:
 1. overview of how each system is intended to operate
 2. description of design parameters and operating requirements
 3. description of operating strategies
 4. information to assist in troubleshooting system operating problems

9. Training materials

Training materials will be in a form permitting future training procedures to be in the same degree of detail and will include at least the following:

1. "As-built" contract documents
2. Building Management Manual
3. TAB and PV Reports
4. Transparencies for overhead projectors and 35 mm slides
5. Manufacturers' training videos (after prior screening for suitability)
6. Equipment models

10. Videotaping

Hands-on and classroom sessions will be videotaped for future reference and retraining but will be held only after all systems have been fully commissioned. Production will be of professional quality and organized into several short modules to permit incorporation of changes.

(Note any requirements for training Owner, Investor or User.)

11. Standard of training

Training will be in sufficient detail and of sufficient duration to ensure:

1. Safe, reliable, cost-effective, energy-efficient operation of all systems in normal and emergency modes and under all conditions
2. Effective ongoing inspection, measurements of system performance
3. Proper preventive maintenance diagnosis, troubleshooting
4. Ability to update documentation
5. Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives

12. Limitations

Long-term ongoing training will not be included. However, the training courses and training materials will permit further ongoing training as well as training of new personnel.

13. Demonstrations

Training will include demonstrations by the trained personnel to show their confidence in, and depth of understanding of, all installed systems and equipment and to demonstrate completeness of their training.

14. Manufacturers' video-based training

Video will be used as training tool after Engineer's review of videos and written approval at least three months prior to static completion. To be included in Construction and Completion Schedule.

TABLE 1: SUMMARY OF TRAINING ACTIVITIES

PDS Phase	Training Activity
2 Definition	Training requirements are defined in the Commissioning Brief. To include: - extent, nature and location of training - standards to be achieved
3a Design	Designer identifies training that will be required and obtains from PWGSC a list of O&M personnel to be trained, prerequisites, qualifications, etc. Designer of specialized projects (e.g.. Some special laboratories) may recommend qualifications..
3b Working Documents	1. Training Plan approved.
3d Construction/ Installation	1. Confirm availability, presence of assigned O&M personnel for observation as system installations proceed. 2. Provide site familiarization sessions.
4 Commissioning	2. Provide site familiarization sessions.
5 Operation	1. Evaluate training provided to O&M personnel using, as basis, ability of O&M personnel to: a. adjust systems, in response to complaints, thus rectifying identified faults b. minimize energy consumption by intelligent adjustments and at the same time maximize system efficiency c. investigate and troubleshoot systems to determine source of, and reasons for, faults or failures; take corrective actions. 2. Observe and assess quality of training. 3. Recommend additional training as necessary.

Sample of Training Activities - Architectural

ARCHITECTURAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Systems and Goals	Instructors	Content (approximately 30% Theory, 70% practical)	Approx. duration	Instruction Materials and Tools
Elevators	Installing Contractor, Manufacturer	Operation and control features, Emergency power, emergency response Interconnection with FA systems (i.e. Fire fighters' features)		
Escalators	Installing Contractor, Equipment Manufacturer			
Waste Management (e.g. garbage collectors, chutes, compactors, shredders, destructors)	Installing Contractor, Authority having jurisdiction	Operation and control features, emergency power, emergency response		Licensing by authority having jurisdiction
Incinerators [with heat recovery]	Installing Contractor, Authority having jurisdiction			
Building Envelope Air/water penetration rate serving building in event of failure of mains analyses Water shedding systems Thermal performance Light transmittance	Installing Contractor, Special Testing Agency			

Sample of Training Activities - Mechanical

MECHANICAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Systems and Goals	Instructor	Content (approximately 30% Theory, 70% practical)	Approx duration	Instruction Materials and Tools
Design Philosophy 1. General overview of design concepts 2. Awareness of interaction of mechanical systems	Engineer	1. Explanation of mechanical and related electrical systems, their interaction 2. Site visit in early stages of project 3. Classroom sessions during commissioning stage	½ day ½ day	1. Schematics of layouts & controls 2. Installed systems, equipment 3. Design Criteria, Design Intents
HVAC Systems Central ducted supply and return systems Exh. systems: kitchen, LFH, BSC, washrms. Smoke control systems: zone isolation, connections to FA systems Stand-alone HVAC systems 1 To learn details of all systems installed 2. To develop in-depth knowledge of the operation of each system	Installing Contractor, Equipment Manufacturer, EMCS trade	1. Explanation of operational concepts of systems and components including air handling units, fans, filters, coils, VAV boxes, humidification systems, use of economizer cycles and controls 2. Equipment operation and adjustment 3. Review of O&M Manuals 4. Equipment troubleshooting 5. Observation during construction 6. Site visits, classroom sessions	3 days	1. "As-built" HVAC drawings 2. TAB & PV Reports 3. Systems Operations Manual 4. Maintenance Manual 5. Installed systems, equipment 6. Controls Schematics and Reports 7. Demonstrations
Steam or Hydronic Heating Systems 1. Training in equipment start-up, operation, shut-down, prevention of, and re-start after emergency shutdown, operation at optimum efficiencies 2. To prevent breakdowns, limit service calls	Contractor, Equipment Manufacturer	1. Start-up, testing and operation of systems, steam generators for humidifiers, circulating pumps, controls (operating, limit, safety). Annual maintenance, restart after emergency shut-down. 2. Review of O&M Manuals 2. Equipment troubleshooting 3. Site visit, then classroom period for Q&A	2 days	1. Installed equipment 2. Demonstrations 3. "As-built" piping drawings 4. Systems Operations Manual 5. Equipment O&M Manual 6. TAB and PV Reports 7. Controls Schematics, Reports

MECHANICAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Systems and Goals	Instructor	Content (approximately 30% Theory, 70% practical)	Approx duration	Instruction Materials and Tools
BAS, EMCS Control systems for mechanical systems Compressed air systems for EMCS. Building control components. System programming. Project-specific controls: (e.g. humidification of special areas, dehumidification of swimming pools, diversified controls: "smart panels" for central and local HVAC systems Debugging software	System Installing Contractor, EMCS sub-trade.	1. Explanation of operational concepts of systems and components 2. Use of various cycles and controls 2. Equipment operation and adjustment 3. Review of O&M Manuals 4. Equipment and system troubleshooting 5. Observation during construction 6. Site visits, classroom sessions	5 days	1. "As-built" HVAC and control drawings 2. Systems Operations Manual 3. Maintenance Manual 5. Installed systems, equipment 6. Controls Schematics and Reports 7. Demonstrations
Water Analysis and Treatment 1. Training in O&M of water treatment equipment 2. To learn how to maintain specified water quality	Installing Contractor, Water Treatment Manufacturer	1. Description of equipment, systems, chemicals, justification for specified standards, sampling collection and testing techniques, analysis of raw water, treated water 2. Review of O&M Manuals. 3. Equipment troubleshooting 4. Observation during construction 5. Classroom sessions	½ day	1. Demonstrations 2. Laboratory facilities 3. Chemical and bacteriological analyses 4. Water treatment O&M Manuals
Refrigeration Systems Kitchen, server, laboratory 1. Training in equipment start-up, operation, shut-down, prevention of, and restart after emergency shut-down 2. To learn to operate equipment safely and at optimum efficiencies 3. To prevent breakdowns, limit service calls	Installing Contractor	1. Start-up, testing of O&M of required conditions, controls (operating, limit, safety). Annual maintenance, re-start after emergency shut-down 2. Review of O&M Manuals 5. Equipment troubleshooting 6. Observation during installation 7. Classroom sessions	2 days	1. Demonstrations 2. "As-built" piping drawings 3. Systems Operations Manual 4. Equipment O&M Manual 5. Controls Schematics & Reports 6. Commissioning Reports

MECHANICAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Systems and Goals	Instructor	Content (approximately 30% Theory, 70% practical)	Approx duration	Instruction Materials and Tools
Fire Protection and Suppression Systems Sprinkler systems, standpipe and hose systems Fire pumps, controller, transfer switch. Total flooding systems Local application systems 1. Training in start-up, shut-down, emergency requirements 2. Training in interconnection with HVAC, smoke control systems, Fire Dept. 3. To learn use of voice communications systems, emergency evacuation protocols	Contractor, local Fire Dept.	1. Periodic testing 2. Annual maintenance 3. Review of O&M Manuals 4. Equipment, system troubleshooting 5. Observation during installation 6. Classroom sessions	½ day	1. Demonstrations 2. "As-built" piping drawings 3. Systems Operations Manual 4. Equipment O&M Manual 5. Controls Schematics & Reports 6. Commissioning Reports
Dom. H&CWS Systems 1. Training in O&M 2. Training in Legionella control	Contractor, Equipment Manufacturer	1. Annual maintenance 2. Review of O&M Manuals 3. Equipment, system troubleshooting 4. Observation during installation 5. Classroom sessions	½ day	1. Demonstrations 2. "As-built" piping drawings 3. Systems Operations Manual 4. Equipment Mtce. Manual 5. TAB / PV Reports 6. Controls Schematics, Reports

MECHANICAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Systems and Goals	Instructor	Content (approximately 30% Theory, 70% practical)	Approx duration	Instruction Materials and Tools
Storm Water Management Systems Roof drains, catch basins, flow controls, site storage ponds 1. Training in storm water management	Contractor, Equipment Manufacturer	1. Annual maintenance 2. Review of O&M Manuals 3. Equipment, system troubleshooting 4. Observation during installation 5. Classroom sessions	½ day	1. Demonstrations 2. "As-built" piping drawings 3. Systems Operations Manual 4. Equipment Mtce. Manual 5. Commissioning Reports 6. Controls Schematics, Reports
Laboratory/Medical Services 1. Training in O&M of each system 2. Training in identification of different services, verification of additional connections, outlets, etc. 3. Training in lab. waste treatment systems	Installing Contractor, Equipment Manufacturer, Servicing Contractor	1. O&M 2. Review of O&M Manuals 3. Equipment, system troubleshooting 4. Observation during installation 5. Classroom sessions	2 days (1 day if only few services)	1. Demonstrations 2. Systems Operations Manual 4. Equipment Maintenance Manual 5. Commissioning Reports 6. Controls Schematics, Reports

Sample of Training Activities - Electrical

ELECTRICAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Goal	Instructor	Content (approximately 30% Theory, 70% practical)	Approx duration	Instruction Materials and Tools
General Overview 1. Overall review of design concepts 2. Awareness of interaction of electrical systems	Engineer	1. Explanation of electrical systems 2. Their interaction with other systems 3. Site visit in early stages of project 4. Classroom sessions during commissioning stage	½ day	1. Schematics of power, 120 volt, low voltage layouts, controls 2. Installed systems, equipment 3. Design Criteria, Design Intents
Incoming Service and High Voltage Distribution 1. To learn details of all systems installed throughout complex and to develop in-depth knowledge of its operation	Engineer, Contractor, Equipment Manufacturer	1. Explanation of operational concepts including transformers, HV switching equipment, controls 2. Equipment operation and adjustment 3. Review of O&M Manuals 4. Equipment troubleshooting 5. Observation during construction 6. Site visits, classroom sessions	1 day	1. "As-built" distribution drawings, schematics, test reports 2. Systems Operations Manual 3. Maintenance Manual 4. Installed systems & equipment 5. Controls Schematics 6. Demonstrations
Low Voltage Systems (including low voltage lighting controls, clocks, fire alarm) 1. Training in equipment start-up, operation, shut-down, transfer to emergency power, re-transfer to normal power, operation at optimum efficiencies 2. To understand system designed to prevent failure, limit service calls	Contractor, Equipment Manufacturer	1. Start-up, testing and operation of all systems and controls (operating, limit, safety) 2. Annual maintenance, restart after emergency failure 3. Review of O&M Manuals. Equipment troubleshooting 4. Observation during construction 5. Site visits, classroom sessions	1 day	1. Installed equipment 2. Demonstrations 3. "As-built" drawings 4. Systems Operations Manual 5. Equip't Maintenance Manuals 6. Controls Schematics, Reports
Telephones, Communications, Signaling Systems 1. To learn telephone link-up with utility				

ELECTRICAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Goal	Instructor	Content (approximately 30% Theory, 70% practical)	Approx duration	Instruction Materials and Tools
Security Systems: CCTV, card control, door position switches 1.				
PA Systems, Intercom. Entertainment, background music, white noise 1.				
Special Systems: (e.g. pocket paging, central dictation, nurse call, division bells, simultaneous translation) 1..				
Lighting Systems: Normal interior, exterior, economy measures 1.				
Emergency Lighting Systems: Exit lighting, battery-powered emergency systems 1.				
Emergency Power Systems 1. Training in O&M of fuel system, diesel engine, generator 2. To be able to maintain specified quality of service	Engineer, Contractor, Equipment Manufacturer, Supplier	1. Description of emergency generating equipment, fuel storage and supply system, special ventilation systems, switch gear, distribution systems 2. Review of O&M Manuals 3. Equipment troubleshooting 4. Observation during construction 5. Site visits, classroom sessions	½ day	1. Demonstrations 2. Systems Operations Manual 3. Maintenance Manual 3. Commissioning Reports
Uninterruptible power systems 1.				
Isolated Power Systems (as for hospital operating rooms) 1.				

ELECTRICAL (THIS IS BROAD OUTLINE ONLY) This Training Plan forms Part of Section 01815				
Goal	Instructor	Content (approximately 30% Theory, 70% practical)	Approx duration	Instruction Materials and Tools
Special/Dedicated Electrical Services to Special Areas 1. Training in equipment start-up, operation, shut-down, prevention of, and restart after emergency failures 2. To be able to operate equipment safely, efficiently, with very high operation level without failure, limit service calls	Engineer, Contractor, Equipment Manufacturer	1. Start-up, testing, operation of equipment, controls (operating, limit, safety) 2. Annual maintenance, restart after emergency failure 3. Review of O&M Manuals 4. Equipment troubleshooting 5. Observation during construction 6. Site visits, classroom sessions	1 day	1. Demonstrations 2. "As-built" drawings 3. Systems Operations Manual 4. Equipment O&M Manual 4. Controls Schematics, Reports 5. Commissioning Reports

END OF SAMPLE TRAINING PLAN

Sample of Installation / Start-up Check List

(Installation / Check Lists are at present being reviewed and revised)

Project: PNE#	Project no/No de projet: P#	Page 105
Project:	Date	
No. on Contract Drawings/French:	MMS Identifier/French	
FILTERS - PRE / FILTRES - PRE		
INSTALLATION CHECKLISTS/LISTES DE VERIFICATION DE L'INSTALLATION		
General: <input type="checkbox"/> "General" sheets, portions as appropriate plus the following:	Général: <input type="checkbox"/> Pages "Général", parties appropriées, plus ce qui suit:	
Construction: <input type="checkbox"/> Media - correct type	Construction: <input type="checkbox"/> Matériel filtrant - de type approprié	
Installation: <input type="checkbox"/> Media in place, clean condition <input type="checkbox"/> Zero leakage around media <input type="checkbox"/> Blank-off plates <input type="checkbox"/> Even velocity profile across filter bank	Installation: <input type="checkbox"/> Matériel filtrant en place, propre <input type="checkbox"/> Aucune fuite autour de matériel filtrant <input type="checkbox"/> Plaques d'obturation <input type="checkbox"/> Profile dvélocité traversant le groupe-filtre	
Casing: <input type="checkbox"/> Accessibility for inspection, replacement <input type="checkbox"/> Access doors or panels (opening out) <input type="checkbox"/> Illumination of interior	Boîtiers: <input type="checkbox"/> Portes ou panneaux d'accès (ouvrant vers l'extérieur) <input type="checkbox"/> Éclairage de l'intérieur	
Appurtenances: <input type="checkbox"/> Filter Gauge - red pointer at point of replacement <input type="checkbox"/> Spare filters for installation prior to acceptance <input type="checkbox"/> Temporary filters for Start-up. Media in place	Dépendances: <input type="checkbox"/> Jauge à filtres <input type="checkbox"/> Filtres de rechange pour installation avant l'acceptation <input type="checkbox"/> Filtres temporaires pour la mise en marche. Matériel filtrant en place	

END OF SAMPLE INSTALLATION / START-UP CHECK LIST

Sample of MMS input into working documents

VARIABLE VOLUME DUAL DUCT BOXES									
Box Identifier	MMS identifier	Size	Air flow rate		Reheat (watts)	No of rows	Heating coil		Notes
			Max	Min			(US GPM)	Elec (kW)	
VVDD-02-0	30-466-01	5	94	100%					
VVDD-04-0	30-466-02	5	90	100%					
VVDD-05-0	20-466-03	5	70	100%					
VVDD-13-0	30-466-04	6	125	100%					
VVDD-01-1	30-466-05	5	85	100%					
VVDD-02-1	30-466-06	5	105	100%					
VVDD-04-1	30-466-07	6	140	100%					
VVDD-05-1	30-466-08	5	104	100%					
VVDD-06-1	30-466-09	5	104	100%					
VVDD-11-1	30-466-10	8	219	40%					
etc.									

STEAM HUMIDIFIERS						
Unit Identifier	MMS Identifier	Air flow rate			Steam	
		Flow (L/s)	Temp (°C)	% RH	Flow (kg/h)	Press (kPa)
HUM-1	30-350-01	1,269	12.8	46 to 58	65	90
HUM-2	30-350-02	2,360	12.8	49 to 55	11	90
HUM-3	30-350-03	2,546	12.8	56 to 63	13	90
HUM-4	30-359-04	8,541	12.8	39 to 56	65	90

END OF SAMPLE MMS INPUT INTO WORKING DOCUMENTS

Sample of Product Information (PI) report form

(This form is at present being reviewed and re-formatted)

Project:		Project number:		Date:	
Projet:		Numero de projet:		Page:	

PRODUCT INFORMATION (PI) INFORMATION SUR LE PRODUIT

Performance Verification (PV) report form accompanies this PI report form: YES

FILTERS / FILTRES - [FINAL / FINALS] [PRE / PRE]	
No. on Contract Drgs/Numero sur le dessin	MMS Identifier/Identification du SSEP:
Description of system/french:	
No. on Contract Drgs/Numero sur le dessin:	MMS Identifier/Identification du SSEP:

PURCHASING INFORMATION/French			
Vendor/Agent Vendeur/Agent::		Address: Adresse:	
Purchase order no/No. d'ordre d'achat:		Date:	
Ordered by/ Commande par:			
Date of manufacture/Date du manufacture:		Date of start-up/Date du mise en marche:	
Details of Warranty: Details de garantie:		Commencement Debut:	Expiration: n:

PRODUCT INFORMATION / INFORMATION SUR LE PRODUIT			
Man'fr/Manufacturie			
Model/Modele:		Size/Dimension:	Type:
Serial no/No. de serie:			Rated capacity/french

Efficiency: [Dust spot] [DOP] Efficacité [Trace de poussière] []	Number & sizes Numéro & Dim		Face Area Façade Air	
Other data Autre données:				

Technician Technicien	Supervisor Superviseur	Date:
Witnessed by Temoin:	Title: Titre:	Date:

Sample of Performance Verification (PV) Report Form

(This form is at present being reviewed and re-formatted)

Project:		Project number:		Date:	
Projet:		Numero de projet:		Page:	

PERFORMANCE VERIFICATION (PV) REPORT / RAPPORT DE VERIFICATION DE RENDEMENT

FILTERS - FINAL / FILTRES - FINALS	
No. on Contract Drgs/No. sur le dessin:	MMS Identifier/Identification du SSEP:
Description of system/french:	
No. on Contract Drgs/No. sur le dessin:	MMS Identifier/Identification du SSEP:

FILTERS - FINAL FILTRES - FINALS	Designed Conception	Shop Drawings Dessins d'atelier	Measured Mesuré	Comments Commentaires
TEMPORARY FILTERS: FILTRES TEMPORAIRES: Flow rate:/débit:				
Face velocity:/Vélocité d'entrée				
PRESSURE DROP:/BAISSE DE PRESSION 1. Clean:/Propre 2. Dirty/Sale				
ACTUAL FILTERS: FILTRES ACTUELS: Flow rate:/Débit				
Face velocity:/Vélocité d'entrée				

PRESSURE DROP:/BAISSE DE PRESSION				
1. Clean/Propre				
2. Dirty/Sale				

FILTERS - PRE	Designed	Measured/	Comments/Commentaire
FILTRES - PRE	Conception	Mesuré	
Flow rate/Débit			
Face velocity/Vélocité d'entrée			
Pressure Drop/Baisse de pression			
1. Clean/Propre			
2. Dirty/Sale			

Technician	Supervisor	Date:
Technicien	Superviseur	
Witnessed by	Title:	Date:
Temoin:	Titre:	

END OF SAMPLE PI AND PV REPORT FORMS

Samples of requirements for schematics

Schematics used in manuals, commissioning reports

PWGSC A&ES CADD Policy is set out in the A&ES Policy and Procedures Manual, Sections 4110 through 4114. This policy requires: (1) that drawings, schematics, diagrams, etc. are provided in an electronic format compatible with the CADD systems in current use by PWGSC A&ES; (2) conformity to guideline documents (available in both official languages) from the Documentation Centre at the Tupper Building, Riverside Drive, Ottawa, Ontario K1A 0M2.

Graphics: will conform to all Federal standards

Required information: Development of schematics, diagrams and graphics shall be based on review of all equipment as actually supplied and installed.

Basic principles for preparation: Schematics, diagrams, charts, etc. illustrate and describe O&M requirements. They are prepared by the Designer, who: (1) identifies all equipment, components, etc.: (2) identifies measurement locations, (3) instruments used: (4) data to be presented; (5) shows design values and measured values: (6) describes how the systems will be tested, used and the methodology employed.

Graphics will be prepared by skilled draftspersons.

Requirements: will include: (1) Sheet size - either 216 x 279 mm or 279 x 432 mm.: (2) Schematics will be in pre-approved format using 36.24 kg white paper stock with maximum of two folds arranged so that title blocks are always visible, with match lines and reference notes is schematics extend to more than a single sheet; (3) Title blocks similar to the Contract Drawings on right-hand side and permanently visible and include legend : (4) Each system, sub-system to be on a separate sheet: (5) Schematics, diagrams will be easily identified, in workable segments, readily followed and, if necessary, prefaced by an index: (6) They will include complete layout of each system as actually installed, identity and locations of all provisions for TAB, flow measuring and regulating devices, all interfacing with, and points of interconnections into, existing systems, valves, dampers, PRV, air terminal units, heat transfer equipment, duct and pipe sizes, room numbers, floor numbers, system numbers, equipment identifiers, cross-reference to Contract documents, PI and PV Report forms, TAB data, calculation sheets.

EMCS graphics:

Many projects now use EMCS in which graphics play a large role. It may be possible, after approval, to incorporate these graphics into the Systems Operations Manual.

END OF SAMPLE REQUIREMENTS FOR SCHEMATICS

SAMPLE COMMISSIONING SCHEDULE

No	Task	Duration	Start	Finish	Dates
	Elevator #1				This area of the table would be used to indicate, in graphic form, dates of start and completion of the activities listed. These would include:: 1. Progress of construction / installation (extracted from the Contractor's Construction / Completion Schedule 2. Milestones 3. Factory tests 4. Testing, performance verification and commissioning
44	Mechanical installation				
45	Electrical installation				
46	Controls				
47	Commissioning & testing				
	HVAC System #1				
88	HVAC unit installation				
89	Piping installation to HVAC unit				
90	Electrical installation				
91	HVAC unit Controls				
92	Point-to-point & other tests				
93	Start-up of HVAC unit				
94	Commissioning & Testing				
95	Ductwork installation				
96	Pressure testing of duct systems				
97	Grilles, registers, diffusers installation				
98	Environmental controls installation				
99	Point-to-point verification				
100	TAB				
101	Pressure testing between laboratories				
102	Environmental testing				
	Heating boiler plant:				
132	Factory pres & performance tests				
133	Boiler installation				
134	Electrical installation				
135	Boiler Controls tests				

No	Task	Duration	Start	Finish	Dates
136	Chimney stack installation				
137	Natural gas installation to boilers				
138	Natural gas system testing				
139	Boiler start-up				
140	Boiler feed water piping installation				
141	Boiler feed pump installation				
142	Boiler feed pump start-up				
143	Boiler FW piping pressure testing				
144	Chemical treatment - installation				
143	Boiler room piping installation				
144	Boiler room piping - pressure testing				
145	Flushing and cleaning				
146	Boiler room integrated equipment and system - Start-up and commissioning				
A similar schedule would be developed for chilled water and condenser water systems					
151	Distribution Piping installation				
152	Distribution piping pressure testing				
153	Flushing and cleaning				
154	Permission granted for Contractor to use distribution system for temporary heat				
	Boiler room H&V system				
173	H&V unit installation				
174	Piping installation				
175	Electrical installation				
176	Controls				
177	Testing and PV				
178	Boiler room air pressure tests				

No	Task	Duration	Start	Finish	Dates
	Plumbing systems				
211	Acid resisting waste piping install'n below grade				
212	Pressure testing of below grade acid waste piping				
213	Acid waste treatment systems				
214	Acid waste treatment system testing, commissioning				
215	Acid resisting waste piping installation above ground				
215	Pressure testing of entire system				
217	Regular waste and storm water piping installation below ground				
218	Pressure testing of below grade regular waste and storm water piping systems				
219	Regular waste and storm water piping installation system above grade				
220	Pressure testing of entire regular waste and storm water systems				
	HWS systems				
223	HWS Heater and circulating pumps - installation				
231	HWS heater and pumping installation testing and commissioning				
232	Water conditioning system installation				
233	Water conditioning system commissioning				
	Hot and cold water systems				
246	H&CWS piping systems installations				
247	H&CWS piping systems pressure testing				
248	TAB of HWC systems				

No	Task	Duration	Start	Finish	Dates
249	Plumbing fixtures installation				
250	PV & adjustment of plumbing fixtures				
	Laboratory gas piping systems				
270	Piping installations				
271	Bulk oxygen station installation				
272	Testing and commissioning				
273	Medical compressed air station installation				
274	Testing and commissioning				
275	Vacuum station installation				
276	Testing and commissioning				
277	Gas Cylinder station installation				
278	Testing and commissioning				
279	Pressure testing of each system				
280	Lab outlets installation				
281	Testing of piping systems and outlets				
	Electrical				
290	Transformer vault installation				
291	Energization and testing				
292	Metered for use by Contractor				
301	Conduit installation				
302	Electrical wiring installation				
303	Megger testing				
	Low voltage systems				
311	Conduit systems installation				
312	Wiring installations				

No	Task	Duration	Start	Finish	Dates
313	Testing and commissioning				
	Communications system				
333	Conduit installation				
334	Wiring installations				
335	Speakers installation				
336	Controls console installation				
337	Testing and commissioning				
340	Lightning protection installation				
341	testing				
	Emergency power installation				
351	Generator #1 installation				
352	Transfer switch installation				
353	Transfer switch testing				
354	Generator fuel installation				
355	Generator exhaust installation				
356	Ventilation system installation				
357	Ventilation system testing & Cx				
358	Integrated system testing & Cx				
	Lab Fume Hoods & BSC's				
411	LFH and BSC installation				
412	Exhaust ducting installation				
413	Controls				
414	Electrical installation				
415	Lab services installation				
416	Exhaust fan and ducting installation				

No	Task	Duration	Start	Finish	Dates
317	LFH & BSC testing and Cx				
418	Integrated testing with HVAC systems				

END OF SAMPLE COMMISSIONING SCHEDULE

Sample specification for Performance Verification of equipment
NMS Section 13920 - Fire Pump

1. General
 - .1 In accordance with ANSI/NFPA 20, supplemented as specified herein.
 - .2 In accordance with Section 01810 - Commissioning: General Requirements, supplemented as specified herein.
- .2 Field test each fire pump, driver and controllers in accordance with ANSI/NFPA 20.
- .3 Testing to be witnessed by [Fire Commissioner of Canada] [Canadian Forces Fire Marshal] [authority having jurisdiction.]
- .4 Develop, with [Engineer] [Consultant] [Owner] assistance, detailed instructions for O&M of this installation.
- .5 Disposal of water
 - .1 Discuss appropriate measures for provision and disposal of water used in testing with Engineer.
- .6 Co-ordination
 - .1 Co-ordinate tests with performance verification of sprinkler systems specified section [] - [], [wet] [dry] pipe sprinkler systems specified Section [] - [] and standpipe and hose systems specified Section [] - [].
- .7 Testing to be witnessed by Fire Commissioner of Canada and authority having jurisdiction.
- .8 Allow operating conditions to stabilize at test conditions before taking measurements.
 - .1 Tests for at least 10 minutes under each of minimum, rated, peak load conditions to verify:

- .1 No overheating of any component.
 - .2 No excessive vibration of unit.
 - .3 No vibration transmitted to structure.
- .2 During each test, measure inlet and outlet pump pressures, rates of flow, electrical power draw, pump speed and plot these points on pump characteristic curves.
- .3 Test controllers and transfer switches using manufacturer's recommended procedures. Perform at least ten (10) automatic and ten (10) manual operations during this test.
- .9 Timing:
 - .1 Perform tests when there is no risk of freezing conditions.
- .10 Identification:
 - .1 Verify that all devices are properly labelled, identifying area served, etc.
- .11 Reports:
 - .1 In accordance with requirements of Section 01818 Commissioning Reports supplemented as specified herein.
 - .2 In addition to reports required by NFPA 20, include at least following:
 - .1 Purchasing information and product information for all equipment. Refer to Section 01817 Commissioning: Report Forms and Schematics.
 - .2 Manufacturer's characteristic curves (family of curves) for fire pump.
 - .3 Drawings or schematics showing locations and types of controls and components.
- .12 Training:
 - .1 Refer to Section 01815 Commissioning: Training of O&M Personnel.

END OF SAMPLE SPECIFICATION FOR PERFORMANCE VERIFICATION OF
EQUIPMENT

Sample of specification for integrated systems test for laboratory

1 General

- 1 In accordance with Section 01810 - Commissioning: General Requirements, supplemented as specified herein.

2 Purpose

- 1 To determine:
 - .1 Operation of all systems working in unison.
 - .2 Response to normal, emergency and "what if" conditions which may occur during laboratory operations.
 - .3 the ability of the EMCS to perform as designed under change-over conditions from normal power to emergency power.
 - .4 that performance of integrated system is as designed and with proper interaction between related systems, equipment and components.

3 Commissioning agency:

- .1 To be [independent Commissioning Agency] [_____]
- .2 Responsibilities to include:
 - .1 Coordinate and conduct tests and fine-tuning of integrated systems.
 - .2 Correct deficiencies identified during integrated systems testing and fine-tuning.
 - .3 Diagnose problems.
 - .4 Modify operating parameters as necessary to satisfy fine-tuning requirements required by Engineer so as to satisfy proper system operation, including adjustments which may become apparent as testing proceeds, modifications to suit changes in system operation as equipment settles down during the "running-in" period.

4 Acronyms:

BSC:	Biological Safety Cabinet
DBT	Dry bulb temperature
DP	Differential pressure
EA	Exhaust air
EMCS:	Energy Management & Control Systems

FA	Fire alarm
HEPA	High Efficiency Particulate air
HVAC:	Heating, Ventilation, Air Conditioning.
LFH:	Laboratory Fume Hood
NC	Noise criteria
PD	Pressure drop (pressure difference)
PV:	Performance Verification
SA	Supply air
SP:	Static pressure
TAB:	Testing, Adjusting and balancing
WBT.	Wet bulb temperature

5 Design criteria, design intents

- .1 DBT, WBT, noise levels, space differential pressure to be maintained in each laboratory at all times within specified tolerances: Refer to Design Criteria and relevant PV Report Forms
- .2 Laboratory DP must not be permitted to go to zero or into opposite pressure values.

6 Application tolerances:

- A. For negatively pressurized laboratories:
 1. SA systems: Plus [0] %; minus [10]%
 2. EA systems: Plus [10]%; minus [0] %.
- .2 For positively pressurized laboratories:
 1. SA systems: Plus [10] %; minus [0]%
 2. EA systems: Plus [0]%; minus [10] %.

7 Timing:

- A. Perform tests only after:

1. Architectural finishes completed.
 2. TAB of HVAC systems successfully completed.
 3. TAB of smoke control systems successfully completed.
 4. Commissioning of FA systems successfully completed.
 5. Commissioning of emergency electrical power systems successfully completed.
 6. Commissioning of all BSC's, LFH, snorkels, other laboratory exhaust systems successfully completed.
 7. EMCS is completed and commissioned to point where it may be used for recording system data and dynamic step response data.
- .2 If necessary, occupancy to be coordinated so as to avoid interference with, or interruption of, any integrated systems tests.

8 Seasonal constraints

- .1 Notwithstanding all-inclusive requirements specified herein, additional separate cycles of Integrated Systems Testing may be necessary during opposite seasons for equipment and systems whose full operation is dependent on seasonal conditions.
- .2 This may necessitate carrying out one of these tests after occupancy and during the Warranty Period.

9 Engineer's responsibilities

- .1 To include:
 - .1 Witness tests and certify results.
 - .2 Provide instruction at the same time as the integrated system performance tests.
 - .3 Provide direction and instruct Commissioning Agency so as to satisfy operating requirements.
 - .4 Fully document results, details of adjustments, changes in system operation as systems settle down.
 - .5 During Warranty Period:
 - .1 Take environmental measurements as necessary to identify existing and potential problems.

- .2 Conduct User surveys to determine degree of satisfaction.

10 Systems to be tested

- .1 These tests shall be applied to all Laboratory HVAC and exhaust systems and related systems.

11 Commissioning procedures - EMCS

- .1 With the EMCS in full operation, change over to emergency power and
 - .1 change from normal operation to operation in fire alarm mode.
 - .2 change from normal operation to smoke exhaust mode.
- .2 Return to normal power and simulate failure of EMCS to test operation of smoke exhaust system without EMCS.
- .3 Perform following during integrated system tests:
 - .1 Perform diagnosis of problems which become apparent during testing.
 - .2 Make adjustments which become apparent as testing proceeds.
 - .3 Make modifications to suit changes as equipment settles down during the "running-in" period.
- .4 Carry out fine-tuning and adjustment of systems as needed.

12 Commissioning procedures - Integrated VAV HVAC and exhaust systems:

- .1 Commissioning Agency to become fully cognizant of all Design Criteria and Design Intents. These may include:
 - .1 Assumed diversity of LFH, BSC, snorkel, other exhaust system usage.
 - .2 LFH operating parameters such as types, face velocity, normal operating and maximum sash heights, minimum flow rate through hood with sash fully closed, etc.
 - .3 Need for redundancy of exhaust systems.
 - .4 Type of LFH exhaust system.- manifolded or dedicated.
 - .5 If manifolded, is the general laboratory exhaust on same system.

- .6 If room exhaust system is separate from LFH exhaust system and if LFH exhaust fan goes down or LFH exhaust air valve fails, possibility for air to be drawn from the LFH into the room.
- .2 The following commissioning procedures are basic only. They may have to be modified for each laboratory, type of LFH, BSC, other exhaust system, supply system, controls, type of supply and exhaust tracking systems used.
- .3 Commissioning to include
 - 1. verification of the integrity of the laboratory envelope,
 - 2. performance verification of maintenance of design DBT, %RH and noise levels in each laboratory at all times while at the same time maintaining design offset between supply air and exhaust air:
 - .1 at maximum and minimum supply and exhaust air flow rates,
 - .2 at various part load conditions of heating and cooling,
 - .3 in "occupied" and "unoccupied" modes,
 - .4 with LFH's at varying sash positions,
 - .5 with BSC's in various modes of operation,
 - .6 with other laboratory exhausts in various modes of operation, and
 - .7 at various combinations thereof.
 - 3. Verify tracking of LFH VAV EA flow rate with SA flow rate from maximum to minimum and record pressure conditions at all exhaust system air valves.
 - 4. Track laboratory supply system from maximum to minimum flow rates and record pressure conditions at all supply system air valves and outlets.
 - 5. Verify integrity of control system and response to within $\pm 5\%$. including:
 - .1 Verify stability of zero drift, span shifts, laboratory DP.
 - .2 Investigate all possible control scenarios to determine if there is any one sequence of operations which will cause lab DP to go to zero or into opposite pressure values.
 - .3 Using repeated cycling of controls, determine if the control loops will require periodic re-calibration.
 - 6. Using recording instruments, challenge LFH face velocity by:
 - i. raising and lowering the sash quickly implementing emergency purge procedures.

- ii. simulating EA failure through LFH by exhaust fan or air valve failure.
 - iii. simulating SA failure by supply fan or VAV box failure.
- .7 Track laboratory DP under all possible combinations of operating conditions, such as:
 - i. All LFH sashes fully open or fully closed.
 - ii. Maximum heating and cooling, minimum heating and cooling.
 - iii. LFH sashes randomly ion partially closed and open positions.
- .8 Identify the position of the sash below which the face velocity rises above the maximum design face velocity or fall below the minimum design face velocity.
- .9 Verification of direction of air flow through doors into the space. This can be by propping the door open about 100 mm, and measuring velocity and direction of air flow through the opening every 150 mm from top to bottom.
- .10 Measure all LFH exhaust duct flow rates and velocities and ensure that each stack discharge is in excess of required velocities.
- .11 Performance verification and demonstration of speed of response (in seconds) in the event of:
 - .1 failure of LFH or BSC air valve to minimum and to maximum,
 - .2 failure of laboratory supply air valve, exhaust air valve to minimum and to maximum,
 - .3 failure of supply fan, exhaust fan,
 - .4 failure of normal electrical power and transfer to emergency power,
 - .5 partial and total failure of EMCS,
 - .6 major chemical spills, where the operation of an emergency pull station maximizes exhaust from the laboratory, increases the negative pressure in the laboratory and informs the central control facility,
 - .7 fire or smoke emergency conditions, in which the FA system stops supply fans serving the fire zone, maximizes general exhaust systems so as to increase the negative pressure in the fire zone relative to surrounding fire or smoke control zones.
- .12 Verification that all exhaust fan discharge ducts in Mechanical Room are fully welded and have been pressure tested and that shaft seals of exhaust fans are tight.

- .13 Verification that indirect connections between BSC's and the manifolded exhaust system will never permit any spillage.
- .14 PV of all snorkels and other exhausts for design exhaust flow rates at all times.
- .15 Survey of supply air to ensure that air velocity and air flow patterns in vicinity of LFH and BSC are within parameters of The Standard.
- .16 Examination of very low leakage dampers on inlet to each exhaust fan for leakage when closed, to permit removal of exhaust fan from the system and to permit O&M personnel to service same without exposure to exhaust air.
- .17 Examination of manifold exhaust ducting for condensation under low flow conditions.
- .18 Verification that exhaust stack discharge exceeds 15 m/s (3000 FPM) at all times.
- .19 PV of lead-lag arrangements for exhaust fans, including automatic change-over.
- .4 Measurement of DP: Either directly or indirectly depending upon design requirements:
 - .1 Direct measurement of DP between laboratory and reference point.
 - .2 Indirect measurement by maintenance of differential between SA and EA flow rates using air flow measuring stations in all ducts.
- .5 Multi-point data loggers may be used to:
 - .1 log each exhaust, laboratory supply, response time,
 - .2 track exhaust system from design maximum flow rate to design minimum flow rate by monitoring conditions at the most remote LFH or BSC,
 - .3 track supply system from design maximum flow rate to design minimum flow rate by monitoring conditions at the most remote supply air valve,
 - .4 record DBT, %RH and total offset between supply air and exhaust air.

13 Commissioning manifolded laboratory exhaust systems:

- .1 Exhaust systems to include general laboratory exhaust, LFH, BSC, snorkels, (elephant trunks), other special exhausts.
- .2 Establish SA and EA flow rates at design conditions. Set LFH sashes to design position. Measure DP or SA-EA flow rate offset. Make necessary repairs and/or seal leaks until design values are achieved.
- .3 Measure DP or SA-EA flow rate offset for all other possible operating conditions such as:

- .1 sashes on all LFH CLOSED, cooling load at MAX.
- .2 sashes on all LFH OPEN, cooling load at MIN.
- .3 sashes on all LFH CLOSED, cooling load at MIN.
- .4 Determine response time (in seconds) while:
 - .1 raising and lowering LFH sash quickly,
 - .2 implementing emergency purge conditions,
 - .3 simulating LFH EA failure,
 - .4 simulating general EA failure,
 - .5 simulating SA flow rate failure.
- .5 Using multi-pen data-logger to record:
 - .1 SA, LFH EA, general EA flow rates,
 - .2 differential pressure,
 - .3 response time (in seconds).
- .6 Track entire exhaust system from design maximum flow rate to minimum flow rate by monitoring SP at most remote EA valve and face velocity at most remote LFH.
- .7 Track entire supply system from design maximum flow rate to minimum flow rate by monitoring SP at most remote SA valve and face velocity at most remote LFH.
- .8 Record DBT, WBT and DP on 7-day strip chart recorder.

14 Laboratory airlocks:

- .1 Purposes: To demonstrate directions of air flow towards space of highest contamination when entering or leaving laboratory.
- .2 Applicable air lock systems: [refer to PV Report Forms] [_____].
- .3 Timing: After integrated systems tests for stable operation and laboratory operations have been successfully completed.
- .4 Conditions at time of tests:
 - .1 Supply and exhaust air systems functional, airlock entry controls operational.
 - .2 Laboratory operational, functioning normally, including monitoring.

- .3 Adjacent areas operating normally.
- .5 Design intents:
 - .1 Entry/Exit process to be bi-directional.
 - .2 In either entry or exit, it must be possible to turn around and return to starting point.
 - .3 If access is denied, it must be possible to turn around and return to starting point.
 - .4 In event of fire conditions, door controls to be released, access to be available in either direction.
- .6 Procedures:
 - .1 Start air systems, allow to stabilize, continue to operate for [60] minutes, then shut down.
 - .2 Execute entry and exit sequences according to established operational protocols.
 - .3 Using instrumentation and smoke tests, monitor and record flow and pressure variables and response time for laboratory and associated air locks throughout +entry and exit protocols.
- .7 Acceptance requires that:
 - .1 Directional air flow in laboratory to be maintained throughout tests.
 - .2 Pressure in all laboratories associated with air system serving this laboratory remain as designed.
 - .3 Safe egress to be maintained at all times. Force on doors to conform to requirements defined in PV Report Forms.

15 Pressure decay tests of welded ducts

- .1 Apply this test only to those portions of laboratory ducted air systems required to be welded for contaminant containment purposes.
- .2 Perform pressure decay test as described in ANSI/ASME N510-1989, section 6.5.3 "Duct and Housing Leak Rate Test (Pressure Decay Method).
- .3 Ductwork to be closed off and sealed between HEPA filter housing and room by closing airtight dampers or, in absence of dampers, by sealing openings to ductwork.
- .4 Application tolerances: Not more than 0.2% of the flow rate at 500 Pa.

16 Other laboratory exhaust systems

- .1 Application tolerances: Plus [10]%; minus [0]%.
 - .2 Standard: As for HVAC systems
 - .3 TAB procedures:
 - .1 TAB as per standard.
 - .2 Plugs for test openings: To match duct materials specifications.
 - .3 Upon completion of TAB, perform activities specified this section.

17 Records of tests

- .1 Use EMCS to record systems data and dynamic step response data.
- .2 Where EMCS points not available, use manually recorded parameters.
- .3 Monitor, record effects, note response times of various operational and failure conditions on systems.
- .4 Measure variable on real-time basis. Utilizing this data, make fine-tuning adjustments as necessary.
- .5 Present test data and results in data file and graphic format.
- .6 Engineer to develop project-specific PV forms.

18 Air systems - Stable operation:

- .1 Purpose:
 - .1 To demonstrate operation and accuracy of air systems.
 - .2 Applicable air systems: All systems in the new facility.
- .2 Conditions at time of tests: All equipment and systems to be operational in automatic mode.
- .3 Procedures: Start air systems run for [60] minutes to stabilize conditions.
- .4 Conditions for Acceptance: Requires:
 - .1 Control of variables associated with test.

- .2 Stable and dynamic system response to laboratory disturbances to permit performance of remaining tests.
- .3 Maintenance of standard steady state conditions listed in PV Report Forms.

19 Normal laboratory operation

- .1 Purpose: To demonstrate that laboratory and associated BSC's, LFH's and snorkels are maintained in safe condition during normal laboratory operation.
- .2 Applicable laboratories: All laboratories in this facility.
- .3 Timing: Perform these tests after tests for stable operation (specified this section) successfully completed.
- .4 Required steady state conditions: Refer to Performance Verification (PV) Report Forms.
- .5 Conditions at time of tests: Laboratory supply and exhaust systems to be operational.
- .6 Procedures:
 - .1 Assume PD across HEPA filters = 250 Pa
 - 2. Start air systems, allow to stabilize, run for [60] minutes, then shut down.
 - .3 Monitor, record flow and pressure variables, response times for lab to reach steady state conditions.
 - .4 Using instrumentation, smoke tests, demonstrate directional air flow.
- .7 Acceptance: requires that:
 - .1 Directional air flow to be maintained.
 - .2 Pressure in all laboratories associated with air system serving this lab remain as designed.
 - .3 Safe egress to be maintained. Force on doors to conform to requirements defined in PV Report forms.

20 BSC and LFH failure

21 Supply fan failure

- 22 Laboratory supply air failure**
- 23 Maximum supply air to laboratory**
- 24 Exhaust fan failure**
- 25 Laboratory exhaust air failure.**
- 26 Maximum exhaust from laboratory**
- 27 Electrical power failure to laboratory**
- 28 Building power failure**
- 29 Activities upon completion of commissioning**
- 30 Commissioning Reports**
- 31 Training**
- 32 Commissioning activities during Warranty Period**
- 33 Laboratory training upon occupancy and during Warranty Period**

END

SAMPLE OF SPECIFICATION FOR INTEGRATED SYSTEMS TEST FOR LABORATORY

CP.1: PROJECT COMMISSIONING MANUAL
END OF APPENDIX A

Appendix B

Commissioning Glossary

(CP.2)

Acceptance

The acceptance by the Owner/Investor of responsibility or ownership of the facility/service/product delivered under the Contract and which, in the opinion of the Owner/Investor, conforms to all terms and conditions of the Contract.

Adjusting

Regulation of the built works as necessary to meet required flow rates, modes of operation, and so on.

Amended Commissioning Plan

The Commissioning Plan as amended in the light of components, equipment, sub-systems, systems approved for installation, suppliers' delivery schedules, the contractor's construction and completion schedule, the user's occupancy schedule, and consideration of all other conditions pertaining to commissioning.

"As-built" drawings and specifications

Drawings prepared from the Project Record Drawings, and providing an accurate record of the project as built and operating. They may be supplemented by schematics and diagrammatic layouts. "As-built set point" drawings also include:

- .1 amendments to show all measured and approved results of performance verification procedures, settings of all controls, systems and equipment as finally set upon completion of commissioning. It also includes project specifications amended by insertion of addenda, change notices, etc.
- .2 flow diagrams and piping schematics as installed at each major item of equipment complete with valves controllers, etc. identified with numbered tags.

Average effectiveness level

The capability of all parts of the built works to meet specified requirements and to maintain this level of operation without interruption for a specified test period.

Balancing

The proportioning of flow rates within a distribution system to meet requirements.

Breakdown maintenance

The prompt correction of unpredicted or unpredictable breakdowns or failures and the making good and restoration to the original level of durability, reliability, efficiency and safety.

Building management manual (BMM)

The manual provided to the Propert Manager, considered as the project's "Owners Manual", which explains what systems, equipment and/or components were incorporated into the building, why they were selected, how the design and operating concepts of the sub-systems, systems and integrated systems are accomplished, and includes the design criteria, design intent, design philosophy, how the design meets the Client's functional and operational requirements, standard operating procedures (SOP) manual and operating and maintenance (O&M) manual. Refer to CP.3 for details.

Built works

Includes all static and dynamic systems and installations, all components, equipment, sub-systems, systems, integrated systems, controls constructed and installed as part of the project.

Certificate of completion

See *General Conditions*. There are two types: "Interim" and "Final".

Client

Usually, but not invariably, the Owner/Investor.

Commissioning (Cx)

A planned program of activities that advances the built works from the earliest Phase to a condition of full operation, meeting all objectives of commissioning as defined in the Commissioning Brief.

Commissioning activities

See *"Commissioning Procedures"*.

Commissioning agency

See *"Commissioning Agent"*.

Commissioning Agency

The person(s) or company qualified and approved to carry out commissioning activities and procedures. The Commissioning Agency may change, depending upon the equipment, system, integrated system being commissioned. It may be the installing contractor, a qualified Testing, Adjusting and Balancing (TAB) Agency, a special Commissioning Agency, etc. (except in cases where the TAB contractor is already under contract on the same project)

Commissioning agent

The General Contractor's delegated person with established reputation in commissioning to oversee all commissioning activities by all commissioning agencies and to be the single point of contact for the Designer, Engineer and PWGSC Commissioning Manager in all matters relating to commissioning. Qualifications are described in *PWGSC Commissioning Manual (CP.1)*".

Commissioning authority

See "*Commissioning Manager*".

Commissioning Brief

The section of the Project Brief which defines the deliverables describes the objectives and scope of commissioning, defines commissioning requirements based upon a detailed study of the User's requirements, and establishes roles and responsibilities for commissioning activities.

Commissioning documentation

A complete set of data and information fully describing the project as a built, finished, functional and operational facility. It includes the "As-built" plans and specifications, working documents, systems design documents, all approved shop drawings and product data, inspection certificates, operating and maintenance manuals, and Building Management Manuals.

Commissioning Engineer

The Designer (Architect, Engineer or other professional producing the design solution meeting the User's requirements) responsible for observing, witnessing and certifying results of commissioning activities performed by the Commissioning Agency. See also "*Designer*".

Commissioning Manager

The person responsible for the management of all commissioning activities and for providing technical advice to the Project Manager regarding commissioning concerns. Refer to *PWGSC Commissioning Manual (CP.1)*". Depending on the size of the project, the Commissioning Manager may be assisted by a team of qualified representatives of the disciplines involved.

Commissioning manual

The overall document dealing with commissioning as carried out in PWGSC. This manual consists of the "*PWGSC Commissioning Manual (CP.1)*" and a number of "*PWGSC Commissioning Guidelines*", all of which are listed in the Table of Contents of the "*PWGSC Commissioning Manual (CP.1)*". .

Commissioning Plan

The document which describes the organization, scheduling, allocation of resources, documentation, dates, roles and responsibilities for verification that the built works meet Contract Document requirements.

Commissioning procedures

Includes TAB, PV (Performance Verification) and all other activities described in the various Commissioning Procedures Manuals or specified in the Contract Documents.

Commissioning Procedures Manual

A document that describes all the procedures used during the Commissioning process.

Commissioning process:

See "*Commissioning*".

Commissioning Report

A debriefing report on commissioning to evaluate the commissioning processes used during the project delivery cycle. This report is prepared by the Designer during, and finalized at the end of the Warranty Period and included in the Building Management Manual.

Commissioning Schedule

A schedule, cross referenced to the Construction Schedule, which highlights dates and times when key commissioning activities are to be implemented and completed and deliverables provided. This schedule is used to track the progress of the commissioning process throughout the project.

Commissioning Team

The Commissioning Team is usually represented by the Commissioning Manager during the NPMS *Project Delivery Stage*. For roles and responsibilities and team definition, refer to "*PWGSC Commissioning Manual (CP.1)*".

Completion

The point at which all terms of the Contract have been fulfilled to the satisfaction of the Project Manager. See "*General Conditions*".

Components

Individual devices, forming part of equipment, sub-system or system.

Concept drawings

Drawings prepared by the Designer to show the design concept.

Conceptual design

See "*Design Concept*".

Construction schedule

The detailed schedule prepared by the Contractor which establishes the scope and approach to project construction operations and incorporating the Amended Commissioning Plan. See also "*Commissioning Schedule*".

Construction Team

The Construction Team is usually engaged following successful bidding on the project and being awarded the construction contract. This team completes its work at the end of NPMS *Project Delivery Stage, Implementation Phase.*, when the management of the completed facility passes to the Property Management Team for operation. The services of the Construction Team may be required during the NPMS *Project Delivery Stage, Delivery Close Out Phase* if construction difficulties become apparent.

Consultant

See "*Designer*".

Contract documents

The Working Documents upon which the contract with the Contractor to deliver the project is based. Usually includes drawings and specifications.

Contractor

Includes sub-contractors, manufacturers, suppliers, vendors, fabricators and sub-trades.

De-commissioning

Facilities which are taken out of service, mothballed, shut down or otherwise made non-operative.

Defect

Any variation in form, fit or function from the Design Intent, Design Criteria or Contract Documents.

Demonstrations

Operation of the built works in the presence of the Project Manager, Commissioning Manager, Client/Investor and/or User to confirm installation and operation in conformity to Commissioning Documentation.

Design-Builder

See both "*Designer*" and "*Construction Team*".

Design concept

The design solution as developed by the Designer and meeting all requirements of the Project Brief. It is the result of analysis of the problem or opportunity, and investigation of the various options. For detailed description of contents, refer to the "*Project Management Manual. (CP.1)*".

Design criteria

All those factors included in the design of a facility prescribed by the Project Brief or determined by the Designer as necessary in order to meet all requirements of the Owner/Investor.

Designer

The Architect, Engineer or other professional producing the design solution meeting the User's requirements. In the context of the Project Brief, the term used is "Consultant".

Design intent

The methodology employed by the Designer which is intended to meet the Design Criteria.

Design Team

The Design Team is usually assembled at the end of NPMS project delivery stage, planning phase and continues to work as a team until the end of NPMS project delivery stage, implementation phase.. The services of the Design Team may be required during NPMS project delivery stage, close-out phase, in the event of design difficulties.

Durability

The average expected service life before failure, based upon the manufacturer's estimate of the hours of operation and also based upon a specific preventive maintenance program.

EMCS

Acronym for Energy Monitoring and Control System. A computerized system with field devices located on building system components to permit monitoring and control of a component, system or integrated system through a central command post or a designated remote station location.

Environment

The output of all related integrated systems. Conditions established within the environment affect, or are affected by, the set points of the components, which in turn adjust, or are adjusted by, the output of the sub-systems, systems and integrated systems.

EPVT

Acronym for Equipment Performance Verification Tests.

Equipment

Devices, components, etc. forming part of a sub-system or system.

Evaluation Report

This report provides an assessment of the project for compliance with the User's functional and operational requirements as describes in the Investment Analysis Report (IAR) and the Project Brief. This report is prepared by the Project Manager with input from the Designer and submitted to the Project Leader after the termination of the Warranty Period and at the end of the Operation Phase.

Extended warranty

A warranty made relating to certain specific items of equipment which is of greater duration than the Warranty Period stipulated in the Contract.

Extent of commissioning

The degree to which components, equipment, sub-systems, systems and integrated systems are commissioned, based upon studies of the User's requirements, effects of such omissions on operating efficiencies, security, health, welfare, comfort, safety, professional and regulatory obligations and liabilities.

Facility

See *"Project"*.

Facility Management Team

See *"Property Management Team"*.

Facility Manager

Usually called the Property Manager in PWGSC. The person responsible for operation and maintenance of the completed facility.

Fine tuning

The additional adjustments made after commissioning so as to optimize performance and to maximize the benefits of a system, sub-system and equipment.

Function

Includes all modes and sequences of control operation, interlocks and conditional control responses, all specified responses to emergency conditions, etc.

Functional performance testing

See *"Performance Verification"*.

General conditions

See PWGSC front-end contract documents.

Implementation phase

A distinct phase within the NPMS Project Delivery Stage during which the built works are checked for static completion, started, tested, adjusted and balanced, operational and functional performance is verified, documentation is verified for completeness, all training is carried out, all facility management plans implemented. At the end of the Project Delivery Stage, the facility is handed over to the Owner/Investor and User.

Inspection certificates

Certificates signed and certified by the authority having jurisdiction which apply to installation, performance verification, commissioning or operation of special systems or equipment.

Installation/start-up Check Lists

A compilation of items that should be examined during pre-start-up inspections. It includes all items specified in the Contract Documents, and items not so specified but considered as essential to good installation engineering practice or necessary for proper operation of the facility.

Integrated systems

Multiple systems driven by the operating parameters of the architectural, structural, mechanical and electrical systems and operating as a coordinated and integrated entity in order to satisfy User's requirements.

Interim commissioning

That portion of commissioning that verifies that the built works are in satisfactory operating condition for initial occupancy.

Life cycle costs

Include capital construction costs, labour, materials, costs of utility connections, utilities such as potable water, thermal energy (heating and cooling), electrical costs, costs of maintenance, repairs and servicing, to operate and maintain the system (or the facility). Depending upon the context, Life Cycle Cost (LCC) may be calculated per annum or over the service life of the facility

Maintainability

A measure of the time required to fully restore the works to perform their intended function after failure with specified procedures and resources. Maintainability of that characteristic of the works which indicates the ease and rapidity with which it can be restored to a specific level of performance.

Maintenance management system (MMS)

A code base system, which is sub divided into a series of numbers/ codes for building devices, components for each base building system such as mechanical (heating/cooling), fire protection, electrical, emergency power systems, fire alarm system. The data base is totally inputted into a computer to permit the effective and timely maintenance / replacement of the building installations, and is used for estimating the life cycle planning.

National Project Management System

The basic framework within which all PWGSC projects are developed, implemented and delivered.

Non-acceptance

The refusal to accept the responsibility/ownership of the facility/service/product delivered under the Contract which, in the opinion of the Owner/Investor, does not conform to the terms or conditions of the Contract.

Operating and maintenance budget

See *"Life Cycle Costs"*.

Operating manual

A project-specific manual prepared by the Designer using schematic and diagrammatic layout drawings to fully describe each system, all Design Criteria, Design Intents, its operation (using narrative-type sequence of operation). During the design phase, it is "generic" in the sense that it generally contains no reference to manufacturer's equipment. During construction and commissioning, it is amended to contain all "As-built" information and forms the Operating Manual for the facility.

Operation

The normal day-to-day manipulation of the works as designed in order to fulfill the intent of the design.

Operating and maintenance (O&M) manuals

An organized compilation of all documentation relating to the facility as a built, finished, functional and operational entity. It consists of two separate manuals – the Operating Manual and the Maintenance Manual.

Performance verification (PV)

The checks and tests carried out to determine if the built works function in accordance with the Design Intent.

Performance verification report

Record of all measured data resulting from testing, adjusting, balancing and performance verification for the built works. It includes all product information. See also "*Product Information*".

Post-occupancy commissioning

Commissioning activities carried out after full occupancy and under normal operating conditions, and may include system optimization, commissioning of seasonal-, occupancy- and weather-sensitive systems.

Preliminary design

The development of the Design Concept in more detail and establishment of technical, operational, cost and scheduling requirements in sufficient detail to ensure that subsequent development of Working Documents continue to meet requirements of the Project Brief.

Preventive maintenance

Pre-planned activities designed to ensure the continuance of durability, reliability, operation at peak efficiency, safety of the works, minimize down-time and to prevent unplanned, unscheduled or unpredictable failures by doing work at scheduled intervals. Preventive maintenance includes servicing and corrective maintenance functions. Preventive maintenance anticipates wear and tear during operation, takes corrective actions so as to minimize deterioration.

Product data

Manufacturers' product data sheets provided by the Contractor for factory-fabricated components, equipment, systems, etc., specified in the Working Documents and required for the project. These are approved before purchase by the Contractor. See also "*Shop Drawings*".

Product information (PI)

A compilation of data gathered from all components and equipment installed on the project, including manufacturer's nameplate data and all other information that is necessary for full and complete commissioning documentation. Product information forms part of the Performance Verification Reports.

Project

A package of activities specifically dedicated to fulfilling a program requirement within a prescribed time period, having defined objectives (including scope, performance, quality, cost).

Project Brief

The document which defines all requirements of the project and services to be provided. It includes general project information, scope of the work, time plan, design data and the Commissioning Brief. It contains design instructions to the Design Team and Commissioning Team and is the basis for Consultant's Agreements. Refer also to *"Request for Proposal (RFP)"*.

Project Leader

The person representing the Owner/Investor and accountable for the overall project development.

Project Manager

The person responsible for the implementation of a project, including management, administration and coordination of activities.

Project record drawings

The Contract Documents amended by the Contractor on site to show the actual location of all features and materials and all other deviations from those called for in the Contract Documents as made during construction. These amendments are made as the work progresses.

Property Management Team

The Property Management Team receives the facility at time of commissioning and operates it throughout its useful life. The team consists of the Facility Manager, Building Operations Manager, in-house maintenance staff, and service contractors. Members of the Design Team, Commissioning Team and Construction Team may also be included.

PV

See *"Performance Verification"*.

PWGSC Commissioning Manager

The person responsible for the management of all commissioning activities and for providing technical advice to the Project Manager regarding commissioning concerns. Qualifications are described in the *"PWGSC Commissioning Manual (CP.1)"*. Depending on the size of the project, the Commissioning Manager may be assisted by a team of qualified representatives of the disciplines involved. The Commissioning Manager represents the Owner / Investor for all PWGSC projects.

PWGSC Commissioning Manual

The document which describes commissioning as carried out in PWGSC.

PWGSC Design Quality Review Team

For definitions, roles and responsibilities, refer to *"PWGSC Commissioning Manual (CP.1)"*.

QA

Acronym for Quality Assurance.

Quality assurance

The process by which the Project Manager ensures that the Designer meets all defined objectives. It includes review of the calibre of Designer and installers, adequacy of quality control by the Contractor.

Quality control

The process by which the Project Manager verifies that all levels of quality described in the Project Brief, set out in the Working Documents and installed in the built works, are attained. It includes a process of review and monitoring through all stages of the project, corrective action where appropriate and documentation in the Commissioning Documentation.

Quality management

The process adopted by which the quality of the product delivered is controlled. It includes quality assurance and quality control, reviews for conformity to applicable codes, standards, regulations, generally accepted professional standards and principles.

Re-commissioning

Commissioning activities carried out on an existing system. These systems may, for example, have been changed by additions or deletions, repeated adjustments in settings or operating parameters, etc.

Redundancy

The replacement equipment immediately available for operation in the event of the failure of the equipment presently on-line.

Redundancy factor

The ratio of the excess number of units installed to the number of units required to meet design demand.

Reliability

The length of time that the system will perform its intended function before failure under stated conditions of application and use and with a specific preventive maintenance program. It is the failure rate per unit of time. There are two types of reliability:

- .1 **Inherent reliability:** that which is built into the design (i.e. the reliability which would be possible if each and every component performed throughout its life precisely as the designer planned).
- .2 **Achieved reliability:** that which is actually experienced. It varies with the manufacturing processes, shipping, storage, application, installation and operator's capabilities.

Repair

Making good restoration to full operating condition without necessarily restoration to original level of durability, reliability, efficiency or safety. See also "*Maintenance*".

Request for Proposal (RFP)

A statement, addressed to interested Designers, of needs defining those elements, services and systems that must be provided and the products that must be delivered in order that the facility will meet the User's program needs. Based upon a detailed study of the User's requirements. Refer also to "*Project Brief*".

Servicing

The routine work required to be performed by virtue of owning the facility. The work to be performed to keep the facility in optimum condition and operating safely and at peak efficiency at all times.

Shop drawings

Drawings prepared by the Contractor illustrating in detail their interpretation of the requirements of the Contract Documents for shop or on-site fabrication of various components, equipment, etc. required for the project. These are approved before construction or installation. See also *Product Data*.

Start-up Check Lists

See "*Installation/Start-up Check Lists*".

Substantial completion

For a definition, refer to "*General Conditions*".

Sub-systems

Components and equipment operating (with distribution network if required) in an integrated manner.

Systems

Consist of multiple sub-systems operating in conjunction with one another to provide an operational entity.

TAB

Acronym for testing, adjusting and balancing.

Testing

Includes pressure, leakage, flow rate and performance verification.

User

The end user of the product of the project or the occupant of the facility. It may include the Client.

Verification

The process by which reported results of TAB, PV and commissioning are checked for completeness, accuracy and validity.

Warranty

The promise made by the Contractor to rectify and make good any defect or fault that appears in the work or that comes to the attention of the Minister within the period stipulated in the Contract commencing normally on the date of the Interim Certificate of Completion.

Warranty inspections

Refer to *"General Conditions of the Contract Documents"*.

Working documents

The drawings and specifications developed by the Designer showing the approved design and describing all quality control and quality assurance requirements for the project in sufficient detail for the Contractor to deliver the project.

END OF APPENDIX B



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Contract Number / Numéro du contrat

EQ754162494

Security Classification / Classification de sécurité
UNCLASSIFIED

SECURITY REQUIREMENTS CHECK LIST (SRCL)

LISTE DE VÉRIFICATION DES EXIGENCES RELATIVES À LA SÉCURITÉ (LVERS)

PART A - CONTRACT INFORMATION / PARTIE A - INFORMATION CONTRACTUELLE		
1. Originating Government Department or Organization / Ministère ou organisme gouvernemental d'origine		2. Branch or Directorate / Direction générale ou Direction Real Property
3. a) Subcontract Number / Numéro du contrat de sous-traitance		3. b) Name and Address of Subcontractor / Nom et adresse du sous-traitant
4. Brief Description of Work / Brève description du travail Rehabilitation and upgrades so as to achieve the project mandate. The scope of work for this project is to develop construction documents and undertake construction and contract administration for the upgrading of the base building and tenant fit-up.		
5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?		<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Non Oui
5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations? Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques?		<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Non Oui
6. Indicate the type of access required / Indiquer le type d'accès requis		
6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets? Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS? (Specify the level of access using the chart in Question 7. c) (Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c)		<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Non Oui
6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted. Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé.		<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes Non Oui
6. c) Is this a commercial courier or delivery requirement with no overnight storage? S'agit-il d'un contrat de messagerie ou de livraison commerciale sans entreposage de nuit?		<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Non Oui
7. a) Indicate the type of information that the supplier will be required to access / Indiquer le type d'information auquel le fournisseur devra avoir accès		
Canada <input type="checkbox"/>	NATO / OTAN <input type="checkbox"/>	Foreign / Étranger <input type="checkbox"/>
7. b) Release restrictions / Restrictions relatives à la diffusion		
No release restrictions Aucune restriction relative à la diffusion <input type="checkbox"/>	All NATO countries Tous les pays de l'OTAN <input type="checkbox"/>	No release restrictions Aucune restriction relative à la diffusion <input type="checkbox"/>
Not releasable À ne pas diffuser <input type="checkbox"/>		
Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>
Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:
7. c) Level of information / Niveau d'information		
PROTECTED A PROTÉGÉ A <input type="checkbox"/>	NATO UNCLASSIFIED NATO NON CLASSIFIÉ <input type="checkbox"/>	PROTECTED A PROTÉGÉ A <input type="checkbox"/>
PROTECTED B PROTÉGÉ B <input type="checkbox"/>	NATO RESTRICTED NATO DIFFUSION RESTREINTE <input type="checkbox"/>	PROTECTED B PROTÉGÉ B <input type="checkbox"/>
PROTECTED C PROTÉGÉ C <input type="checkbox"/>	NATO CONFIDENTIAL NATO CONFIDENTIEL <input type="checkbox"/>	PROTECTED C PROTÉGÉ C <input type="checkbox"/>
CONFIDENTIAL CONFIDENTIEL <input type="checkbox"/>	NATO SECRET NATO SECRET <input type="checkbox"/>	CONFIDENTIAL CONFIDENTIEL <input type="checkbox"/>
SECRET SECRET <input type="checkbox"/>	COSMIC TOP SECRET COSMIC TRÈS SECRET <input type="checkbox"/>	SECRET SECRET <input type="checkbox"/>
TOP SECRET TRÈS SECRET <input type="checkbox"/>		TOP SECRET TRÈS SECRET <input type="checkbox"/>
TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) <input type="checkbox"/>		TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) <input type="checkbox"/>



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PART A (continued) / PARTIE A (suite)

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets?
Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS? ☒ No ☐ Yes
Non Oui

If Yes, indicate the level of sensitivity:

Dans l'affirmative, indiquer le niveau de sensibilité:

9. Will the supplier require access to extremely sensitive INFOSEC information or assets?
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate? ☒ No ☐ Yes
Non Oui

Short Title(s) of material / Titre(s) abrégé(s) du matériel:

Document Number / Numéro du document:

PART B - PERSONNEL (SUPPLIER) / PARTIE B - PERSONNEL (FOURNISSEUR)

10. a) Personnel security screening level required / Niveau de contrôle de la sécurité du personnel requis

- | | | | |
|---|---|---|--|
| <input checked="" type="checkbox"/> RELIABILITY STATUS
COTE DE FIABILITÉ | <input type="checkbox"/> CONFIDENTIAL
CONFIDENTIEL | <input type="checkbox"/> SECRET
SECRET | <input type="checkbox"/> TOP SECRET
TRÈS SECRET |
| <input type="checkbox"/> TOP SECRET - SIGINT
TRÈS SECRET - SIGINT | <input type="checkbox"/> NATO CONFIDENTIAL
NATO CONFIDENTIEL | <input type="checkbox"/> NATO SECRET
NATO SECRET | <input type="checkbox"/> COSMIC TOP SECRET
COSMIC TRÈS SECRET |
| <input type="checkbox"/> SITE ACCESS
ACCÈS AUX EMPLACEMENTS | | | |

Special comments:

Commentaires spéciaux:

NOTE: If multiple levels of screening are identified, a Security Classification Guide must be provided.

REMARQUE: Si plusieurs niveaux de contrôle de sécurité sont requis, un guide de classification de la sécurité doit être fourni.

10. b) May unscreened personnel be used for portions of the work?
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail? ☒ No ☐ Yes
Non Oui

If Yes, will unscreened personnel be escorted?
Dans l'affirmative, le personnel en question sera-t-il escorté? ☒ No ☐ Yes
Non Oui

PART C - SAFEGUARDS (SUPPLIER) / PARTIE C - MESURES DE PROTECTION (FOURNISSEUR)

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises?
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS? ☒ No ☐ Yes
Non Oui

11. b) Will the supplier be required to safeguard COMSEC information or assets?
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC? ☒ No ☐ Yes
Non Oui

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises?
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ? ☒ No ☐ Yes
Non Oui

INFORMATION TECHNOLOGY (IT) MEDIA / SUPPORT RELATIF À LA TECHNOLOGIE DE L'INFORMATION (TI)

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data?
Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS? ☒ No ☐ Yes
Non Oui

11. e) Will there be an electronic link between the supplier's IT systems and the government department or agency?
Disposera-t-on d'un lien électronique entre le système informatique du fournisseur et celui du ministère ou de l'agence gouvernementale? ☒ No ☐ Yes
Non Oui



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PART C - (continued) / PARTIE C - (suite)

For users completing the form manually use the summary chart below to indicate the category(ies) and level(s) of safeguarding required at the supplier's site(s) or premises.

Les utilisateurs qui remplissent le formulaire manuellement doivent utiliser le tableau récapitulatif ci-dessous pour indiquer, pour chaque catégorie, les niveaux de sauvegarde requis aux installations du fournisseur.

For users completing the form online (via the internet), the summary chart is automatically populated by your responses to previous questions.

Dans le cas des utilisateurs qui remplissent le formulaire en ligne (par Internet), les réponses aux questions précédentes sont automatiquement saisies dans le tableau récapitulatif.

SUMMARY CHART / TABLEAU RÉCAPITULATIF

Category Catégorie	PROTECTED PROTÉGÉ			CLASSIFIED CLASSIFIÉ			NATO				COMSEC					
	A	B	C	CONFIDENTIAL	SECRET	TOP SECRET	NATO RESTRICTED	NATO CONFIDENTIAL	NATO SECRET	COSMIC TOP SECRET	PROTECTED PROTÉGÉ			CONFIDENTIAL	SECRET	TOP SECRET
				CONFIDENTIAL		TRÈS SECRET	NATO DIFFUSION RESTREINTE	NATO CONFIDENTIEL		COSMIC TRÈS SECRET	A	B	C	CONFIDENTIAL		TRÈS SECRET
Information / Assets Renseignements / Biens Production																
IT Media / Support TI																
IT Link / Lien électronique																

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?

La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE?

☒ No / Non ☐ Yes / Oui

If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification".

Dans l'affirmative, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire.

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?

La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE?

☒ No / Non ☐ Yes / Oui

If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification" and indicate with attachments (e.g. SECRET with Attachments).

Dans l'affirmative, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire et indiquer qu'il y a des pièces jointes (p. ex. SECRET avec des pièces jointes).



Government of Canada
Gouvernement du Canada

Contract Number / Numéro du contrat

EQ754162494

Security Classification / Classification de sécurité
UNCLASSIFIED

PART D - AUTHORIZATION / PARTIE D - AUTORISATION

13. Organization Project Authority / Chargé de projet de l'organisme

Name (print) - Nom (en lettres moulées) Barrett, Michael		Title - Titre Project Manager	Signature
Telephone No. - N° de téléphone 226-448-3173	Facsimile No. - N° de télécopieur 519-654-4304	E-mail address - Adresse courriel michael.barrett@pwgsc-tpsgc.gc.ca	Date 2016/02/23

14. Organization Security Authority / Responsable de la sécurité de l'organisme

Name (print) - Nom (en lettres moulées) von Zuben, John		Title - Titre SO	Signature 	Digitally signed by VonZuben, John DN: cn=CA, o=GC, ou=PWGSC-TPSGC, cn=VonZuben, John Date: 2016.02.23 13:16:51 -05'00'
Telephone No. - N° de téléphone 416-512-5968	Facsimile No. - N° de télécopieur 416-952-6481	E-mail address - Adresse courriel John.vonZuben@pwgsc.gc.ca	Date 2016-02-23	

15. Are there additional instructions (e.g. Security Guide, Security Classification Guide) attached?
Des instructions supplémentaires (p. ex. Guide de sécurité, Guide de classification de la sécurité) sont-elles jointes? ☒ No / Non ☐ Yes / Oui

16. Procurement Officer / Agent d'approvisionnement

Name (print) - Nom (en lettres moulées) Karen Lau		Title - Titre Supply Specialist	Signature
Telephone No. - N° de téléphone 416-512-5299	Facsimile No. - N° de télécopieur 416-512-5862	E-mail address - Adresse courriel karen.lau@pwgsc-tpsgc.gc.ca	Date March 21, 2016

17. Contracting Security Authority / Autorité contractante en matière de sécurité

Name (print) - Nom (en lettres moulées) Anna Kuliycka Contract Security Division Anna.Kuliycka@pwgsc-tpsgc.gc.ca Tel/Tél - 613-957-1258 / Fax/Télec - 613-954-1171		Title - Titre Contract Security Division	Signature
Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date Feb 24, 2016