



## Annex B

# GENERAL PROCEDURES & STANDARDS

## For Construction Management

August 2, 2012





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# 1 INTRODUCTION

## 1.1 GENERAL PROCEDURES AND STANDARDS

### 1.1.1 GENERAL

- .1 These PWGSC *General Procedures and Standards (GP&S)* for Construction Management (CM) have been developed to:
  - .1 Facilitate the development of a consistent, well-documented CM process reflecting industry best practices; and
  - .2 Ensure compliance with federal government standards, PWGSC Policies and Treasury Board directives.

### 1.1.2 HARMONIZATION WITH THE TERMS OF REFERENCE (TOR)

- .1 The GP&S document must be used in conjunction with the TOR, as the two documents are complimentary.
- .2 The TOR describes project-specific requirements, services and deliverables while the GP&S document outlines with minimum standards and procedures common to all projects.
- .3 In the case of a conflict between the two documents, the requirements of the TOR takes precedence.

### 1.1.3 KEY LINKS:

- .1 Guiding document: <http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/index-eng.html>
- .2 NMS: <http://www.tpsgc-pwgsc.gc.ca/biens-property/ddn-nms/questions-eng.html>
- .3 Definitions:  
Refer to <http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/ti-it/gloss-present-intro-eng.html>

## 1.2 PROJECT DELIVERY

### 1.2.1 GENERAL REQUIREMENTS

- .1 The project delivery requirements outlined in this document are applicable to all PWGSC construction management projects, unless otherwise indicated in the TOR.
- .2 PWGSC project delivery is defined in the National Project Management System (NPMS) <http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/index-eng.html>
- .3 The CM must:
  - .1 Obtain written authorization from the Departmental Representative before proceeding from one phase of work to the next phase of a project;
  - .2 Coordinate all services with the Departmental Representative;
  - .3 Deliver each project utilizing best practices in support of User Department needs, respecting the approved financial budget, schedule, scope, quality;
  - .4 Establish a cohesive functional partnership and open communication between all members of the project delivery team throughout all phases of the project life; the CM may be required to participate in partnering sessions;



- .5 Conduct rigorous quality assurance reviews during the design and construction phases, including the application of value engineering principles;
- .6 When scope changes are required, analyse the impact on all project components and resubmit for approval before proceeding further;
- .7 Establish and maintain a change control procedure for all changes and provide timely notification to allow review;
- .8 Ensure that experienced staff are assigned for the production, coordination and delivery of all requirements; ensure that the CM team has an in-depth understanding and collective 'buy-in' of the project requirements, scope, budgeting, scheduling and risk management;
- .9 Prepare a continuous risk identification and management program employing effective methodologies;
- .10 Provide continuous and comprehensive documentation of the project at all stages of the project implementation;
- .11 Ensure continuity of key personnel and maintain a dedicated working team for the life of the project;

### **I.2.2 SERVICE DELIVERY FOR ALL PROJECTS**

- .1 For all projects, the CM shall:
  - .1 Deliver the project to be within:
    - .1 The established construction budget,
    - .2 The key milestones, according to the established project schedule.
  - .2 Ensure that each team member:
    - .1 Understands the project requirements, for seamless delivery of the required services;
    - .2 Functions as a cohesive partnership with open communication between all members of the project delivery team throughout all phases of the project life;
    - .3 Function as an integrated and focused team with an in-depth understanding and collective 'buy-in' of the project requirements, scope, budget, risk and scheduling objectives.
  - .3 Deliver the work in a professional manner during all phases of the project, employing best practices for budget, schedule, quality, and scope management;
  - .4 Maintain continuity of key personnel and maintain a dedicated working team for the life of the project.
- .2 The ethical guidelines governing PWGSC is described in the following web link:  
<http://www.tpsgc-pwgsc.gc.ca/dgs-dob/erfe-fer-eng.html>

## **I.3 PROCUREMENT OF GOODS AND SERVICES**

### **I.3.1 PWGSC CONTRACTING REQUIREMENTS**

- .1 BAI0 Code of Conduct for Procurement applies to all goods and services tenders issued by the CM in compliance to the TOR.

### **I.3.2 CM "OWN FORCES" WORK**

- .1 The TOR establishes limits to the value of individual construction work packages for which the CM shall be allowed to submit tenders. The intent is the the CM "own forces" to be limited to advisory, coordination and serving as constructor.



### **I.3.3 INDUSTRY STANDARD PRACTICES**

- .1 The CM will review the tender work packages to confirm completeness and that the procurement method will achieve value for money and meet the schedule.
- .2 The CM will use standard Construction Association practices for tendering for the project area. This will involve the use of CCDC standard contracting documents.
- .3 Normally this will include public advertisement to the industry using provincially acceptable advertisement methods or where justified for value for money, an invitation to three to five bidders experienced in the work.
- .4 Where limited trades or suppliers are proven, the Project Manager with the approval of the contracting authority, may authorize pre-qualified or sole source tenders.
- .5 The CM will review the wording and content of all addenda prior to issue.
- .6 The CM will analyze the bids for each tender package to determine if the bid is comprehensive and that the bidder is capable of successfully completing the work. The CM will recommend award or advise if changes or alternative procurement strategies will be needed to meet the project requirements.
- .7 The CM, the project manager, the consultant and the client/user department are required to agree upon award and this is to be documented. The CM will not be required to enter into any contract against their recommendation.



## 2 PROJECT ADMINISTRATION

### 2.1 GENERAL REQUIREMENTS FOR ALL PROJECTS

- .1 The administration requirements outlined in this section are applicable to all PWGSC projects in Western Region, unless otherwise indicated in the TOR.
- .2 “Project Team” refers to key representatives involved in this project including the CM and their staff.

### 2.2 PROJECT MANAGEMENT

#### 2.2.1 GENERAL

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

#### 2.2.2 NATIONAL PROJECT MANAGEMENT SYSTEM

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

### 2.3 LINES OF COMMUNICATION

- .1 In general, communications will be through the Departmental Representative, unless directed otherwise.
  - .1 This includes formal contact between the Consultant, the Contractor, the PWGSC Project Team and the User Department.
- .2 Direct communication between members of the PWGSC Project Team on routine matters may be required for resolution of technical issues.
  - .1 However, this shall not alter project scope, budget or schedules, unless confirmed in writing by the Departmental Representative.

### 2.4 MEETINGS

- .1 The Departmental Representative will arrange meetings throughout the project, with representatives from:
  - .1 The User Department;
  - .2 PWGSC
  - .3 The Consultant team; and
  - .4 The Construction Manager



- .2 Standing agenda items shall be established in the Project Procedures Manual. A list will be provided and the project phased meetings that they will be reviewed.

## **2.5 CONSTRUCTION MANAGER RESPONSIBILITIES**

- .1 Responsibilities for Advisory and Support Services and for Constructor Services are defined in the Annex A TOR.

## **2.6 CONSULTANT RESPONSIBILITIES**

- .1 The “Consultant Team” includes the Consultant’s staff, sub-consultants and specialists.
  - .1 This team must maintain its expertise for the duration of the project.
  - .2 The team must include qualified registered architectural and engineering professionals, with extensive relevant experience, capable of providing all required services.
  - .3 Team members may be qualified to provide services in more than one discipline.
  - .4 The Consultant may expand the team to include additional disciplines.
- .2 The Consultant is responsible for:
  - .1 Obtaining Departmental Representative acceptance for each project phase before proceeding to the next phase.
  - .2 Accurately communicating design, budget, and scheduling issues to staff, sub-consultants and specialists.
  - .3 Co-ordinating input for the Departmental Representative’s Risk Management Plan
  - .4 Co-ordinating the quality assurance process and ensuring that submissions of sub-consultants are complete and signed-off by reviewers;
  - .5 During the design phases:
    - .1 Attend meetings,
    - .2 Record the issues and decisions,
    - .3 Prepare and distribute minutes within two working days of the meeting,
    - .4 Ensure all meetings are green i.e. using electronic documents or double-sided hard copies and
    - .5 Ensure sub-consultants attend required meetings.
  - .6 During the construction phase:
    - .1 Attend meetings and provide site inspection services
    - .2 Ensure sub-consultants provide site inspection services and attend required meetings.
- .3 The Consultant is responsible for:
  - .1 Coordinating and directing the work of all team activities, sub-consultants and specialists
  - .2 Preparing a design that meets project requirements.
  - .3 Obtaining approvals on behalf of the Departmental Representative from the User and other levels of government such as provincial and municipal governments and the authorities having jurisdiction;
    - .1 The Consultant shall adjust the documentation to meet the requirements of these authorities.

## **2.7 PWGSC RESPONSIBILITIES**

- .1 Administration
  - .1 PWGSC administers the project and exercises continuing control over the project during all project phases.



- .2 The following administrative requirements apply during all phases of the project delivery.
- .2 Reviews
  - .1 PWGSC will review the work at various stages and reserves the right to reject unsatisfactory work at any stage.
  - .2 If later reviews show that earlier acceptances must be withdrawn, the Consultant shall re-design and re-submit at no extra cost.
- .3 Acceptance
  - .1 PWGSC acceptance of submissions from the Consultant simply indicates that, based on a general review, the material complies with governmental objectives and practices, and meets overall project objectives
  - .2 Acceptance does not relieve the Consultant of professional responsibility for the work and for compliance with the contract.
- .4 PWGSC Project Management
  - .1 The Project Manager assigned to the project is the Departmental Representative.
  - .2 The Departmental Representative is directly responsible for:
    - .1 The progress and administration of the project, on behalf of PWGSC
    - .2 Day-to-day project management and is the Consultant's single point of contact for project direction.
    - .3 Providing authorizations to the Consultant on various tasks throughout the project.
  - .3 Unless directed otherwise by the Departmental Representative, the Consultant obtains all Federal approvals necessary for the work.
- .5 PWGSC Professional & Technical Resources Team
  - .1 Provides professional advice and quality assurance reviews of consultant deliverables by Architectural and Engineering professional disciplines.
  - .2 Offers expert technical advice on related project issues, such as functional programming, options analysis, risk management, cost planning, scheduling, contract interpretation, specifications, terms of reference, commissioning, claims management, project delivery approach and project compliance.
  - .3 Participates regularly in design phases and may attend (during construction), contractor meetings and conduct field reviews on behalf of the Departmental Representative.
  - .4 Provides a Design Manager for the project, who will coordinate the services of the Professional & Technical Resources Team through the Departmental Representative;
    - .1 The Design Manager is the assembler and coordinator of the Resources Team of Architects, Engineers, Interior Designers, Project Planners, Cost Planners and Commissioning Specialists, all with specific areas of expertise.
- .6 PWGSC Commissioning Specialist represents the Departmental Representative's interests in the commissioning process for buildings by:
  - .1 Providing technical advice on O&M matters, operational criteria and quality assurance on the commissioning process throughout the project life cycle;
  - .2 Coordinating and overseeing internal PWGSC commissioning activities during all project phases to ensure that O&M concerns are addressed;
  - .3 Working closely with the Consultant, the Consultant's Commissioning Manager, the CM's commissioning team, and the Departmental Representative for Commissioning activities and,
  - .4 Reviews all documentation and reported results relative to commissioning throughout the project delivery.



## **2.8 USER DEPARTMENT RESPONSIBILITIES**

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

## **2.9 REVIEW AND APPROVAL BY AUTHORITIES**

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



## 3 PROJECT PROCEDURES MANUAL

### 3.1 GENERAL

#### 3.1.1 CM PROJECT PROCEDURES MANUAL

- .1 The Construction Manager shall submit a Project Procedures Manual within three weeks of contract award outlining the procedures, roles, responsibilities, levels of authority, communications, and information systems for the execution of the project.
- .2 The manual will be available in both hardcopy and digital format.
- .3 The minimum acceptable table of content shall include the knowledge areas identified in section 4 Required Service Standards:

- Introduction
- Project directory
- Scope management
- Schedule management
- Cost management
- Quality management
- Human Resource management
- Communication management
- Risk management
- Safety management
- Security management
- Environmental management
- Appendices:  
format for monthly reports noted in section 5.0 Project Reporting

#### 3.1.2 CM SOFTWARE

- .1 The Project Manager will review the CM corporate software and may accept proprietary applications which exceed the minimum PWGSC departmental standards identified in project reporting 5.0 to accommodate a developed CM corporate business system.

#### 3.1.3 REVIEW AND ACCEPTANCE PROCESS

- .1 The Project Manager will review and accept the Project Procedures Manual to ensure it complies with the required service standards and project reporting sections defined below prior to construction starting on site.



## 4 REQUIRED SERVICE STANDARDS

### 4.1 GENERAL

#### 4.1.1 CONTENT OF PROJECT PROCEDURES MANUAL

- .1 The content of the project procedures manual will be customized to meet the project specific TOR as identified in section 2. The minimum service standards are defined in this section.

### 4.2 SCOPE MANAGEMENT

#### 4.2.1 SCOPE CHANGE MANAGEMENT

- .1 Advise the project manager of any potential increase or decrease in scope that may affect project cost, schedule or quality and ensure the scope change management is addressed in the appropriate change log.

### 4.3 SCHEDULE MANAGEMENT

#### 4.3.1 REQUIREMENT

- .1 The Construction Manager shall provide a Project Planning and Control Schedule for the project, for the purpose of Planning, Scheduling, Progress Monitoring (Time Management), during all design phases and including all construction phases.
- .2 A qualified CM scheduler, with experience commensurate with the complexity of the project, is required to develop and monitor the Project Planning and Control Schedule during the design process, through construction to commissioning and close-out.
- .3 The Construction Manager shall adhere to good industry practices for schedule development and maintenance, as recognized by the Project Management Institute (PMI) and is consistent with the NPMS <http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/index-eng.html>.
- .4 PWGSC presently utilizes Microsoft Project for its current Control Systems and any software used by the consultant should be compatible with this program, using one of the many commercially available software packages.

#### 4.3.2 PROJECT SCHEDULE

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



#### 4.3.3 MILESTONES

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

#### 4.3.4 WORK PACKAGE ACTIVITIES

- .1 All work package activities will need to be developed based on:
  - .1 Project Objectives;
  - .2 Project Scope;
  - .3 Milestones;
  - .4 Meetings with the project team; and
  - .5 The Construction Manager's full understanding of the project and its processes.
- .2 Subdivide the elements down into smaller more manageable pieces that organize and define the total scope of work in levels that can be scheduled, monitored and controlled.
  - .1 This process will develop the Activity List for the project.
- .3 Each activity will describe the work to be performed using a verb and noun combination (i.e. Review Design Development Report).
- .4 These elements will become activities, interdependently linked in the Project Schedule.

#### 4.3.5 SCHEDULE REVIEW AND APPROVAL

- .1 Once the Construction Manager has identified and properly coded all the activities to the acceptance of the Departmental Representative, the activities are then sorted into a logical order and appropriate duration are applied to complete the schedule.
- .2 The Construction Manager, together with the Project Team, can then analyze the schedule to see if the milestone dates meet the project timelines and then adjust the schedule accordingly by modifying durations or changing logic.
- .3 When the schedule has been satisfactorily prepared, the Construction Manager can present the detailed schedule back to the Project Team for acceptance and application as the project baseline.
- .4 There may be several iterations before the schedule meets with the Project Team's agreement and the critical project timelines.
- .5 The final agreed version must be copied and saved as the baseline to monitor variances during the design process.

#### 4.3.6 SCHEDULE MONITORING AND CONTROL

- .1 Once Base-lined, the schedule can be better monitored, controlled and reports can be produced.
- .2 Monitoring is performed by, comparing the baseline activities completed and milestone dates to the actual and forecast dates to identify the variance and record any potential delays, outstanding issues and concerns and provide options for dealing with any serious planning and scheduling issues.
- .3 There will be several schedules generated from the analysis of the baseline schedule as outlined in the Required Services Sections of the TOR.
- .4 Each updated schedule reflects the progress of each activity to date, any logic changes, both historic and planned, projections of progress and completion indicating the actual start and finish dates of all activities being monitored.



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

#### **4.3.7 MONTHLY CONSTRUCTION SCHEDULE REPORT**

- .1 Upon review and acceptance of the draft Project Schedule, the Construction Manager is to monitor changes to the schedule at least once a month and submit written monthly reports to the Departmental Representative on any deviations from the master construction schedule.
  - .2 These monthly reports must identify not only reasons for delay but also offer suggestions, where possible, on how to bring the project back on track.
  - .3 If changes to the Schedule become necessary, indicate the impact and the reasons for such changes and submit proposed amendments to the Departmental Representative for review and acceptance.
1. The Scheduler shall provide a Project Planning and Control Schedule for the project, for the purpose of Planning, Scheduling, Progress Monitoring (Time Management), during all the design phases up to the construction procurement phase.
  2. A qualified Scheduler, with experience commensurate with the complexity of the project, is required to develop and monitor the project schedule during the design process.
  3. The Scheduler shall adhere to good industry practices for schedule development and maintenance, as recognized by the Project Management Institute (PMI).

## **4.4 COST MANAGEMENT**

### **4.4.1 GENERAL**

- .1 The following provides a general indication of the information needed by the CM cost estimator to prepare specific classifications of estimates.
- .2 These are the minimum requirements only and should be supplemented where additional information exists or is warranted.
- .3 Construction cost estimates are to be prepared and submitted to PWGSC at various stages during the design process.
- .4 In addition to the CM estimates, PWGSC will have other independent estimates performed to compare help form the overall project estimate.



#### 4.4.2 TREASURY BOARD (TB) DEFINITIONS

- .1 The Treasury Board estimate definitions are:
  - .1 Indicative Estimate;
    - .1 A low quality, order of magnitude estimate that is not sufficiently accurate to warrant TB approval as a Cost Objective.
  - .2 Substantive Estimate;
    - .1 An estimate which is of sufficiently high quality and reliability as to warrant TB approval as a Cost Objective for the project phase under consideration.
    - .2 It is based on detailed systems and component design, taking into account all project objectives and deliverables.
- .2 TB Terminology:
  - .1 Constant dollar estimate;
    - .1 This is an estimate expressed in terms of the dollars of a particular base fiscal year.
      - .1 It includes no provision for inflation.
      - .2 Cash flows over a number of fiscal years may also be expressed in constant dollars of the base year including no allowance for inflation in the calculation of costs.
  - .2 Budget-year (BY) dollar estimate:
    - .1 Budget year dollars is also be referred to as Nominal dollars or Current dollars.
      - .1 This is an estimate based on costs arising in each fiscal year of the project schedule.
      - .2 It is escalated to account for inflation and other economic factors affecting the period covered by the estimate.

#### 4.4.3 PWGSC CLASSES OF ESTIMATES

- .1 PWGSC applies a detailed, four level, classification using the terms Class A, B, C and D.
- .2 Apply these estimate classifications at the project stages as defined in the TOR.
  - .1 An Indicative Estimate shall be at least a class 'D'; and
  - .2 A Substantive Estimate shall be at least a class 'B'.
  - .3 A Tender Estimate shall be a class 'A'.

#### 4.4.4 COSTING MONITORING AND CONTROL

- .1 Provide costing and cost control services for all aspects of the Services and Work from commencement of contract award through to the completion of the Project including:
  1. During project implementation;
  2. For each Work Package at each stage of tender documents (33%, 66%, 99%);
  3. Prior to and after award of each tender package; (Review of consultants cost estimates)
  4. Monthly during the delivery of the Project;
  5. When there is any Project scope change affecting the construction estimates.



- .2 Work with the Consultant and the Departmental Representative to derive the best overall solution to meet the program requirements, Estimated Construction Cost and the Schedule. The Construction Manager is to establish a cost control program and prepare a projected cash flow for the Project, based upon reconciled estimates.
- .3 Within the limits of the Estimated Construction Cost, establish estimates for Work packages, as well as make and document assumptions for Work not yet defined. Submit to the Departmental Representative for review. Update and refine the estimates for the approval of the Departmental Representative as the development of the drawings and specifications proceeds.
- .4 The intent is to ensure that, at all times during the Project, a comprehensive construction estimate is in place, which includes all aspects of the Project, even those which are not fully developed and/or which have not yet been assigned to any specific Work package.
- .5 The Consultant may retain an independent, third party Professional Quantity Surveyor - Cost Specialist - who will have access to the same Project information, drawings and specifications as the Construction Manager. This Professional Quantity Surveyor will provide as required, back up cost estimates on a program wide basis on behalf of PWGSC. Co-operate and coordinate all budget and estimating information with PWGSC's Cost Specialist and respond to questions by the Cost Specialist. Reconcile estimates with estimates from PWGSC's Cost Specialist, to the approval of the Departmental Representative.
- .6 Discuss with the Departmental Representative and the Consultant's Cost Specialist such matters as inflation, trade settlements, market conditions, risk contingencies and the like. Such discussions shall be considered to form part of the cost estimating process. Document allowances arising as part of the cost estimates.
- .7 The Construction Manager's estimator is expected to review all information provided and to visit the Work as required throughout the course of Project, in order to become knowledgeable and familiar with the Site conditions, Site access, on-Site progress, etc. The Construction Manager's estimator shall analyze local labour and material supply conditions, local bidding practices and competition, in order to establish pricing levels. A written report detailing this reconnaissance activity is expected.
- .8 Inform the Departmental Representative and Consultant in writing immediately of any issues. Recommend actions to ensure the Project remains within the Estimated Construction Cost.
- .9 Provide timely identification and early warning of all changes that affect or potentially affect the Construction Budget. Suggest appropriate mitigating measures including proposed alternative design solutions to bring the Project back on budget.
- .10 Incorporate into cost estimating process and cost estimates information obtained from Risk Management Plan.
- .11 Provide the Consultant of the life cycle cost information for alternative materials, methods and systems. Use all available information to ensure that the Project Estimated Construction Cost (upon which design and construction decisions will be made) is respected.
- .12 Participate and provide costing for Value Engineering and studies defined in the TOR.
- .13 Relate Cost Estimates to Cash Flow: Provide and maintain a cash flow for the Work, based upon the Project Schedule and the current estimate at each stage.
- .14 No acceptance or approval by PWGSC, whether expressed or implied shall be deemed to relieve the Construction Manager of its professional or technical responsibility for



the Construction Manager's estimates and monthly reports. Neither does acceptance of an estimate by PWGSC in any way abrogate the Construction Manager's responsibility to maintain the Estimated Construction Cost throughout the life of the Project and to undertake corrective action should the lowest acceptable bid, for any Work package, differ significantly from the approved estimate.

## 4.5 QUALITY MANAGEMENT

### 4.5.1 GENERAL

- .1 The Design Consultant is responsible to establish quality control standards for execution of each part of the work through preparation and issuance of detailed draft specifications that describe acceptable materials, methods of installation, relevant testing standards and tests.
- .2 The Construction Manager is responsible to review quality control standards being proposed by the Design Consultant, and provide comment as related to standard trade practices.
- .3 Proposed revisions to quality control standards that are agreed by Design Consultant may be implemented into revised draft specifications to create the framework for Quality Management.

### 4.5.2 QUALITY CONTROL SYSTEM

- .1 The Construction Manager is responsible to identify a Quality Management System to ensure that the specified quality standards for the Project are achieved.
- .2 The Construction Manager will apply rigorous quality assurance reviews during the design and construction phases, including participation in reviews of the systems, components, construction tools and techniques of the proposed design.
- .3 The primary responsibility for construction quality control remains with the Construction Manager.
- .4 The Construction Manager will be responsible for ensuring that the Construction Manager's Subcontractors adhere to:
  - .1 Best industry practices and standards following the requirements of the Construction Documents.
  - .2 Professional conduct in all phases of the project, employing best practices for budget, schedule, quality, and scope management,
- .5 The Construction Manager's Team will work cooperatively to:
  - .1 Adopt good project delivery processes such as Risk Management and advising on methods to obtain best value
  - .2 Ensure that all Health, Security and Sustainable Development issues are properly adhered to
- .6 The Work must meet the design and operational intent and criteria.
- .7 The Construction Manager's continuous adherence to quality management of the entire construction process throughout all aspects of construction is of the utmost importance. The significance of this issue cannot be understated.
- .8 Actively document non-compliance and establish a process for correction of all non-compliant Work.
- .9 Adopt good project delivery processes such as Risk Management and advising on methods to obtain best value
- .10 Monitor and follow-up on the Work.
- .11 Do not rely solely upon the Consultant to document non-compliance with the design, but rather take a leading role in managing the Subcontractors and their Work, establishing a



- quality management database to ensure all construction issues, observations and reports are recorded and closed out, completely and correctly, to the approval of the Departmental Representative.
- .12 Establish, monitor, update and report on a quality management database specific to this Project. Inputs to the database will come from PWGSC, the Consultant team, Construction Manager's team daily Site observations, etc.
  - .13 Output from the database will go to Subcontractors and suppliers as required, the Consultant, and the Departmental Representative.
  - .14 All quality issues are to be addressed promptly, to ensure the pace of construction is maintained without the need for rework of the Work.
  - .15 The Quality Management role is responsible for:
    - .1 Day-to-day execution of the Quality Plan – architectural, mechanical, electrical and structural components and systems;
    - .2 Working with Subcontractors to explain the nature of the Quality Plan and their role in it and ensuring quality workmanship on Site;
    - .3 Maintaining quality records on Site including:
      - .1 Inspections and tests reports;
      - .2 Non-conformance reports; and
      - .3 Corrective actions reports and sign offs.
    - .4 Facilitating quality inspections by the Departmental Representative, and the Consultant
    - .5 Reporting to the Departmental Representative on the quality process for the Project.

#### **4.5.3 QUALITY CONTROL SERVICES**

- .1 The Construction Manager shall:
  - .1 Attend regular integrated design sessions with the Project Teams during the development of the design and preparation of construction document so as to advise on quality issues related to:
    - .1 Selection of materials, building systems and equipment;
    - .2 Constructability,
  - .2 Ensure suitability and durability of materials for the Work
  - .3 Coordination between all design disciplines (including architectural, structural, geotechnical, mechanical, electrical and civil),
  - .4 Provide testing services as required, which may include concrete testing, compaction testing and other testing, as specified in construction documents.
  - .5 Cost of all specified tests is to be included within the construction budget.

#### **4.5.4 QUALITY CONTROL DELIVERABLES**

- .1 The Construction Manager shall prepare the following deliverables:
  - .1 Quality Control Plan
    - .1 Prepare and submit to the Departmental Representative (within thirty (30) days of award of contract) a Quality Control Plan including, but not limited to:
      - .1 Identification and definition of key activities and deliverables
      - .2 Description of internal controls,
      - .3 Methodologies and procedures to be utilized to deliver a high quality facility
      - .4 Deliverable verification plan including commissioning strategy
  - .2 Monthly Quality Control Report



- .1 The Construction Manager shall, on a monthly basis, provide:
  - .1 An updated quality log indicating what was inspected and when, including
  - .2 What was determined to be of insufficient quality,
  - .3 Who's responsibility it is to repair,
  - .4 When the re-inspection will take place and
  - .5 Verification the work is done, including sign-off by consultant or testing agency who initially noted deficient work.

## **4.6 HUMAN RESOURCE MANAGEMENT**

### **4.6.1 GENERAL**

- .1 Construction Manager staff that have been proposed by the construction management firm are to be available for the project for its entire duration.
- .2 Construction Management staff changes, if necessary due to outside constraints are to be requested in writing to the Departmental Representative.
- .3 Resume of proposed replacement staff are to be included with request, and replacement is to have equivalent experience or more.

### **4.6.2 ROLES AND RESPONSIBILITIES**

- .1 Provide names and summary resumes of all CM staff. This can be reproduced from the RFP proposal.
- .2 Provide an organizational chart to illustrate roles and responsibilities.

## **4.7 COMMUNICATIONS MANAGEMENT**

### **4.7.1 GENERAL**

- .1 Construction Manager and all construction staff, including contractors and sub-contractors are to have no communication with print, television or radio media.
- .2 The client has a communications protocol, and all requests from the media are to be directed to the Departmental Representative, who will then forward the request to the Client's project representative.

### **4.7.2 PROJECT COMMUNICATION**

- .1 Construction Manager is to communicate with the Departmental Representative on all issues relating to the project.
- .2 Construction Manager's communications with Design Consultant are to be carbon copied to the Departmental Representative.
- .3 Construction Manager's approved communications with Client's Facility Manager are to be carbon copied to the Departmental Representative.
- .4 Communication issues which may impact the project progress should be identified in the monthly report.



## 4.8 RISK MANAGEMENT

### 4.8.1 CONTEXT

- .1 The CM's services will include Risk Management. The CM shall develop a Risk Management Plan (RMP) in a format acceptable to the Departmental Representative and report on Risk in the Project Procedures Manual and the monthly reports. The RMP must identify risk allowances for schedule and cost for each risk.
- .2 All risk shall be evaluated monthly. If the Risk event does not occur, the risk shall be removed from the RMP. Conversely, if a new risk materializes, this should be added to the report. Assess as a minimum the risk factors noted below.
- .3 The Construction Manager is to provide support to the Departmental Representative in identifying risks throughout the Project life cycle, providing input and assessment of the Project risk plan (<http://publiservice-app.tpsgc-pwgsc.gc.ca/forms/pdf/189.pdf>).
- .4 The Construction Manager is to provide the Departmental Representative written comment on the Project risk plan at each stage of the Project.
- .5 The Construction Manager shall:
  - .1 Review, comment and advise on the PWGSC Risk Management Plan
  - .2 Participate in project risk management sessions organized by the Departmental on a semi -annual basis (2 times per year).
  - .3 Advise on Project Risks specific to the project and recommend mitigation options to the Departmental Representative;
  - .4 Advise on issues of risk that integrate project planning with procurement planning and construction.
  - .5 Model Risk Management on this project using the model described in <http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/conn-know/risque-risk/index-eng.html>
  - .6 Identify and implement methodologies aimed at mitigating and minimizing the impact of construction activities on the community where the Work is during construction;
  - .7 Implement a claims avoidance program.

### 4.8.2 RISK MANAGEMENT DELIVERABLES

- .1 The Construction Manager is to submit a monthly report on Project Risks to the Departmental Representative.
- .2 The report shall contain the following:
  - .1 Risk tracking log showing mitigation measures
  - .2 Documentation on risk mitigation activities
  - .3 Documentation on risks that are no longer appropriate.
  - .4 Documentation on New Risks
  - .5 Results of Risk Workshops



## 4.9 PROCUREMENT MANAGEMENT

### 4.9.1 GENERAL

- .1 The Construction Manager is to follow the TOR requirements with respect to tendering procedures and minimum requirements.

### 4.9.2 SUB-CONTRACT PROCUREMENT

- .1 The Construction Manager will deliver the construction services called for in the Terms of Reference and section 1.3 of this GP&S.
- .2 As an independent entity, the Construction Manager will select its own subcontractors through processes that are fair, open and transparent and that all qualified subcontractors have the opportunity to be considered for the construction Work.

### 4.9.3 SUB-CONTRACT DELIVERABLE

- .1 In subcontracting for the construction the Construction Manager shall submit a procurement strategy with each proposed work package.
- .2 The CM shall periodically review and recommend changes to the proposed work packages.
- .3 The CM shall define the method of procurement for each work package and will obtain the approval of the PM.
- .4 The CM will manage the subcontracts as defined in section 5 Construction Administration including:
  - .1 Manage subcontractors and ensure they provide the required services in a manner consistent with the terms and conditions of this Contract and achieve timely delivery of quality services at the lowest cost;
  - .2 Establish quality and performance requirements and monitor subcontractor performance, including quality of deliverables, adherence to schedules and costs;
  - .3 Provide for dispute resolution, initiation of subcontract amendments and payments; and
  - .4 Respond diligently to any industry or PWGSC enquiries concerning the awarding of subcontracts and inform the Departmental Representative of any unresolved enquiries in a timely manner.
- .5 The CM will recommend changes and will monthly manage the change order log.
- .6 The CM is responsible for all claims resulting from their subcontracts; the CM will maintain a claims log.



## 4.10 SAFETY MANAGEMENT

### 4.10.1 GENERAL

- .1 The Construction Manager is confirmed to be Prime Contractor, or equivalent designation as stipulated by the Provincial Occupational Health and Safety legislation for location where construction Work takes place and is responsible for control of the site.
- .2 The Construction Manager is responsible to adhere to federal legislation as stipulated in Canada Labour Act where applicable.

### 4.10.2 SAFETY MANAGEMENT DELIVERABLES

- .1 The Construction Manager will manage safety using deliverables and reports, as listed:
  - .1 Advance Notice of Project
  - .2 Site Safety Plan
  - .3 Site Specific Safety Plan
  - .4 Designated/hazardous substances Safety Codes of Practice, when applicable
  - .5 Subcontractor(s) Site Specific Safety Plan
  - .6 Subcontractor Safety Acknowledgement
  - .7 Subcontractor Orientation Record
  - .8 Daily Task Hazard Assessments
  - .9 Weekly Safety Site Inspection
  - .10 Weekly Tool Box Meetings
  - .11 Monthly Construction Manager Site Safety Inspection

## 4.11 SECURITY MANAGEMENT

### 4.11.1 SECURITY CLEARANCE REQUIREMENTS

- .1 Follow the specific direction in the TOR

### 4.11.2 SECURITY OF SITE REQUIREMENTS

- .1 Follow the specific direction in the TOR



## 4.12 ENVIRONMENTAL MANAGEMENT

### 4.12.1 CEAA PROJECT MITIGATIONS

- .1 The Construction Manager is to manage the construction Work within environmental legislation, and as interpreted by environmental limitations stipulated by Environmental Consultant, as described in construction documents.
- .2 Limitations on construction imposed by environmental constraints are to be respected and included in construction Work, and are not to be seen as justification for extra work.
- .3 Mitigations required due to construction activities, which are in themselves impacting on the environment, are to be implemented without delay following the noted construction activity.

### 4.12.2 SUSTAINABILITY AND ENVIRONMENTAL RESPONSIBILITY

- .1 The Consultant will incorporate sustainability requirements into the design.
- .2 The Construction Manager will provide:
  - .1 Advice on the source and availability of regional materials and materials with recycled content, including on-site verification of same
  - .2 A comprehensive waste management program for the Work and fit-up;
  - .3 Site verification related to the use of acceptable materials, compiling and verifying MSDS sheets and WHMIS information; and
  - .4 Monitoring and testing for building energy performance as well as indoor air quality during building operations
  - .5 Develop and maintain a sustainable development strategy with responsibilities for each sub contractor and supplier maintained.

### 4.12.3 WASTE MANAGEMENT

- .1 The Construction, Renovation, and Demolition (CRD) Non-hazardous Solid Waste Management Protocol to which PWGSC is bound, provides direction on the undertaking of non-hazardous solid waste management actions on projects.
  - .1 The protocol is designed to meet the federal requirements, provincial/territorial policies and the objectives of the PWGSC Sustainable Development Strategy (SDS).
- .2 The contractor must implement a solid waste management program.
- .3 Contractors must be instructed to plan for extra project time when implementing CRD waste diversion initiatives.
  - .1 Added labour costs can be recuperated and waste management costs savings can be achieved through reduced tipping fees, avoided haulage costs, and the sale of reusable and recyclable materials.

### 4.12.4 CM RESPONSIBILITIES

- .1 Research and investigate hazardous waste disposal strategies in context of the project and make recommendations.
- .2 Include in the contract documents, a requirement for the contractor to develop a waste reduction and management plan during the construction of this project.
- .3 Identify, on the site plan where large (garbage) bins shall be stored, as well as easy disposal truck access/exit to/from same, to assist the Contractor in reducing waste or re-cycling of materials on and off site.

### 4.12.5 WASTE REDUCTION WORK PLAN

- .1 The Construction Manager shall:
  - .1 Prepare and submit to the Departmental Representative for review and acceptance, a Waste Reduction Work Plan



- .2 Prepare the Plan in accordance with the requirements outlined in Division 01 in the Construction Management Agreement,
- .3 Ensure that the Plan is in compliance with PWGSC guidelines and meets the requirements of local authorities having jurisdiction,
- .4 Clearly outline the strategy and methodology for optimizing solid waste diversion from landfill and disposing of toxic or hazardous materials in the most appropriate manner.
- .5 Include all related schedules outlining expected inventory targets and results required when waste audits are conducted through reduction, reuse and recycling including.
  - .1 Requirements for sorting construction waste on site by types,
  - .2 A description of the most practical manner for recycling each individual material
- .6 Develop specific procedures for conducting waste management audits on site, including audit objectives, frequency and format. Prepare written monthly reports containing records of waste disposal efforts, including:
  - .1 A review of the implementation strategy;
  - .2 A review of subcontractors disposal practices for paints, solvents and pressure treated wood scraps and other similar products or materials;



## 5 PROJECT REPORTING

### 5.1 TECHNICAL REPORTS

#### 5.1.1 PURPOSE

- .1 This section provides direction and standards for the preparation of reports delivered to PWGSC during all the various stages of project delivery and for specific services such as investigations, studies, analysis, strategies, audits, surveys, programs, plans, etc.
- .2 Technical Reports are official government documents, which are typically used to support an application for approval or to obtain authorization or acceptance and as such they must:
  - .1 Be complete, clear and professional in appearance and organization, with proper reference to related parts and contents in the report
  - .2 Clearly outline the intent, objectives, process, results and recommendations,
  - .3 Present the flow of information and conclusions in a logical, easy to follow sequence
  - .4 Be in written narrative, graphic, model (traditional and / or computer generated), and photographic format, which can be web enabled.
  - .5 Ensure that all pages are numbered in sequence
  - .6 Be printed double-sided, if hard copies are produced

#### 5.1.2 STANDARDS FOR PWGSC TECHNICAL REPORTS

- .3 Standard practice for the organization of technical reports requires:
  - .1 A cover page, clearly indicating the nature of the report, the date, the PWGSC reference number and who prepared the report
  - .2 A Table of Contents
  - .3 An Executive Summary
  - .4 The body of the report is to be structured such that the reader can easily review the document and locate, respond to and /or reference related information contained elsewhere in the report.
  - .5 Appendices to be used for lengthy segments of the report, supplementary and supporting information and / or separate related documents
- .4 The report content must:
  - .1 Ensure that the executive summary is a true condensed version of the report following the identical structure, including only key points and results / recommendations requiring review and / or approval.
  - .2 Use a proper numbering system (preferably legal numbering), for ease of reference and cross-reference.
  - .3 The use of 'bullets' is to be avoided.
  - .4 Use proper grammar, including using complete sentences, in order to ensure clarity, avoid ambiguity and facilitate easy translation into French, if required.
  - .5 The use of undefined technical terms, industry jargon and cryptic phrases are to be avoided.
  - .6 Be written as efficiently as possible, with only essential information included in the body of the report and supporting information in an appendix if needed.



## 5.2 PROJECT PROCEDURES MANUAL

### 5.2.1 GENERAL

- .5 The Project Procedures manual is the first deliverable and is considered a technical report.

## 5.3 MONTHLY REPORTS

### 5.3.1 GENERAL

4. Status Reports shall be issued by the CM monthly during the entire project.

### 5.3.2 DESIGN STAGE REPORTS

5. While project is only in Design Stages, the monthly report should include the following information:
  - .1 Outstanding issues
  - .2 Schedule
  - .3 Description of Variances from Approved Schedule
  - .4 Plan to accelerate Schedule (if required).
  - .5 Cost Estimate
  - .6 Description of Variances from Approved Cost Plan
  - .7 Plan to implement Cost Control (if required)
  - .8 Cash Flow
  - .9 Description of Variances from Approved Cash Flow
  - .10 Risk Management Plan
  - .11 Description of Variances from Previous Plan
  - .12 Status Report
  - .13 Updated Quality Log.

### 5.3.3 CONSTRUCTION STAGE REPORTS

6. While project is under Construction, the monthly report shall include the following information:
  - .1 Outstanding issues – this will include a narrative of what was accomplished in the previous month and what is planned for the coming month including key progress photographs.
  - .2 Schedule
  - .3 Description of Variances from Approved Schedule
  - .4 Plan to accelerate Schedule (if required).
  - .5 Cost Estimate
  - .6 Description of Variances from Approved Cost Plan
  - .7 Plan to implement Cost Control (if required)
  - .8 Cash Flow
  - .9 Description of Variances from Approved Cash Flow
  - .10 Risk Management Plan
  - .11 Description of Variances from Previous Plan
  - .12 Status Report
  - .13 Log of all Packages Awarded to Date with Costs
  - .14 Change Log – including all contemplated change notices and approved change orders
  - .15 Site Instruction Log – including all site instructions issued by consultants.



- .16 Request for Information Log – including all RFI's sent to consultants, returned with responses from consultants, and log of contractors that RFI's were issued to.
- .17 Shop Drawing Log – including all shop drawings listed in specifications, and required submission dates from contractors, such that normal review time by Construction Manager and consultant, along with expected manufacture and delivery times allow for equipment or material to be delivered to site in advance of its required implementation into the construction schedule
- .18 Updated Quality Control Log: The updated quality log should indicate what was inspected and when, what was determined to be of insufficient quality, who's responsibility it is to repair, when the re-inspection will take place and verification the work is done.
- .19 Lessons Learned Log

## 5.4 MINUTES

1. Prepare meeting agenda and minutes for the two sets of bi-weekly meetings during design and construction.
2. Prepare meeting agenda and minutes for Commissioning meetings.

## 5.5 PHOTOGRAPHIC RECORD

The CM is responsible for progressively submitting a digital photographic record of the progress of construction.

## 5.6 CONSTRUCTION RECORD

- .1 Minimum construction record standard is defined in section 7.

## 5.7 COST

### 5.7.1 COSTING SERVICES REPORT

- .1 Costing report format and detail is of critical importance to this project  
The Construction Manager shall prepare a draft cost report and submit to the Departmental Representative for review and acceptance within 10 weeks of contract award to establish the content and format of the monthly reports going forward. Revise as required incorporating comments of the Departmental Representative. The draft report will include the initial breakdown of the construction budget identifying a budget for each tender package, the Construction Management fees and a single separate line for the construction contingency.
- .2 Submit costing information in the monthly report to include the following:
  - .1 Costing activities during the previous month,
  - .2 Costs committed and expended to date,
  - .3 Identify for each Work package, the original estimate amount, the approved budget, the contract amount, the contingency, the breakdown and total of approved change orders, estimated amounts on contemplated change orders, the revised contract amount, the total cost anticipated and the variance to complete the Project. This shall be presented in a table format.



- .4 Highlighting any areas of concern and new information received etc.,
- .5 Forecast and proposed construction estimate revisions and changes to construction contingencies.
- .6 Include as separate cost categories, the Construction Manager's fixed fee and percentage fee
- .7 Narrative;
- .8 Elemental or other format Estimate Summary;
- .9 Estimate Back-up Detail;
- .10 Basis for escalation, inflation and contingency calculations;
- .11 Detailed measurement and pricing;
- .12 Outline description of estimate basis;
- .13 Description of information obtained and used in the estimate.
- .14 Listing of notable exclusions; listing of items/issues carrying significant risk;
- .15 Reconciliation against last submission;
- .16 Cash Flow updates
- .17 An exception section including sufficient description and cost detail to clearly identify:
  - .1 Scope Change: Identifying the nature, reason and total cost impact of all identified and potential Project scope changes affecting the Estimated Construction Cost.
  - .2 Cost overruns and under runs: Identifying the nature, the reason and the total cost impact of all identified and potential cost variations.
  - .3 Options enabling a return to the Estimated Construction Cost: Identifying the nature and potential cost effects of all identified options proposed to return the Project within Estimated Construction Cost.
- .18 Cost of forecasted final subcontract amounts
- .19 Changes in construction contingency

## **5.8 CLOSE OUT DOCUMENTS**

### **5.8.1 LESSONS LEARNED**

- .1 The CM will participate with the team in a lessons learned process.

### **5.8.2 O AND M MANUAL**

- .1 Refer to Section 7 for minimum standards.

### **5.8.3 AS-BUILTS**

- .1 The CM is responsible for progressively submitting all changes to the consultant who has been commissioned to prepare the digital record as-built documents.



## 6 DIVISION ONE

### 6.1 GENERAL REQUIREMENTS

#### 6.1.1 CM RESPONSIBILITIES

- .1 The CM is responsible for the content of Division One for all subcontracts. To ensure consistency to NMS standards, the consultant has been retained to prepare Division One for the CM following the CM's direction.

#### 6.1.2 DIVISION 01 REQUIREMENTS

1. The General Requirements specification is intended as a guide for preparation of individual tender package specific General Requirements specifications. The specification listing will follow the National Master Specification numbering. The design content of individual tender packages will be different for each assignment, and not all of the listed General Requirements may be relevant or required.
2. The CM will maintain a spreadsheet of all costs related to division one.



## 7 CONSTRUCTION ADMINISTRATION

### 7.1 CODES, ACTS, STANDARDS, REGULATIONS

#### 7.1.1 GENERAL

1. The Codes, Acts, Standards and Guidelines listed in the following articles, may apply to this project. The CM is responsible for ensuring the latest edition is applied.
2. In all cases the most stringent Code, standard and guideline shall apply.

#### 7.1.2 PWGSC DOCUMENTS AVAILABLE FROM PWGSC PROJECT MANAGER:

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

#### 7.1.3 CODES AND REGULATIONS:

1. The NRC National Building Code of Canada 2010;
2. The NRC National Fire Code of Canada, 2010;
3. The NRC National Plumbing Code of Canada 2010;
4. The NRC Model National Energy Code for Buildings 2011;
5. CSA C22.1-09, Canadian Electrical Code Part I Safety Standard for Electrical Installations and CE Code Handbook. Amendments for Provinces;
6. Canadian Code for Preferred Packaging;
7. National Electrical Manufacturers Association (NEMA);
8. Electrical and Electronic Manufacturers' Association of Canada (EEMAC);
9. American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) - ANSI/IEEE C62.41-1991, Surge Voltages in Low-Voltage AC Power Circuits;
10. American Society for Testing and Materials (ASTM);
11. ASTM F 1137-00(2006), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners;
12. The Canada Labour Code;
13. <http://laws.justice.gc.ca/en/L-2/>
14. The Canada Occupational Health and Safety Regulations;
15. <http://laws.justice.gc.ca/eng/SOR-86-304/index.html>
16. All other Territorial and Municipal Acts, Codes, By-laws and regulations appropriate to the area of concern.

#### 7.1.4 STANDARDS AND GUIDELINES PRODUCED BY THE GOVERNMENT OF CANADA:



1. Standards and Directives of the Treasury Board (TB):
    - .1 <http://www.tbs-sct.gc.ca/pol/index-eng.aspx?tree=standard>
    - .2 <http://www.tbs-sct.gc.ca/pol/index-eng.aspx?tree=directive>
    - .3 And including;
      - .1 Accessibility Standard for Real Property,  
<http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=12044>
      - .2 Fire Protection Standard.  
<http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316>
  2. Labour Canada's, Fire Commissioner of Canada Standards;
    - .1 [http://www.hrsdc.gc.ca/eng/labour/fire\\_protection/policies\\_standards/commissioner/index.shtml](http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/index.shtml).
    - .2 And including,
      - .1 FC-301 Standard for Construction Operations, June 1982,
      - .2 FC-302 Standard for Welding and Cutting, June 1982,
      - .3 FC-311 Standard for Record Storage, May 1979.
      - .4 FC-403 Fire Protection Standard for sprinkler Systems, November 1994
  3. The Standards and Guidelines for the Conservation of Historic Places in Canada
    - .1 [www.historicplaces.ca](http://www.historicplaces.ca);
  4. Labour Canada's, Technical Documents;
    - .1 [http://www.hrsdc.gc.ca/eng/labour/fire\\_protection/policies\\_standards/guidelines/index.shtml](http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/guidelines/index.shtml)
    - .2 And Including,
      - .1 Fire Protection for Information Technology Facilities and Equipment.
  5. Canadian Food Inspection Agency's Containment Standard for Facilities Handling Plant Pests.
  6. Public Health Agency of Canada's Laboratory Biosafety Guidelines, 3<sup>rd</sup> Edition,
  7. Canadian Council of Animal Care's Guidelines on: Laboratory Animal Facilities – Characteristics, Design and Development.
- 7.1.5 HEALTH CANADA STANDARDS AND GUIDELINES:**
1. Guidelines for Canadian Drinking Water Quality – Sixth Edition – 1996;
  2. Guidelines for Canadian Drinking Water Quality – Summary Table – Dec 2010;
  3. Guidance for Providing Safe Drinking Water in Areas Of Federal Jurisdiction – Version I – 2005;
  4. The Canadian Council of Ministers of the Environment (CCME) ;
  5. Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (CCME, 2003);
  6. Canada – Wide Strategy for the Management of municipal Waste Water Effluent;
  7. The Canadian Environmental Protection Act (CEPA, 1999);
  8. The Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, published in Canada Gazette Part II on June 12, 2008 (Registration SOR/2008-197).
- 7.1.6 STANDARDS AND GUIDELINES:**
1. Air Conditioning and Refrigeration Institute (ARI);
  2. American Conference of Governmental Industrial Hygienists (ACGIH, Industrial Ventilation Handbook);
  3. Air Diffusion Council (ADC);
  4. Air Movement and Control Association (AMCA);



5. American Association of State Highway and Transportation Officials (AASHTO) Standards
6. American National Standards Institute (ANSI);
7. ANSI/AIHA Z9.5, Laboratory Ventilation;
8. .1 ANSI/NEMA C82.1-04, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast;
9. .2 ANSI/NEMA C82.4-02, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps;
10. ANSI/TIA/EIA-606- Administration Standard for the Telecommunications Infrastructure of Commercial Buildings;
11. ANSI Z358.1, Emergency Eyewash and Shower Equipment;
12. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), including but not limited to;
  - .1 ASHRAE Laboratory Design Guide,
  - .2 ASHRAE Standards and Guidelines,
  - .3 ASHRAE Applications Handbook – 2007,
  - .4 ASHRAE HVAC Systems and Equipment Handbook – 2008,
  - .5 ASHRAE Fundamentals Handbook – 2009,
  - .6 ASHRAE Refrigeration Handbook – 2010,
  - .7 ASHRAE 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size – 2007,
  - .8 ANSI/ASHRAE 55, Thermal Environmental Conditions for Human Occupancy – 2004,
  - .9 ANSI/ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality – 2010,
  - .10 ASHRAE 90.1, Energy Efficient Design of New Buildings – 2010,
  - .11 ASHRAE 105: Standard Method of Measuring and Expressing Building Energy Performance,
  - .12 ASHRAE 110, Method of Testing Performance of Laboratory Fume Hoods,
  - .13 ASHRAE 111; Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC&R Systems,
  - .14 ASHRAE 114; Energy Management Control Systems Instrumentation, and
  - .15 ASHRAE 135; BACnet: A Data Communication Protocol for Building Automation and Control Networks.
13. Asphalt Institute Standards for Hot Mix;
14. American Society of Mechanical Engineers (ASME);
15. American Society for Testing and Materials (ASTM);
16. American Water Works Association (AWWA) Standards;
17. American Welding Society (AWS);
18. Associated Air Balance Council (AABC);
19. Canadian Standards Association;
20. CSA A23.3-04 (2010) Design of Concrete Structures;
21. CSA B51-09 Boiler, pressure vessel and pressure piping Code;
22. CSA B52-05 Mechanical Refrigeration Code;
23. CSA B64-01 Backflow Preventers and Vacuum Breakers;
24. CSA B139-09 Installation Code for Oil Burning Equipment;
25. CSA B149.1-10 Natural Gas and Propane Installation Code;
26. CSA B651-04 Accessible Design for the Built Environment;
27. CSA C22.2 No. 41-07 Grounding and Bonding Equipment;
28. CSA S16-09 Design of Steel Structures;



29. CSA Z204-1994 Guideline for Managing Indoor Air Quality in Office Buildings;
30. CSA Z320-11 Building Commissioning Standard & Check Sheets;
31. CSA Z316.5-94, Fume Hoods and Associated Exhaust Systems;
32. CAN/CSA-23.1-04 and CAN/CSA-A23.2-04 Concrete materials and methods of concrete construction; and Methods of test and standard practice for concrete CAN/CSA-C22.2 No. 214-94 "Communications Cables";
33. CAN/CSA-C22.3 No.3-[98(R2007)], Electrical Co-ordination;
34. CAN/CSA-B651-04(R2010), Accessible Design for the Built Environment;
35. CAN3 C235-[83(R2010)], Preferred Voltage Levels for AC Systems, 0 to 50,000 V;
36. CAN/CSA-T528-93, "Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings", Canadian Standards Association;
37. CAN/ULC – S524-06 Standard for the Installation of Fire Alarm Systems;
38. CAN/ULC – S537-04 Fire Alarm System Verification Report;
39. CAN/ULC – S102-07 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies;
40. CAN/ULC – S102.2-07 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies  
CAN/ULC S112-M90 (R2001) Standard Methods of Fire Test of Fire-Damper Assemblies;
41. CAN/ULC S115-05 Standard Method of Fire Tests of Fire stop Systems;
42. International Mechanical Code – Latest Version;
43. Institute of Boiler and Radiation, Hydronic Institute (IBR);
44. Manufacturers Standardization Society of Valve and Fitting Industry (MSS);
45. National Fire Protection Association (NFPA), including;
  - .1 NFPA 10; Standard for Portable Fire Extinguishers – 2010,
  - .2 NFPA 13; Standard for Installation of Sprinkler Systems – 2010,
  - .3 NFPA 14; Standard for Installation of Standpipe and Hose Systems – 2010,
  - .4 NFPA 24: Standard for the Installation of Private Fire Service Mains and Their Appurtenances-2010,
  - .5 NFPA 30; Flammable and Combustible Liquids Code,
  - .6 NFPA 45; Standard on Fire Protection for Laboratories Using Chemicals,
  - .7 NFPA 1142: Standard on Water Supplies for Suburban and Rural Fire Fighting-2007.
46. SEFA 1.2, Scientific Equipment & Furniture Association;
47. Sheet Metal and Air Conditioning Contractors National Association (SMACNA);
48. Transportation Association of Canada (TAC) Guide for Canadian Roads;
49. Manual of Uniform Traffic Control Devices (MUTCD);
50. Telecommunications Industry Association (TIA);
  - .1 Commercial Building Telecommunications Cabling Standard TIA/EIA-568,
    - .1 Part 1: General Requirements, TIA/EIA-568-B.1,
    - .2 Part 2: Balanced Twisted Pair Cabling Components, TIA/EIA-568-B.2,
    - .3 Addendum 1 - Transmission Performance Specification for 4-pair 100 Ohm Category 6 Cabling, TIA/EIA-568-B.2-1,
    - .4 Optical Fibre Cabling Components Standards, TIA/EIA-568-B.3.
  - .2 ANSI/TIA/EIA-569-A Commercial Building Standards for Telecommunications pathways and spaces,
    - .3 Pathways and Spaces, ANSI/TIA/EIA-569-B,
    - .4 Telecommunications Infrastructure Standard for Data centers TIA-942,



- .5 J-STD-607-A Commercial Building Grounding and - Bonding Requirements for Telecommunications.

51. Underwriters' Laboratories of Canada (ULC);

52. ULC/CSA Approval is required for all electrical and mechanical equipment.

#### **7.1.7 STANDARDS AND GUIDELINES FOR TRANSPORTATION**

1. Canadian Highway Bridge Design Code

2. Transportation Association of Canada - Manuals, Guides and Handbooks.

### **7.2 CONSTRUCTION WORK**

#### **7.2.1 GENERAL**

1. During The Construction Stage, The Construction Manager Shall:

- .1 Fulfill the obligations as Constructor, responsible for all Sub trade Contractors, Suppliers and any maintenance or operational requirement contractors that require access to the site; and "Constructor" in accordance with the Provincial Health and Safety Act

.2 Maintain on a current basis and make available to the Departmental Representative, all construction related documents, including:

- .1 The daily log;
- .2 Records of all project contracts and drawings,
- .3 Maintain a photographic record of site progress
- .4 Include a site web cam to monitor project progress
- .5 Copies of all project related correspondence,
- .6 Samples, purchases, materials and equipment,
- .7 All data from subtrades
- .8 Maintenance instructions and operating manuals and
- .9 A current set of project record documents for the purpose of recording all approved changes that occur during construction and for completing as-built documents

2. When construction Work is duly authorized by Canada and assigned to the Construction Management agreement, the Construction Manager shall:

- .1 Be responsible for the development, coordination and management of all work and services included in Division 01.
- .2 Ensure the provision of all necessary equipment to the Project and all other resources required to perform these duties and services;
- .3 Procure, coordinate, administer and manage all construction work and contracts in a holistic fashion;
- .4 Prepare and execute contracts with the successful Sub trades so as to:
  - .1 Coordinate and manage the respective contracts in an integrated manner to avoid any conflicts between the Work of the Construction Manager's Own Forces and the Work of the Construction Manager's Sub trades.
  - .2 Coordinate, manage and complete all the Work of each Subtrade tender package in strict adherence to the accepted drawings and specifications of each tender package, including all addenda and authorized change orders.
  - .3 Deliver the Work Packages by the agreed upon completion dates
- .5 Develop and implement a procedure for review, certification, processing and payment of



Subtrades in accordance with the terms and conditions of the Construction Management Agreement.

- .6 Schedule and conduct progress meetings at which Subtrades, PWGSC and the Construction Manager can jointly discuss such matters as procedures, progress, problems, risks and scheduling.
- .7 Provide timely response to correct issues, as they occur

### 7.2.2 CONSTRUCTION MONITORING

1. Monitor the Work of the Subcontractors and coordinate the Work with the activities and responsibilities of all subcontractors and suppliers, PWGSC, Consultant and Construction Manager.
2. Maintain competent full-time supervisory, quality management and field engineering staff on Site during implementation of the Work to monitor and provide general direction to all those associated with the Work for all work shifts as required. Identify unacceptable Work early to avoid delays that might arise as a result of required corrections of deficient Work. Ensure that comprehensive quality management processes are followed daily. Ensure that adequate back-up personnel are available.
3. Maintain a daily logbook. The daily log will include all activities on the Site. Document and verify quantities of materials received and record Work progress through daily photographs and narrative reports. All log entries and reports are to be made available on the project web site. Record the following:
  - .1 Weather conditions, particularly unusual weather relative to Work in progress,
  - .2 Material and equipment deliveries,
  - .3 Daily activities and major Work done through all shifts of Work,
  - .4 Start, stop or completion of activities through all shifts of Work,
  - .5 Presence of inspection and testing firms, tests taken, results, etc.,
  - .6 Unusual Site conditions experienced,
  - .7 Digital Photographic record of key construction progress
  - .8 Significant developments, remarks, email or other correspondence, etc.,
  - .9 Reports, instructions from appropriate authorities response actions,
  - .10 Strength on-Site by each Subcontractor and the Construction Manager;
  - .11 Safety inspections and reports; and
  - .12 If work is based on unit prices, measure and record the quantities for verification of monthly progress claims and the Final Certificate of Measurement.
4. Monitor progress on site and ensure coordination of trades.
  - .1 Establish on-Site organization and lines of authority in order to carry out the overall plans of the Construction Manager and PWGSC;
  - .2 Recommend to the Departmental Representative for comments, acceptance, or rejection the procedures for coordination among occupants, PWGSC Project and operations staff, the Consultant, Subcontractors, and suppliers and the Construction Manager with respect to all aspects of the Project. Implement approved procedures;
  - .3 To meet the Project Schedule completion, the Construction Manager and all
  - .4 Subcontractors may be required to perform the Work, as required, on a twenty- four hour day, seven days per week basis.
  - .5 Schedule and conduct progress meetings at which Subcontractors, PWGSC, Consultant and Construction Manager who can discuss jointly such matters as procedures,



- progress, problems, risks, costs and scheduling;
- .6 Provide daily monitoring of the Schedule as the Work proceeds;
  - .7 Complete the Work according to the accepted construction documents, Project
  - .8 Schedule and Project Estimated Construction Cost;
  - .9 As part of a comprehensive quality management process, provide daily inspection of all aspects of the Work, documenting matters for action or follow-up by Subcontractors, or referral to the Consultant. Ensure the Work is constructed as specified. Use photographs to document issues and their correction;
  - .10 Monitor and document progress of any specialized contractors and suppliers to ensure their actions on the Site do not compromise the Work. Refer any issues and related documentation (report with photographs) immediately to the Departmental Representative;
  - .11 Review the adequacy of the Subcontractors personnel and equipment and availability of material and supplies to meet the Schedule. Implement remedial action when requirements of a subcontract or the Project Schedule are not being met;
  - .12 Prepare and maintain a decision log recording all decisions affecting Schedule, construction estimates, scope, or quality, including dates, place, and participants.
  - .13 These records are to be made available to PWGSC at all times;
  - .14 Monitor and document all health and safety matters daily; and
  - .15 Monitor and document deliveries of all specialized components or equipment to the Site.

### 7.2.3 SUBCONTRACTOR CHANGES

1. When a change to a subcontract is identified on site, the Consultant shall prepare and issue a contemplated change notice (CCN). The Construction Manager shall prepare an indicative cost estimate and submit to the Departmental Representative and the Consultant for review.
2. The consultant will review the indicative cost estimate prepared by the Construction Manager and provide the Departmental Representative with a recommendation of its reasonableness. The Departmental Representative will be responsible for authorizing the change based on the indicative cost estimate and the reasonableness of the estimate, and request that the Construction Manager obtain firm pricing for it. If the indicative cost estimate provided by the Construction Manager is not accepted by the Departmental Representative, the Construction Manager will issue the change to the subcontractor as a CCN to obtain exact pricing before the Departmental Representative will consider approval of the change.”
3. Upon acceptance of the quote, a change order is prepared and issued by the Construction Manager to the Subcontractor, with a copy to the Consultant and Departmental Representative.
4. A detailed log of the cost of forecasted final subcontract amounts, changes in construction contingency that may result, change notices and change orders is to be maintained by the Construction Manager for all subcontracts, at all times throughout the Project. A copy of this log is to be included in the monthly report.

### 7.2.4 PERMIT AND APPROVALS

- .1 Make application for, pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that



work conforms to requirements of Authority having jurisdiction. The Construction Manager will be responsible for coordinating, paying for and obtaining all permits and approvals from local and statutory authorities and shall:

1. Liaise with local and statutory authorities with respect to hoarding, traffic restrictions, services and associated diversions and/or connections.
2. Inform PWGSC of their requirements to inform any statutory body via applications or orders.
3. Ensure that all applications are filed and executed successfully.
4. Verify that all necessary approvals have been obtained.

### **7.2.5 SITE REVIEWS**

- .1 The Construction Manager shall:
  - .1 Arrange with the Departmental Representative for the issuance of necessary forms respecting substantial and final completion of the work;
  - .2 Provide Project Team of the inspection schedule and updates
  - .3 Prepare lists of incomplete and deficient items;
  - .4 Schedule completion of these items with the Sub trades and distribute all lists as appropriate;
  - .5 Distribute substantial and final completion certificates.

### **7.2.6 PROJECT SITE DOCUMENTS**

- .1 The Construction Manager shall:
  - .1 Maintain at the Project Site, on a daily basis, records of all necessary contracts, samples, purchases, materials, equipment, maintenance and operating manuals and instructions, and other Work related documents, including revisions.
  - .2 Maintain records of Site Safety Training.
  - .3 Maintain and post all permits.

### **7.2.7 SHOP DRAWINGS**

1. The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Departmental Representative approves the detail design inherent in shop drawings, responsibility for which shall remain with Contractor or Subcontractor submitting same, and such review shall not relieve Contractor or Subcontractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of Contract Documents. Shop drawings shall be stamped: "Checked and Certified Correct for Construction" by the Construction Manager and stamped: "reviewed" by the Consultant before returning to the subcontractor.
2. The Construction Manager shall:
  - .1 Submit for the Departmental Representative's review, ten (10) copies of each shop drawing or in digital form.
  - .2 Review, discuss, record problems and identify agreed remedial action.
  - .3 Monitor and record the progress of shop drawing review. Record parties designated for action and follow up.
  - .4 On completion of project, forward reviewed shop drawings to the Departmental representative.
  - .5 Verify that shop drawings include the project number and are recorded in sequence.



- .6 Verify the number of copies of shop drawings required.
- .7 Do not commence manufacture or order materials before shop drawings are reviewed.
- .8 Shop drawing submissions and approval time frames should be noted on the project schedule and in the monthly reports
- .9 Impact of delays in reviewing and approving shop drawings should be identified in the Risk Management planning.

### 7.2.8 OPERATIONS AND MAINTENANCE MANUALS

- .1 Two (2) weeks prior to any scheduled training, submit to Departmental Representative four (4) copies of approved Operations Data and Maintenance Manual in both hard copy and electronically and in official languages compiled as follows:
  1. Bind hard copy data in vinyl hard cover 3 "D" ring type loose leaf binders for 212 x 275 mm size paper. Binders must not exceed 75 mm thick or be more than 2/3 full.
  2. Enclose title sheet labeled "Operation Data and Maintenance Manual," project name, date and list of contents. Project name must appear on binder face and spine.
  3. Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labeled tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .2 Include following information plus data specified.
  1. Maintenance instruction for finished surface and materials.
  2. Copy of hardware and paint schedules.
  3. Description: Operation of the equipment and systems defining start-up, shut-down and emergency procedures, and any fixed or adjustable set points that affect the efficiency of the operation. Include nameplate information such as make, size, capacity and serial number.
  4. Maintenance: Use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:
    1. lubrication products and schedules.
    2. trouble shooting procedures.
    3. adjustment techniques.
    4. operational checks.
    5. Suppliers names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number.
  5. Sustainability: include records of performance testing and operational requirements and specifications of all related equipment
  6. Warranties showing:
    1. Name and address of projects.
    2. Commencement date (date of Certificate of Substantial Completion)
    3. Duration of warranty.
    4. Clear indication of what is being warranted and the remedial action.
    5. Signature and seal of the Warrantor.
  7. Additional material used in project.
  8. Spare parts: List all recommended spares to be maintained on site to ensure optimum



efficiency. List all special tools appropriate to unique application. All parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address).

9. Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

### **7.2.9 WARRANTIES**

1. Before completion of work collect all manufacturers' extended warranties and deposit with Departmental Representative. Include copies in O&M Manuals.

### **7.2.10 SIGNS**

.1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etc, in both official languages or by the use of commonly understood graphic symbols to the Departmental Representative's approval.

### **7.2.11 CLEANING**

.1 The Construction Manager shall:

1. Clean up work area as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

2. Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.

3. Wash and polish glass, mirrors, ceramic tile, aluminum, chrome, stainless steel, baked or porcelain enamel, plastic laminate and other plastic surfaces, floors, hardware and washroom fixtures. Clean manufactured articles in accordance with manufacturer's directions.

4. Clean areas under contract including building exterior and surrounding site, to approval of Departmental Representative.

5. Advise Departmental Representative in writing of intent to clean and obtain approval to proceed. Obtain acceptance of cleaning in writing from Departmental Representative when completed. Cleaning shall be completed prior to application for Substantial Completion.



## 7.3 COMMISSIONING PROCESS

### 7.3.1 GENERAL

- .1 This section summarizes the PWGSC commissioning process, the requirements and associated roles and responsibilities as they relate to the various phases in the delivery of a project.
- .2 It is to be used as a guide in further developing the commissioning plan, specification and related documents for a project.
- .3 Commissioning is not a replacement for good design and construction practices.
  - .1 It requires coordinated efforts on the part of all parties involved in the Project.
- .4 The Commissioning overlaps the design phase through construction and into the operation phase.
- .5 The PWGSC Commissioning Manual CP.1 4<sup>th</sup> edition, November 2006, is available for free download at the following site:
  - .1 <http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/bi-rp/tech/miseenservice-commissioning/manuel-manual-eng.html>
- .6 The PWGSC Commission Manual CP.2 – Commissioning Glossary is available for free download at the following site:
  - .1 <http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/bi-rp/tech/miseenservice-commissioning/manuel-manual-b-eng.html>
- .7 “Commissioning” is a quality assurance process, in which the functional requirements of the Owner/occupant and the operational requirements of facility management are proven to function as intended.
- .8 The “commissioning process” is a planned program of quality management and information transfer that extends through all phases of a project’s development and delivery, up to and including the warranty period.
- .9 The process consists of a series of checks and balances to ensure that the work is designed, installed and proven to operate as intended.
- .10 Commissioning has two main components, functional and operational.
  - .1 The functional component deals with:
    - .1 Security, Health (indoor air quality) and occupant safety;
    - .2 Comfort (temperature, relative humidity, ventilation, air flow patterns, air purity and well being);
    - .3 Cost-effectiveness of design; and
    - .4 Systems and equipment supporting Owner’s functional requirements.
  - .2 The operational component deals with:
    - .1 Operation and Maintenance (O&M) issues; e.g., design review with a particular concern for the operation and maintenance of the systems today and in the future, when repairs are required;
    - .2 Performance evaluation of systems and equipment;
    - .3 Accessibility to O&M Documentation; and
    - .4 Review of the training plan against the current needs now and in the future.

### 7.3.2 COMMISSIONING PLAN

- .1 The Commissioning Plan will typically be developed by the Construction Manager through his own Commissioning Agent.



- .2 The Commissioning Plan is the project-specific document and which describes the process for verifying that all built works meet the Investor's requirements within the limits of the working documents.
- .3 It is essential that the Consultant provide specifications that detail requirements for all submittals and testing in each Specification Section in order for the Construction Manager to properly prepare a complete Commissioning Plan.
- .4 The Commissioning Plan will be reviewed and accepted by the Departmental Representative prior to commencement of construction.
- .5 The Commissioning Plan may require periodic update throughout design.

### 7.3.3 COMPONENT VERIFICATION

- .1 Component verification sheets (CV) sheets are developed by the Consultant and incorporated in the contract documents to ensure the facility is an operating entity and meets the requirements as described in the Agreement.
- .2 The CV sheets are intended to monitor and track the supply and shop drawing requirements associated with each component. The *Consultant* must verify that the components being installed in the built works are acceptable to their design and the approved shop drawings.
- .3 The commissioning process requires the documentation of all the components installed as part of a system that will have performance verification testing conducted.
- .4 Sample CV sheets for various types of components are to be provided by the Consultant in Div 01.

### 7.3.4 SYSTEM & INTEGRATED SYSTEM TESTING

- .1 The "performance verification tests" (PVTs) are developed by the Construction Manager to ensure the facility is an operating entity and meets the requirements as described in the Agreement.
- .2 The PVTs are intended to demonstrate the functional performance of the systems & integrated system during the various modes of operation, against the design intent. Each test must be uniquely identified and reflected in the Construction Manager's commissioning schedule.
- .3 Once the contract has been awarded the Construction Manager must monitor the sub-contractor's process to help ensure the timely completion of these tests. The Construction Manager must witness each test. The Construction Manager must provide final certification of the test results. After an acceptable review of the test document, the PWGSC Commissioning Specialist will recommend to the Departmental Representative the acceptance or rejection of the test results.
- .4 Sample PVT sheets for various types of system are to be provided by the Consultant in Div 01.

### 7.3.5 TEST REQUIREMENTS

- .1 Each CV or PVT shall be uniquely named, numbered and categorized by discipline.
- .2 Tests shall define:
  - .1 Test Purpose;
  - .2 System design narrative;
  - .3 Test Prerequisites;
  - .4 Testing Procedures;
  - .5 Test Comments; and
  - .6 Test Sign-off Block.
- .3 System Performance Verifications Tests



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

### **7.3.6 COMMISSIONING (EVALUATION) REPORT**

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

### **7.3.7 OVERVIEW OF ROLES AND RESPONSIBILITIES**

- .1 The following provides a general overview of the roles, responsibilities and implementation of the commissioning process. The commissioning process is a logical sequence of verifications from component verifications through to system & integrated system, performance verification testing.
- .2 At completion of the commissioning process all results are documented and audited for acceptance.

### **7.3.8 MAJOR TASKS AND RESPONSIBILITIES**

- .1 Schematic Design and Design Development Phase:
  - .1 Consultant;
    - .1 Develop commissioning strategy,
    - .2 Develop preliminary commissioning plan.
  - .2 Construction Documentation Phase:
    - .1 Consultant;
      - .1 Complete the final commissioning plan,
      - .2 Specify the Commissioning requirements in Div 01 and provide sample Commissioning CV and PCT sheets in Div 01 for Bidders purposes,
      - .3 Develop project specific CV and PVT sheets.
  - .3 Construction Phase:
    - .1 Consultant;
      - .1 Monitor and report on contract commissioning activities,
      - .2 Finalize development of job specific CV and PVT sheets,



- .3 Review and certify component verification sheets as they are completed by the Construction Manager, and
- .4 Review commissioning schedule
- .2 Construction Manager;
  - .1 Comply with the requirements in the Specifications,
  - .2 Complete the component verification,
  - .3 Conduct the equipment system start-up and proving, and
  - .4 Develop the commissioning schedule, reflecting the PVTs.
- .4 Commissioning Phase
  - .1 Consultant
    - .1 Witness all system and integrated systems tests,
    - .2 Review and certify commissioning test results,
    - .3 Track and compile all commissioning documentation submitted by the Construction Manager and confirm that all commissioning tasks are completed,
    - .4 Incorporate all commissioning documentation into a preliminary commissioning report and recommend interim acceptance.
    - .5 Identify “deferred” commissioning tests due to seasonal constraints, etc.
  - .2 Construction Manager
    - .1 Comply with the requirements in the specifications,
    - .2 Conduct the system testing, and
    - .3 Conduct the integrated system testing.
- .5 Operating Phase
  - .1 Consultant
    - .1 Provide advice and recommendations for fine tuning, if required,
    - .2 Witness “deferred” commissioning tests,
    - .3 Review and certify “deferred” systems test results,
    - .4 Incorporate deferred system test results and all other commissioning documentation into a final commissioning report with an executive summary recommending final acceptance.
  - .2 Construction Manager
    - .1 Address warranty issues,
- .6 Evaluation Phase
  - .1 Consultant
    - .1 Provide advice and recommendations during the final evaluation.

## 7.4. SURVEYS

### 7.4.1 SITE SURVEY

- I. Site surveys are generally prepared for PWGSC projects involving site work
  - .1 The survey may be contracted separately by PWGSC or may be included in the scope of the *Consultant* for the project. The guidelines given here apply in either case. In cases where PWGSC contracts for the survey directly, the *Consultant* may be requested to review the scope of work for the survey and recommend modifications to the technical requirements to suit the specific project site.
  - .2 The criteria listed here are not absolute; they should be modified by the *Consultant* to suit the particular conditions of the project. All surveys should be prepared and sealed by a surveyor licensed in the state where the project is located.



## 7.4.2 GENERAL REQUIREMENTS

- I. Surveys should generally contain the following information:
  - .1 Locations of all permanent features within limits of work, such as buildings, structures, fences, walls, concrete slabs and foundations, above-ground tanks, cooling towers, transformers, sidewalks, steps, power and light poles, traffic control devices, manholes, fire hydrants, valves, culverts, headwalls, catch basins or inlets, property corner markers, benchmarks, etc.
  - .2 Location of all adjacent and abounding roads or streets and street curbs within limits of work, including driveways and entrances. Type of surfacing and limits should be shown. For public streets, right-of-way widths and centerlines should also be shown.
  - .3 Location of all trees, shrubs, and other plants within limits of work.  
For trees, calliper size should be shown; dead trees should be indicated.
  - .4 Location of all overhead telephone and power lines within the limits of work and their related easements
  - .5 Based on existing records, location of underground utilities, such as gas, water, steam, chilled water, electric power, sanitary, storm, combined sewers, telephone, etc. should be shown. Sizes of pipes (I.D.), invert elevations, inlet or manhole rim elevations should be indicated. Where appropriate, information should be verified in the field.
  - .6 Based on existing records, location of underground storage tanks or other subsurface structures.
  - .7 Topography field criteria should include such items as 300 millimetre or 600 millimetre contour intervals plotted on a grid system appropriate to the scale of the survey; elevations at top and bottom of ditches and at any abrupt changes in grade; periodic top-of-curb and gutter elevations, as well as street centerline elevations; elevations at all permanent features within the limits of work; ground floor elevations for all existing buildings.
  - .8 Bearings and distances for all property lines within the limits of work.
  - .9 Official datum upon which elevations are based and the benchmark or adjacent to the site to be used as a starting point
  - .10 Official datum upon which horizontal control points are based
  - .11 If there are not already two benchmarks on the site, establish two permanent benchmarks.
  - .12 Elevations of key datum points of all building structures and improvements directly adjacent and across the street from the project site during both wet and dry season
  - .13 Delineate location of any wetlands or floodplains, underground streams or water sources.

