APPENDIX H

Draft Commissioning Plan

COMMISSIONING PLAN
DFO Facility - SAR
Newfoundland and Labrador

Prepared for:
Public Works and Government Services Canada

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1.0 INTRODUCTION

Commissioning is a quality assurance process, conducted by an individual independent of the design and construction teams, to improve the success of a construction project. It provides the owner with a means to independently verify the project's planning, design, construction, and operational process. The commissioning process seeks to provide optimized energy efficiency, system maintainability, and indoor air quality.

The commissioning process, during both the design and construction phases, has the following steps:

- Establish the commissioning team
- Review the project requirements, basis of design, and design documents to ensure that the owner's requirements are met
- Ensure the design is well documented
- Develop a commissioning plan and schedule
- Review contractor submittals
- Ensure the bid documents show the proper requirements for commissioning,
- Review the installation of applicable equipment and systems,
- Review operational checkout performed by installing contractors,
- Verify and document proper performance of equipment,
- Review operation and maintenance manuals and ensure a copy remains on site, and
- Review training of owner's operating and maintenance staff.
- Distribute final commissioning report
- Develop facility requirements and operations and maintenance plan
- Review building operations 10 months after substantial completion.

1.1 DEFINITIONS

In order to understand the Commissioning Plan, the following terms have been defined. Any reference to these terms carries the stated and associated working definition outlined herein.

Commissioning Authority (CxA) - Is the service firm and its resources (internal and external) that provide the planning, preparation, implementation and management of the detailed commissioning plan. The Commissioning Authority (CxA) will be responsible for coordinating the activities of the commissioning team members.

Commissioning Agents - The internal technical resource staff of the CxA that will be responsible for the execution of the on-site testing activities.

Commissioning Team - Personnel that will be directly involved in the building commissioning process. The commissioning team consists of the owner's representatives, CxA, Contractors, Consultants and O&M Staff.

Commissioning Plan - The Commissioning Plan defines the scope and approach to the Total Building commissioning program that is to be executed for the project.

Owner's Project Requirements - Meeting the Owner's Project Requirements (OPR) is the primary concern of the commissioning team. This important document will guide the design, construction, and operation of the future building. This can include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria and supporting information.

Design Narrative - The Design Narrative (DN) is where the design team describes in detail the concepts and features it intends to incorporate during schematics.

Basis of Design - The Basis of Design (BOD) document is used by the design team to explain its reasoning and assumptions for choices made in the DN.

Contractors - These are the general contractor and their subcontractors who are responsible for physical construction of the project.

Project Manager - The individual or firm responsible for the overall management and delivery of the project to the Owner.

Consultants - The architects and engineers responsible for producing the design drawings and specifications for this project as well as the base contract administration inspection, quality assurance and acceptance activities.

User / Operator - A user or operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

In Contract Tests - Testing requirements that are defined in the contract documents that are a contractor's responsibility to carry out and document appropriately.

Commissioning Check Sheets - Mechanical, Electrical, Controls equipment and Life Safety systems check sheets that are specific to each system and its major components. These are used to verify system operation and are developed by the CxA with the support of the project team and OEM suppliers.

Static Inspections - Systematic detailed inspections of operable mechanical, life safety, electrical systems and components carried out under the commissioning plan by personnel from the construction and Cx Teams. Site personnel will utilize Cx check sheets for recording

installation deficiencies on a component / system basis. Timing of static inspections is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components or systems.

Contractor Start-Up Program - Contractor start-up and verification program activities are conducted by the contractors and/or their sub-trades and equipment vendors. Contractor / vendor checking of the physical installation of the work and equipment and reviewing the completion of system installation and readiness, is completed prior to the Commissioning Agents functional performance testing and verification activities.

Functional Performance Testing - Systems performance tests are specific hands-on tests, used to verify the Functional Performance Testing at the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility and the Owner's Project Requirements.

2.0 BUILDING INFORMATION

Project Name:	DFO Facility - SAR
Location:	Twillingate, NL
Building Type:	Search and Rescue facility
Building Areas:	Twillingate OPS: 446.5 m^2 (4,806 ft^2)
	Twillingate FRC: 266.3 m^2 (2,866 ft^2)

3.0 COMMISSIONING TEAM'S RESPONSIBILITIES

Table 2 gives a task breakdown of the Commissioning Process and lists the responsible parties. The completion of each of the following commissioning tasks is considered a Commissioning Process Milestone.

Table 1 Team Responsibilities

	Design Team Lead	Project Manager	Commissioning Authority	Mechanical Designer	Electrical Designer	Contractor	Owner/Operator
Plan and schedule design meetings	x	x					
Plan and schedule construction meetings	x	x				x	
Plan and schedule site inspections and operation tests		x	x			x	
Develop Cx plan and edit as necessary			x				
Review and comment on Cx plan	x	x	x	x	x	x	x
Review Owners Project Requirements			x				
Review Basis of Design			x				
Review and comment on Design development report, ensure OPR and BOD are met	x	x	x	x	x		x
Prepare Specification	x		x	x	x		
Prepare system manuals outline		x	x				
Review and comment 75%, 99% submissions, ensure OPR is met			x	x	x		
Review Submittals	x		x	x	x		
Develop installation checklists			x				
Complete installation checklists						x	
Develop functional test and checklists			x				
Perform functional test and complete checklists	x	x	x			x	x
Organize O&M manual		x		x	x	x	
Review and approve O&M manual			x	x	x		
Determine requirements of operator training			x				x

COMMISSIONING TEAM'S RESPONSIBILITIES
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	Design Team Lead	Project Manager	Commissioning Authority	Mechanical Designer	Electrical Designer	Contractor	Owner/Operator
Conduct operator training			x				
Update Systems Manual			x	x		x	
Complete Final Commissioning Report			x				
Develop operations and maintenance plan			x				
Perform seasonal testing	x	x	x			x	x
Develop ongoing Cx plan			x				

4.0 DESCRIPTION OF THE MANAGEMENT, COMMUNICATION AND REPORTING OF THE COMMISSIONING PROCESS

The Commissioning Team shall follow the following communication protocol in the event that issues arise. Table 4 is an identification tool for proper management, communication and reporting to be used by the Commissioning Team. The Project Team shall understand the following to insure their responsibility in the event of an issue is understood.

Table 2 Description of the management, communication and reporting of the commissioning process

Issue	Protocol
For requests for information (RFI) or formal documentation requests.	Stantec, acting as the Commissioning Authority (CxA) goes first to the Project Manager. (Copy to Contractor).
For verbal information or clarification.	The CxA goes directly to the informed party.
For notifying contractors of deficiencies.	The CxA documents deficiencies through the Owner's Project Manager (NBDTI).
For scheduling monthly commissioning meetings	The CxA shall specify the times for monthly commissioning meetings.
For scheduling systems tests or training.	The CxA can supply times for functional testing and training but scheduling is ultimately the responsibility of the Owner's Project Manager or the Prime Contractor.
For making requests for significant changes.	The CxA has no authority to issue change orders, this is the responsibility of the Owner's Project Manager (NBDTI).
Subcontractor disagreement with requests or interpretations by the CxA.	The subcontractor shall try to resolve with the CxA, but the Owner's Project Manager (NBDTI) shall be informed of all issues.

5.0 RECOMMISSIONING SCHEDULING AND DIRECTION FOR TESTING OF NEW EQUIPMENT

The following systems should be recommissioned after five (5) to seven (7) years. If additional systems are added, they should be added to this list and recommissioned on the same timeline. When recommissioning occurs, qualified commissioning agents, controls contractor, mechanical Contractor, Fire Protection Contractor, and Electrical Contractor should be retained.

Mechanical Systems - (including integral equipment controls)

- Heat Recovery Ventilator
- Ductwork (HVAC)
- Split Heat Pumps
- Testing and Balancing (sampling) HVAC

Electrical Systems

- Main distribution
- Power Distribution system - Contactors/Starters /Disconnects
- Powered distribution system – panels
- Grounding system (visual inspection)
- Emergency lighting and exit lighting
- Lighting
- Occupancy sensors
- Electric baseboard heaters
- Intrusion alarm and CCTV system
- Energy metering
- Vessel connections
- Fuel monitoring

Life Safety Systems

- Fire alarm system
- Note: Stantec will utilize a sampling rate of 100% for all fire alarm devices, door hold-open devices, and emergency lighting. Installing contractor is required to perform fire alarm and life safety functional testing under the direction of Stantec to avoid system contractor warranty complications.

Plumbing

Plumbing systems including:

- Plumbing fixtures
- Mixing valves
- Domestic sanitary systems/piping
- Trap primers
- Domestic water systems/tanks

6.0 DOCUMENTATION UPDATING

The following items listed in Table 3 are to updated throughout the life of the building, especially after the recommissioning and new systems are installed.

Table 3 List of Commissioning Documents

List of Expected Work Products
Ongoing Commissioning Plan
Owners Project Requirements and Basis of Design
Training Program
Systems Manual
Project Commissioning Specifications
Functional Performance Testing Forms
Current Facilities Requirements and Operation and Maintain Plan
Final Commissioning Report

7.0 COMMISSIONING PROCESS

A commissioning meeting shall be called by the Commissioning Agent at roughly 60% completion of the construction. In attendance shall be the Project Manager, Mechanical and Electrical Designers, General contractor representative and all other designated subcontractors.

The meeting will review the reporting structure, lines of communication, the different parties' responsibilities, and the general schedule for site inspections, startup of equipment, and training. Stantec will use this opportunity to go through the Commissioning Schedule in detail and update it using the input from the project team.

The desired outcome of the meeting is all involved parties have a good understanding of the commissioning process and their individual responsibilities.

7.1 COMMISSIONING PLAN

Following the kick-off commissioning meeting, the Commissioning Agent will update the commissioning plan. The commissioning schedule that had been discussed during the kick-meeting with will be added to the plan. It will then be submitted for approval by the PWGSC Project Manager. The Commissioning Plan is a live document and can be updated throughout the Cx procedure. Each time the Cx Plan is update it must be submitted for the Owner's Approval and then distributed among the Cx Team members.

7.2 SUBMITTALS

The Commissioning Agent shall provide the General Contractor and all subcontractors responsible for commissioned equipment with a list of the documentation required for the commissioning process. This list will be delivered through the PWGSC Project Manager.

The data is typically similar to the requirements of the Designers. It will include installation and startup procedures, O&M data, performance data and control drawings. The Commissioning Agent will review the documents to ensure they meet the requirements of the basis of design, Owner's Project Requirements and commissioning related items mentioned in the contract documents. The Commissioning Agent reviews for energy efficiency, system operability and maintainability and compliance with the Owner's Project Requirements.

The recommendations from these reviews will be formally documented by the Commissioning Agent and will be forwarded to the Project Manager.

7.3 SITE MEETINGS / REVIEW

The Commissioning Agent will suggest times for the Project Commissioning Meetings as required. These meetings will be scheduled by the PWGSC Project Manager or Prime Contractor.

At these meetings, the General Contractor will have the opportunity to report on the construction progress and share any information that will affect the commissioning schedule or equipment / systems to be commissioned. Stantec will use this opportunity to update the commissioning schedule which will be distributed with the meeting minutes (Stantec will chair and minute these meetings).

7.4 INSTALLATION VERIFICATION

Prior to the startup of the equipment, all shall be inspected and the correct installation be verified by the installing contractor. This is done to reduce delays and damage during initial startup. There is to be no sampling at this step. The Commissioning Authority does not need to be present during each test, but should be present for central pieces of equipment and has the right to inspect a sample of equipment of his/her choosing.

All deficiencies are to be recorded and fixed before Startup check and Functional Performance test.

7.5 START-UP CHECK

The startup check is the checkpoint to ensure each specific piece of equipment is operating independently as designed.

All deficiencies are to be recorded and repaired prior to commencing Functional Performance Testing.

7.6 FUNCTIONAL PERFORMANCE TEST

The Functional Test is not only the testing of each piece of equipment, but is also a check that the pieces of equipment together produce the proper final result.

The Commissioning agent is not responsible for coordinating the functional tests but can gives suggestions. It is ultimately the responsibility of the Prime Contractor to schedule these tests.

It is the responsibility of the Commissioning Agent to document all results of the Functional Tests. Any deficiencies are to be corrected by the subcontractor and retesting will be scheduled by the Prime Contractor, if required. Any disputes regarding the requirement of retesting between the Commissioning Agent and the subcontractor shall be handled by the Project Manager.

7.7 O&M MANUALS

The Commissioning Agent shall review the O&M manuals before functional tests. It is assumed that they will be 95% complete, with the remainder completed once the functional tests are completed.

The Commissioning Agent will evaluate the O&M Manuals and produce a report of the findings. The evaluation report will be submitted for the Cx Team Members information.

It is not the responsibility of the Commissioning Agent to produce the O&M manuals.

7.8 TRAINING

The Commissioning Agent and the Operator will determine all mechanical and Electrical systems (as per indicated in LEED V4) for which formalized training is required. This will happen after the Commissioning Agent has reviewed the product data sheets. The Commissioning Agent will then develop the Operator Training Checklists, which will include the training requirements.

7.9 SYSTEMS MANUAL

Stantec will provide the requirements for the Systems Manual in the construction documents and will then verify that the systems manual is updated and delivered completely. Stantec will verify by completing an evaluation of the system manual and transmit it to the PWGSC/Project Manager. This manual is sometimes referred to as a Re-commissioning Manual. Its primary intent is to assist the building O&M Staff in operating the building by outlining guidelines on maintaining the ongoing operation of the building through continuous benchmarking and testing. This document will be provided by the Prime Contractor. The Systems manual is to include the following:

- Executive Summary
- Basis of Design
- Single Line Diagrams
- Construction Record Documents and Specifications
- Approved Submittals

- As-Built Drawings
- As-Built Sequence of Operations
- Confirmation of training
- Equipment O&M Manuals
- Final Commissioning Report
- Recommended Schedule for recommissioning
- Recommended schedule for sensor calibration

7.10 BUILDING OPERATIONS MANUAL (BOM)

The Commissioning Agent shall develop and provide the Project Manager with the BOM. The purpose of this manual is to organize and present the necessary information for efficient building operation. A number of documents will be formally requested by the CxA to aid in development of the Plan. These documents will be provided by the Contractors, and in some cases, the Designers. The plan includes the following:

- Sequence of operations
- Building occupancy schedule
- Equipment Run Time
- Setpoints of all HVAC equipment
- Lighting Levels throughout the building
- Minimum outdoor air requirements
- Any changes to the schedules
- System Narrative describing Mech and Electrical Systems
- Preventative Maintenances Plan
- Commissioning Future Program

7.11 FINAL REPORT

The Commissioning Agent will supply the Project Manager with a final commissioning report.

For each piece of commissioned equipment, the final report will include the following:

- Commissioning Executive Summary
- Owners Project Requirements
- Evaluation of Systems Manual
- Design Review Reports
- Project Commissioning Specification

- Verification of Installation Forms
- Verification of Installation Report
- Functional Performance Testing Forms
- Functional Performance Testing Report
- TAB Report Evaluation
- Site Review Reports
- Commissioning Meeting Minutes
- On-going Commissioning Plan
- Current Facility Requirements and Operations and Maintenance Plan
- Training Program Evaluation
- Submittal Review Reports