



The Regional Municipality of Durham
Works Department
Facilities Design, Construction and Asset Management

Commissioning Guidelines for Facilities Projects

Design Specifications For Engineering and Architectural Submissions for Facilities Projects

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1. Definitions

Building Systems: The dynamic operating systems in a building that will be subject to the Commissioning Process, including but not limited to: HVAC, automation, refrigeration, plumbing, power and lighting, life safety, fire protection, vertical transportation, site services, communication and signal, audio visual, security, food preparation and storage, and other specialized systems. In this guideline, Building Systems includes specialized equipment or systems included in the construction that may be provided for customer programs, such as security systems, CCTV, uninterruptible power supplies and computer room cooling systems. The building envelope including roofing assembly (while not a dynamic system) is also considered a building system for the purposes of this guideline.

Checklists: Verification checklists that are developed and used during all phases of the commissioning process to verify that the owners project requirements are being achieved. This includes checklists for general verification, plus testing, training and other specific requirements.

Commissioning (Process): A quality assurance oriented process that ensures the building systems and assemblies perform interactively according to the design intent, and that the stakeholders' objectives and operational criteria are achieved through a process of planning, testing, verifying, and documenting the performance of the facilities as it is constructed, and where necessary through seasonal commissioning after occupancy.

Commissioning Authority: An individual or firm identified by the Region of Durham, who will lead, plan, and schedule and coordinate the activities to implement the Commissioning Process. The Commissioning Authority may be the project design consultant for lower complexity projects or quotations, or another third party commissioning agent.

Commissioning Plan: A document prepared by the Commissioning Authority to set out the organization, schedule, and allocation of resources, specifications, and documentation requirements of the Commissioning Process

Commissioning Reports: Functional performance verification reports, test data records, performance reports, etc. that record the Commissioning results for every item of equipment, assembly, or entire system as described in the commissioning plan.

Commissioning Issues Log: A formal and ongoing record of problems or concerns, and their resolutions, rose during the course of the Commissioning Process, and included in the Final Commissioning Report.

Contractor Commissioning: Commissioning activities on non-complex projects carried out by the contractor following a basic commissioning plan, but not necessarily needing a Commissioning Authority.

Design Review - Commissioning: A review of the design documents to determine compliance with the Owner's Project Requirements, including coordination between systems and assemblies being commissioned, features and access for testing, commissioning and maintenance, and other reviews required by the commissioning plan.

Independent Commissioning Authority: A Commissioning specialist who is independent of the design team engaged by the Region who leads, plans, and schedules and coordinates the commissioning team to implement the commissioning process for complex projects.

Operations and Maintenance (O&M) Manual: Systems-focused composite document of use to the Building Operator and Owner during the occupancy and operation phase, which includes the owner's requirements, operating manual, maintenance manual, shop drawings, record drawings and additional information such as warranties.

Owner: the Region of Durham, including various Regional project stakeholders, and the Region's Representative. Each Regional stakeholder may have program-specific requirements and deliverables that may vary between building types.

Owner's Project Requirements (OPR): A document that details functional requirements for the project and the expectations of how it will be used and operated.

Bid Documents: A collection of written documents including bid information and forms, contract forms and conditions, drawings, specifications and schedules, the combination of which provides all particulars required to complete the construction project, including commissioning specifications.

Project Manager : The Project Manager (Region Representative) who oversees the Project team, to ensure delivery of projects to meet owner's needs.

Startup Checklist: The record of the initial starting or activating of systems and equipment, including completion of construction checklists.

Static Components: Means the non-dynamic components of the facility such as exterior site features, building envelope, substructure, structure, interior finishes, ramps, stairs, railings, hardware, signage etc.

Scope of Work: Means the description of the project scope as approved by the Owner through the project charter.

Test Procedure: A written protocol that defines methods, personnel, and expectations, equipment, assemblies, systems, and interfaces among systems.

Training Plan: A written document that details the expectations, schedules, budget and deliverables of commissioning process activities, related to training of project operating and maintenance personnel, users and occupants.

Verification: The process by which specific components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Bid documents and the project requirements.

2. General

The following requirements shall be used as minimum guidelines for the preparation of Consultant's Proposals in response to an RFP from the Region, and for all Projects that include Commissioning for Facilities Design, Construction and Asset Management (DCAM) projects.

The intent of this guideline is to ensure building equipment performs as specified and as originally intended according to the Owner's Project Requirements, installation of equipment meets contract specifications, the commissioning of building systems/equipment, sequence of operations have been verified to on site conditions, and the total performance/integration of new equipment/systems are fully commissioned.

Generally, the Commissioning process is a quality focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated and maintained to meet the Owner's project requirements.

Commissioning within the Region of Durham projects can be completed by a number of different processes dictated by the various different project delivery methods. These methods have been outlined in Section 6.

3. Qualifications

Commissioning carried out by an Independent Commissioning Authority, shall be certified as a Commissioning Professional and hold a currently valid certificate from one of the following national and/or international organizations American Society of Heating, Refrigerating & Air Conditioning Engineers Inc.(ASHRAE), Association of Air Balance Council(AABC), National Environmental Balancing Bureau (NEBB), Association of Energy Engineers (AEE), and/or Building Commissioning Association (BCA).

Testing, Balancing and Measurement to be in compliance to ASHRAE standards and any other applicable NEEB Procedural standards or AABC standards. For system Balancing and Testing, the technician/balancer/tester shall be NEBB or AABC certified and hold a currently valid certification.

4. Owner's Project Requirements (OPR)

Development of the Owner's Project Requirements (OPR) document describes the criteria that the Owner considers key or important to the project; primarily they convey the Owner's wishes to the construction and design teams and to the Owner's facility operating staff. This should not be confused with the "functional program" or "Commissioning plan" which typically addresses the specific details rather than the general goals.

The OPR will serve as a focus for the Design Team, to help them understand the main goals of the client, and ultimately provide a baseline against which the completed facility or project can be judged.

5. Preparation of Business Cases

During the preparation of business cases by Facilities DCAM, the Project Manager responsible for the project must determine if Commissioning is required on the project, based on the OPR, and at what stage commissioning will provide the most value to the Region, its staff and the building occupants.

Project Managers should ask the following questions of the project:

- Will Commissioning result in fewer system deficiencies and increase the efficiency of project delivery?
- Will Commissioning result in improved occupant comfort and productivity?
- Will Commissioning result in reduced Operation and Maintenance cost for the Region?

It is recommended that an appropriate level of Commissioning be included on all projects, with systems identified in Section 7 of this guideline document.

6. Preparation of Commissioning Documents

6.1 Quotations

Region of Durham Purchasing bylaw dictates that projects up to \$125k in construction value must receive a minimum of three (3) formal quotations. For these types of projects the Region may prepare the quotation documents in-house or have a consultant prepare the documents.

.1 Consultant Prepared Commissioning Documentation

If a Consultant is preparing the Quotation Documents and Commissioning services are required on a project, as determined by the Project Manager, the Consultant must provide the following Commissioning Services in addition to the requested Design services:

.1 Commissioning Pre-Design and Design Services

- Meet with stakeholders to develop the Owner's Project Requirements in accordance with ASHRAE Guideline 0-2013.
- Conduct interviews with Region's Operations and Maintenance staff to discuss the critical objectives and challenges of the project.
- Review the design with the view of optimization to meet the Region's defined project requirements. Provide comment on space utilization and maintenance/ service accessibility of design.
- Include Region-prepared Pre-Functional Test Forms, Test Procedures, Commissioning issues Log, Training and Operating checklists, in the tender documentation. Refer to Appendix A for forms and Checklists.

.2 Commissioning Construction Services

- Refine commissioning plan based on updated design and contract documents.
- Review and provide comment on space utilization and maintenance/ service accessibility of contractor's selected equipment.
- Provide support for interpretation of the functional test forms, procedures and checklists of designated systems.
- Review testing, balancing, functional test forms, procedures and checklist documentation, completed by the contractor.
- Confirm testing and balancing results are within parameters identified in the design documentation.
- Review stakeholder training documentation for conformance with the Commissioning plan.

.2 Region-Prepared Commissioning Documentation

If the Region is preparing the Quotation Documents and Commissioning is required on a project, as determined by the Project Manager, the Project Manager/ Technician must complete the Commissioning Quotation Checklist, included in Appendix B of this document.

The Project Manager must ensure that the documentation required at the Pre- Tender and Construction Closeout stages have been completed and is included in the close out package.

6.2 Tenders

Region of Durham Purchasing bylaw dictates that projects over \$125k in construction value must be tendered through an open bidding opportunity advertised on the

Region's website. Commissioning for these projects shall be completed by the following parties:

- Design Consultant on the project, or
- Independent Third Party Commissioning Authority.

.1 Design Consultant Prepared Commissioning Documentation

.1 Commissioning Pre-Design and Design Services

- Meet with stakeholders to develop the Owner's Project Requirements in accordance with ASHRAE Guideline 0-2013.
- Consult with Region's Operations and Maintenance staff to discuss the critical objectives and challenges of the project.
- Review the design with the view of optimization to meet the Region's defined project requirements. Provide comment on space utilization and maintenance/ service accessibility of design.
- Prepare Commissioning plan based on the design and submit to the Project Manager.
- Include Region prepared Pre-Functional and Functional Test Forms, Test Procedures, Training and Operating checklists, in the tender documentation. Refer to Appendix A for forms and checklists.
 - Create and maintain Design Commissioning issues log. Follow-up on rectification of deficiencies.

.2 Commissioning Construction Services

- Refine commissioning plan based on updated design and contract documents.
- Review and provide comment on space utilization and maintenance/ service accessibility of contractor's selected equipment.
- Provide support for interpretation of the functional test forms, procedures and checklists of designated systems.
- Review testing, balancing, functional test forms, procedures and checklist documentation, completed by the contractor.
- Review stakeholder training documentation for conformance with the Commissioning plan.
- Create and maintain Construction Commissioning issues log. Follow-up on rectification of deficiencies.

- .2 Independent Third Party Commissioning Agent Prepared Commissioning Documentation**
- .1 Commissioning Pre-Design Services**
- Review existing building systems to understand the scope of existing operations.
 - Meet with stakeholders to develop the Owner's Project Requirements in accordance with ASHRAE Guideline 0-2013.
 - Consult with Region's Operations and Maintenance staff to discuss the critical objectives and challenges of the project.
 - Chair and arrange a pre-design commissioning meeting with the commissioning team.
- .2 Commissioning Design Services**
- Review and provide comment on design documentation at the 30%, 60%, 90% and Tender review stages for items noted in the scope of services.
 - Review and comment on Design Consultant's design with the view of optimization to meet the Region's defined project requirements. Review and provide comment on space utilization and maintenance/ service accessibility of design.
 - Prepare Commissioning plan based on the design provided by the Design Consultant's.
 - Prepare pre-functional and functional test forms, test procedures, training and operating checklists and provide to Prime Consultant for inclusion in tender documents.
 - Co-ordinate with the Project team to review the site, project requirements and commissioning outcomes for the project.
 - Review Pre-Start Health and Safety documentation prepared by others.
 - Chair and arrange a pre-construction commissioning meeting with the commissioning team.
 - Prepare documents required for detailed emergency system verification (Operation of ATS, Backup Generator, UPSs, and related life safety systems). If required.

.3 Commissioning Construction Services

- Arrange and chair a commissioning meeting with the commissioning team. Prepare and distribute minutes to commissioning team.
- Attend the pre-construction meeting with Contractor, Prime Consultant and Region to identify commissioning requirements of the project.
- Refine commissioning plan based on updated design and contract documents.
- Review contractor's submittals for design compliance. Review and provide comment on space utilization and maintenance/ service accessibility of contractor's selected equipment.
- Provide support for interpretation of the functional test forms, procedures and checklists of designated systems.
- Review testing and balancing documentation, verify percentage of testing and balancing as outlined in the ASHRAE Commissioning guidelines.
- Confirm testing and balancing results are within parameters identified in the design documentation.
- Witness stakeholder training is completed as per the design documentation.
- Witness major equipment start-up, testing and balancing as required.
- Witness systems start-up, testing and balancing.
- Review Contractor's marked-up As-built documentation for completeness and provide comment for inclusion in the Record Drawings.
- Perform review of the O&M documentation as outlined in the commissioning plan and provide advice to the Region and the Prime Consultant on acceptability of the Contractor's documentation.
- Co-ordinate detailed emergency system verification.
- Review Pre-Start Health and Safety documentation for compliance with Ministry of Labour and Region of Durham guidelines.

.4 Commissioning Closeout Services

- Create and maintain Commissioning issues log. Follow-up on rectification of deficiencies.
- Co-ordinate collection of commissioning documentation in preparation of final commissioning report.
- Review Prime Consultants record drawing package for completeness.
- Assemble closeout document package for delivery to the Owner.

7. Commissioned Systems

The Commissioning process for projects within the Region of Durham is applicable to the systems noted below.

7.1 Mechanical Systems

- Air Handling Unit Systems
- Boilers
- Unit heater / Force Flow heaters
- Wall fin Radiators
- Pumps
- Humidifiers
- Exhaust Fan Systems
- Variable air Volume Boxes
- Heating water Systems
- Split air conditioning units

7.2 Electrical Systems

- Lighting and Lighting Control
- Ceiling Fans
- Transfer Switches
- Emergency Power Systems
- UPS systems

7.3 Plumbing Systems

- Domestic hot water heaters
- Domestic hot water re-circulators
- Booster pumps
- Drainage sump pumps

7.4 Building Automation Systems

- Individual system control sequence
- Graphics
- Integrated systems

7.5 Life Safety Systems

- Fire alarm
- Sprinkler System
- Standpipe system
- Security / Access Control

7.6 Service Systems

- Vehicle hoists
- Compressed air systems
- Vacuum Systems
- Compressed gas systems

8. Building Automation Systems

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8.1 Operational Improvements

During the Commissioning Phase of the Building Automation System, The Commissioning team must recommend operational improvements aimed at optimizing the systems functions and improving comfort levels within the environment.

9. Demonstration and Training Plan

Training of the Owner's forces must be completed effectively on every project. Training must ensure that the following items have been fully explored:

- Explain the general purpose of the system (Design intent and OPRs).
- How to navigate the O&M Manuals
- Review of all drawings and schematics
- Start up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, control set-up and programming troubleshooting and alarms.
- Interactions with other systems
- Adjustments and optimizing methods for energy consumption
- Health and Safety Issues
- Special maintenance and replacement sources
- Occupant interaction issues
- System response to different operating conditions.

10. Test Equipment

The Commissioning Authority must furnish tools, equipment and materials required to fulfill all requirements of this during the commissioning process.

11. Close-Out Document Package

The close-out document package is prepared by the Commissioning Authority when retained to perform Commissioning activities or the Region of Durham representative when the Owner is completing the Commissioning. The close-out document package is a critical indicator of a project's success and will aid in the future Operation and Maintenance of a system or facility. Close-out document packages must include the following:

11.1 Description of How to Navigate the Package

- .1 Tabs, Contents, Sections and appendices .
- .2 Table of Contents

11.2 Owners Project Requirements

- .1 Commissioning agent must document the co-ordination of activities in assisting the development of the OPR.

11.3 Basis of Design Statement (If applicable).

- .1 Include the basis of design statement. Identify the process of the Basis of Design through to the development of the Specifications and Contract Documents.

11.4 Equipment Schedule

- .1 Identify all equipment installed as part of the project.

11.5 Commissioning Data

- .1 Includes Commissioning Plan, Commissioning meeting information, Training plan,
- .2 Measured Data, Pre- Functional and Functional Check Sheets, Measurement points, test equipment used, Calibration Certificates, TAB review and acceptance
- .3 Commissioning issues log, O+M reviews, Final Commissioning Report.

11.6 Operation and Maintenance manual

- .1 Inspections and declarations, Spare parts, maintenance materials and special tools.
- .2 Operation and maintenance manual, Record (as-built) documents and samples.
- .3 Record documents.

11.7 Warranty Documentation.

- Include the date of Warranty start and finish
- Items included under contractor warranty and manufacturer warranty.

11.8 Training and Demonstration Documentation

- .1 Include signed attendance sheets, training checklist etc.

12. Related Documents

12.1 Appendix A – Pre-Functional Test Forms

12.2 Appendix B – Commissioning Issues Log

12.3 Appendix C – Training and Demonstration Checklist

12.4 Appendix D – Quotation Commissioning Checklist

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