

**Part 1        General**

**1.1            SUMMARY**

- .1        A formal commissioning process is in place for this project. Work shall include but not limited to implementation of coordinated commissioning activities, executed by the Contractor and Commissioning Agents.
- .2        Work specified in this section and equipment commissioning sections is to be performed by an independent Agency specializing in this type of work and paid by the Department Representative.
- .3        This section describes the commissioning of the building components, equipment and systems and outlines the duties and responsibilities of the Commissioning Team.
- .4        The commissioning process shall be applied to listed building components, and all products, equipment and systems provided under Divisions 20 to 28.
- .5        The Commissioning Manager as directed by the Departmental Representative shall develop a Commissioning Plan.

**1.2            DEFINITIONS**

- .1        Commissioning Team
  - .1        Personnel that will be directly involved in the building commissioning process. The Commissioning Team shall comprise of Commissioning Manager, Commissioning Agents, Departmental Representatives, Contractors, and Independent Third Party Testing Agencies.
- .2        Commissioning Plan
  - .1        The Commissioning Plan defines the scope and approach to the Total Building Commissioning Program that is to be executed for the project.
- .3        Construction Manager
  - .1        The contracting firm responsible for management of the construction process for the project.
- .4        Contractor
  - .1        The construction firm and its sub-contractors that are responsible for physical construction of the project.
- .5        Departmental Representatives

- .1 The Departmental Representatives that are responsible for production of the design drawings and specifications for the project as well as the base contract administration, inspection, quality assurance and acceptance activities.
- .2 The design Department Representatives are not required to be involved in any of the commissioning verifications or performance testing programs, but may witness these activities at their discretion.
- .6 Third Party Testing Agencies
  - .1 Specialty firms or agencies retained to conduct acceptance tests on a system of component and provide a certificate of acceptance and conformance to governing standards.
- .7 Out of Contract Tests
  - .1 Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies. Examples would be high voltage testing programs, building envelope testing and air quality testing.
- .8 In Contract Tests
  - .1 Testing requirements that are defined in the contract documents and are the contractors responsibility to carry out. Tests may be witnessed by the Department Representative and Commissioning Agents. Documented test results are turned over for review.
- .9 Check Sheets
  - .1 Electrical check sheets that are specific to systems and components for the project that are used for verifying and testing of the work.
  - .2 The commissioning check sheets will be layed out to record three types of site information; technical equipment data, static installation checks and operation checks. Sample check sheets are included at the end of this section.
  - .3 The check sheets will have the equipment's specified and approved shop drawing information input by the Commissioning Manager. The Contractors shall be responsible for completing the technical data section by verifying through the equipment nameplates on site that the equipment installed matches the approved shop drawings.
  - .4 The check sheet manuals will be turned over to site following approval of shop drawings.
- .10 Contractor Start-Up Program
  - .1 Contractor / Supplier checking of the physical installation of the work and reviewing the completeness of system installation and readiness for start-up prior to Commissioning verification activities occurring.

.2 Contractor start-up program activities are conducted by the mechanical and electrical contractors or their sub-trades and their equipment suppliers, and may be witnessed by the Department Representative and / or Commissioning Agents.

.11 Static Inspections

.1 Systematic detailed inspections of mechanical and electrical systems and components carried out under the Commissioning Program by personnel from the Commissioning Team. Site personnel will utilize check sheets for recording installation readiness or deficiencies on a component system bases. Timing of static inspections is tied to construction progress and occurs once contractor checks have been completed.

.12 Acceptance Inspections

.1 A series of formal inspections carried out by the Department Representatives for systems that result in acceptance of the Work as complete.

.13 Performance Testing

.1 Performance tests are specific hand-on tests conducted with test instruments; to prove that the systems as installed meet both the specified performance requirements for major pieces of equipment and that installed system performance meets the design intent and specified operating requirements.

**1.3 GENERAL**

.1 Provide a fully functional facility:

- .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
- .2 Facility user and O&M personnel have been fully trained in aspects of installed systems.
- .3 Optimized life cycle costs.
- .4 Complete documentation relating to installed equipment and systems.

.2 Use this Plan as master planning document for Commissioning:

- .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Commissioning.
- .2 Communicates responsibilities of team members involved in Commissioning Scheduling, documentation requirements, and verification procedures.

- .3 Sets out deliverables relating to O&M, process and administration of Commissioning.
- .4 Describes process of verification of how built works meet Departmental Representative's design requirements.
- .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
- .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
  - .1 Overview of Commissioning.
  - .2 General description of elements that make up Commissioning Plan.
  - .3 Process and methodology for successful Commissioning.
- .3 Acronyms:
  - .1 BAS - Building Automation System
  - .2 BMM - Building Management Manual.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 MSDS - Material Safety Data Sheets.
  - .5 PI - Product Information.
  - .6 PV - Performance Verification.
  - .7 TAB - Testing, Adjusting and Balancing.
  - .8 WHMIS - Workplace Hazardous Materials Information System.
- .4 Commissioning terms used in this Section:
  - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
  - .2 Deferred Commissioning - activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

#### **1.4 REFINEMENT OF COMISSIONING PLAN**

- .1 During construction phase, Commissioning Manager will revise, refine and update Plan to include:
  - .1 Changes resulting from Client program modifications.
  - .2 Approved design and construction changes.
- .2 Departmental Representative to include testing parameters at full range of operating conditions and check responses of equipment and systems.

**1.5 COMMISSIONING PARTICIPANTS**

- .1 Ensure that Commissioning participant:
  - .1 Could complete work within scheduled time frame.
  - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
    - .1 Modify ventilation rates to meet changes in off-gassing.
    - .2 Changes to heating or cooling loads beyond scope of EMCS
    - .3 Changes to EMCS control strategies beyond level of training provided to O&M personnel.
    - .4 Redistribution of electrical services.
  - .2 Provide names of participants to Commissioning Manager and details of instruments and procedures to be followed for Commissioning 1 month prior to starting date of Commissioning for review and approval.

**1.6 EXTENT OF COMMISSIONING**

- .1 Commission electrical systems and equipment:
  - .1 Low voltage below 750 V:
    - .1 Power Distribution System
    - .2 Building System Grounding
    - .3 Load Balancing
  - .2 Other systems and equipment:
    - .1 Voice / Data Cabling Test (If Applicable)
    - .2 Motor Starters (If Applicable)

**1.7 DELIVERABLES RELATING TO O&M PERSPECTIVES**

- .1 General requirements:
  - .1 Compile documentation.
  - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
  - .1 Warranties.
  - .2 Operations & Maintenance Manual.
  - .3 Inventory of spare parts, special tools and maintenance materials.
  - .4 Computerized Maintenance Management System (CMMS) identification system used.
  - .5 WHMIS information.

- .6 MSDS data sheets.
- .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

## **1.8 DELIVERABLES RELATING TO THE COMMISSIONING PROCESS**

- .1 General:
  - .1 Start-up, testing and Commissioning requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
  - .2 Definitions:
    - .1 Commissioning as used in this section includes:
      - .1 Commissioning of components, equipment, systems, subsystems, and integrated systems.
      - .2 Factory inspections and performance verification tests.
  - .3 Deliverables: provide:
    - .1 Commissioning Specifications.
    - .2 Startup, pre-Commissioning activities and documentation for systems and equipment.
    - .3 Completed installation checklists (ICL). Completed product
    - .4 information (PI) report forms. Completed performance
    - .5 verification (PV) report forms. Results of Performance
    - .6 Verification Tests and Inspections. Description of
    - .7 Commissioning activities and documentation.
    - .8 Description of Commissioning of integrated systems and documentation.
    - .9 Training Plans.
    - .10 Commissioning Reports.
    - .11 Prescribed activities during warranty period.
    - .12
  - .4 Departmental Representative and Commissioning Manager to witness and certify tests and reports of results provided to by Contractor.

## **1.9 PRE-COMMISSIONING ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Items listed in this Commissioning Plan include the following:
  - .1 Pre-Start-Up inspections: by Commissioning Manager and Department Representative prior to permission to start up and rectification of deficiencies to Commissioning Manager and Department Representative satisfaction.

- .2 Commissioning Agent to use approved check lists.
- .3 Commissioning Manager and Department Representative will monitor some of these pre-start-up inspections.
- .4 Include completed documentation with Commissioning report.
- .5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Commissioning Manager and Department Representative and does not form part of Commissioning specifications.
- .6 Commissioning Manager and Department Representative will monitor some of these inspections and tests.
- .7 Include completed documentation in Commissioning report.
- .2 Pre-Commissioning activities - LIFE SAFETY SYSTEMS
  - .1 N/A
- .3 Pre-Commissioning activities - ELECTRICAL:
  - .1 Low voltage distribution systems under 750 V:
    - .1 Requires independent testing agency to perform pre- energization and post-energization tests.
    - .2 Load Balancing.
  - .2 Other systems and equipment:
    - .1 Voice / Data Cabling:
      - .1 Visual inspection.
      - .2 Manufacturers VAR testing requirements.

**1.10 START-UP**

- .1 Start up components, equipment and systems.
- .2 Performance Verification (PV):
  - .1 Approved Commissioning Agent to perform. Repeat when necessary until results are acceptable to Departmental Representative and Commissioning Manager
- .3 Use procedures modified generic procedures to suit project requirements.
- .4 Commissioning Manager to witness and certify reported results using approved PI and PV forms.
- .5 Commissioning Manager and Departmental Representative to approve completed PV reports.
- .6 Commissioning Manager and Departmental Representative reserves right to verify up to 30% of reported results at random.

- .7 Failure of randomly selected item shall result in rejection of PV report or report of system start-up and testing.

**1.11 COMISSIONING ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Perform Commissioning by specified Agent as using procedures developed by Commissioning Manager and Departmental Representative.
- .2 Commissioning Manager and Departmental Representative to monitor Commissioning activities.
- .3 Upon satisfactory completion, Commissioning agent performing tests to prepare Commissioning Report using approved PV forms.
- .4 Departmental Representative and Commissioning Manager to witness and certify tests and reports of results.
- .5 Commissioning Manager and Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

**1.12 COMISSIONING OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION**

- .1 Commissioning to be performed by specified Commissioning specialist, using procedures developed by Commissioning Manager and Departmental Representative.
- .2 Tests to be witnessed by Commissioning Manager and Departmental Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Commissioning Agent to prepare Commissioning Report, to be certified by Commissioning Manager and Departmental Representative.
- .4 Commissioning Manager and Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
  - .1 HVAC and associated systems forming part of integrated HVAC systems
  - .2 Emergency lighting systems
- .6 Identification:
  - .1 In later stages of Commissioning, before hand-over and acceptance Contractor and Commissioning Manager to co-operate to complete inventory data sheets and provide assistance in full implementation of CMMS identification system of components, equipment, sub-systems, systems.

**1.13 INSTALLATION CHECK LISTS (ICL)**

- .1 Refer to attached samples

**1.14 PERFORMANCE VERIFICATION (PV) REPORT**

- .1 Refer to attached samples

**1.15 DELIVERABLES RELATING TO ADMINISTRATION OF COMISSIONING**

- .1 General:
  - .1 Complete Commissioning of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

**1.16 COMISSIONING SCHEDULES**

- .1 Contractor to prepare detailed Commissioning Schedule and submit to Commissioning Manager for review and approval same time as project Construction Schedule. Include:
  - .1 Milestones, testing, documentation, training and Commissioning activities of components, equipment, subsystems, systems and integrated systems, including:
    - .1 Submission of list of instrumentation with relevant certificates
    - .2 Notification of intention to start TAB: 14 days before start of TAB.
    - .3 After successful start-up, correction of deficiencies and verification of normal and safe operation.
    - .4 Notification of intention to start Commissioning: 14 days before start of Commissioning.
    - .5 Notification of intention to start Commissioning of integrated systems: after Commissioning of related systems is completed 14 days before start of integrated system Commissioning.
    - .6 Identification of deferred Commissioning.
    - .7 Implementation of training plans.
    - .8 Commissioning reports: immediately upon successful completion of Commissioning.
  - .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over.
  - .3 Commissioning schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Commissioning Schedule into Construction Schedule.
- .3 Departmental Representative, Contractor and Contractor's Commissioning agent will monitor progress of Commissioning against this schedule.

**1.17 COMMISSIONING REPORTS**

- .1 Include completed and certified PV reports in properly formatted Commissioning Reports.
- .2 Before reports are accepted, reported results to be subject to verification by Commissioning Manager and Departmental Representative.

**1.18 ACTIVITIES DURING WARRANTY PERIOD**

- .1 Commissioning activities must be completed before issuance of Interim Certificate, it is anticipated that certain Commissioning activities may be necessary during Warranty Period, including:
  - .1 Adjustment to the new Automatic Transfer Switch and Generator Control Settings.
  - .2 Fine Tuning of Emergency and BMS/HVAC Systems.
  - .3 Adjustments to Power Quality Meters.
  - .4 Adjustments to Surge Protection Devices.

**1.19 TESTS TO BE PERFORMED BY DEPARTMENTAL REPRESENTATIVE**

- .1 As required

**1.20 FINAL SETTINGS**

- .1 Upon completion of Commissioning to satisfaction of Commissioning Manager and Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Commissioning Reports.

**END OF  
SECTION**