



Commissioning Plan

Quinte West Affordable Housing

2023-0120

COMMISSIONING PLAN

QUINTE WEST AFFORDABLE HOUSING
2023-0120



TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
THE COMMISSIONING PLAN	4
1 Commissioning Process Overview	5
1.1 Goals and Objectives	5
1.2 Systems to Be Commissioned	6
1.2.1 Mechanical Systems	6
1.2.2 Electrical Systems	6
2 The Commissioning Team	7
2.1 Organizational Chart Of The Commissioning Team	7
2.2 Roles And Responsibilities of the Commissioning Team	8
2.2.1 Commissioning Authority	8
2.2.2 Owner or Owner's Representative	9
2.2.3 Design Consultant	9
2.2.4 General Contractor	10
2.2.5 Manufacturers	11
2.3 Roles And Responsibility Matrix	12
2.4 Commissioning Team Contact Information	13
3 The Commissioning Process	14
3.1 Schematic Design and Design Phase	14
3.1.1 Scoping Meeting – Not in Scope	14
3.1.2 Communication Structures	14
3.1.3 Design Review Report	14
3.1.4 Commissioning Specifications	14
3.2 Construction Phase	14
3.2.1 Commissioning Meeting Minutes	14
3.2.2 Start-up and Pre-functional Check Sheets	15
3.2.3 Functional Performance Tests and Plans	16
3.2.4 Issues Log and Deficiency Resolution	17
3.3 Occupancy and Operations Phase	18
3.3.1 Operator Training	18
3.3.2 Final Commissioning Report	19

APPENDICES

- APPENDIX A** *Owner's Project Requirements (OPR) (NOT IN SCOPE)*
- APPENDIX B** *Basis of Design Requirements (BOD) Review (NOT IN SCOPE)*
- APPENDIX C** *Scoping Meeting*
- APPENDIX D** *Communication Structure*
- APPENDIX E** *Design Review Report*
- APPENDIX F** *Commissioning Specifications*
- APPENDIX G** *Shop Drawing Review (NOT IN SCOPE)*
- APPENDIX H** *Commissioning Meeting Minutes*
- APPENDIX I** *Site Visit Reports (NOT IN SCOPE)*
- APPENDIX J** *Start-Up and Pre-Functional Check Sheets*
- APPENDIX K** *Testing, Adjusting and Balancing (TAB Review Report) (NOT IN SCOPE)*
- APPENDIX L** *Functional Test Plans*
- APPENDIX M** *Issues Log*
- APPENDIX N** *Operations and Maintenance Manual Review Report (NOT IN SCOPE)*
- APPENDIX O** *Training Plan and Record*
- APPENDIX P** *Warranty Review (NOT IN SCOPE)*
- APPENDIX Q** *Lessons Learned Review (NOT IN SCOPE)*
- APPENDIX R** *Monitoring Based Commissioning (MBCx) Plan (NOT IN SCOPE)*

Client: Brian Luey Architect Inc.
Project Name: Quinte West Affordable Housing
Project Number: 2023-0120
Date: 28/09/2023



EXECUTIVE SUMMARY

Commissioning is a process used to enhance the quality and functionality of new and existing buildings and to minimize negative consequences of building design, construction and operation. It is a systematic process of ensuring, through documented verification, that all building systems perform interactively according to the documented design intent and the owner’s operational needs. According to the ASHRAE Guideline 0-2005 The Commissioning Process, “The Commissioning Process is a quality-oriented process for achieving, verifying and documenting that the operation of facilities, systems, and assemblies meets defined objectives and criteria” (ASHRAE 2)^[1].

HRCx was retained in January 2023 by Brain Luey Architect Inc. to provide commissioning services as required for a 3-storey, 32 unit affordable housing building located at 20 South St. Quinte West (Hasting County), Ontario.

^[1] American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. [ASHRAE Guideline 0-2005: The Commissioning Process](#). Atlanta: Georgia. 2005.

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THE COMMISSIONING PLAN

This Commissioning Plan guides the commissioning activities during all phases of the projects; pre-design, design, construction, acceptance and post-acceptance. It provides details of responsibilities for the design-bid-build team, commissioning authority and Owner. The plan does not include guidance on start-up, testing, balancing, demonstration and training as required by Engineers or authorities having jurisdiction over the project. Please refer to the construction documents on start-up, testing and balancing required by the design-bid-build team.

The Commissioning Plan is a tool that is constantly updated throughout the project as it progresses, and is provided iteratively to the entire Commissioning Team. At the completion of commissioning activities, the Commissioning Plan becomes the Final Commissioning Report.

The Commissioning Plan functions as a management and communication tool providing scope and structure to the commissioning process. The Plan specifies the expectations, roles and responsibilities, standards and deliverables for all of the commissioning activities.

1 COMMISSIONING PROCESS OVERVIEW

1.1 GOALS AND OBJECTIVES

The process of commissioning aims to provide a fully functional facility that meets the user's requirements by verifying the systems, equipment and component operation. It is important to consider commissioning activities at the project inception and incorporate commissioning principles into the design development, construction documents and building phase that meet and exceed *ASHRAE Standard 202-2013, and CSA Standard Z320-2011*.

The process begins with the establishment of the Commissioning Team. A Commissioning Authority is selected to oversee the process and ensure the involvement of the Occupant, Designer, General Contractor, Mechanical Engineer/Contractor, Electrical Engineer/Contractor, as well as any other parties that are a part of the design and construction of the building.

The next step is to develop a Commissioning Plan by identifying the systems to be commissioned and describing the proposed methods to ensure proper operation. Once the systems are installed, and the installation verified by the contractor, the Commissioning Authority performs a series of functional tests on all of the systems and compiles the Final Commissioning Report. The commissioning process has been proven to result in:

- Fewer occupant complaints.
- Verified operating efficiency.
- Shorten construction time.
- Lower life cycle cost.
- Ability to sustain concept design.

1.2 SYSTEMS TO BE COMMISSIONED

1.2.1 MECHANICAL SYSTEMS

All new mechanical equipment and systems as well as their respective controls that are within the design scope of work will be included in the commissioning scope for functional testing and verification of operation.

The following mechanical systems and equipment will be commissioned:

Mechanical Equipment	
Makeup Air Units	Split A/C Units and Auxiliary Heating Devices
Exhaust Fans	Heat Pumps
Pumps (heating/cooling water, condenser water, DHW)	Electric Water Heater
Unit Heaters	Force Flow Heaters
Baseboard Heaters	

A sampling strategy will be employed for equipment that is of low complexity and low criticality.

1.2.2 ELECTRICAL SYSTEMS

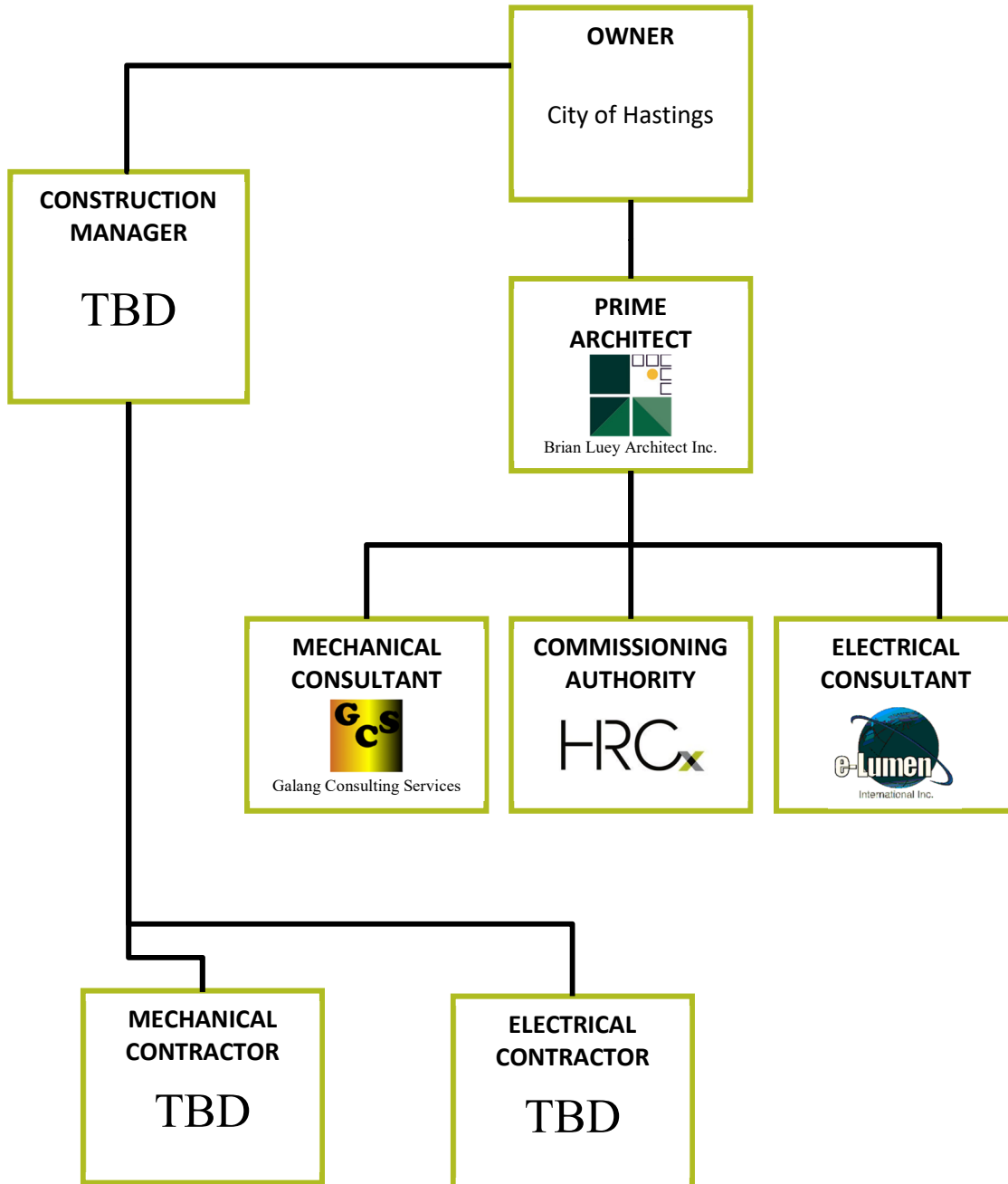
The following electrical systems and equipment will be commissioned:

Electrical Equipment	
Distribution Panels	Switchboards
Generator	Transformers
Lighting Control	Metering

A sampling strategy will be employed based on system and equipment criticality and complexity.

2 THE COMMISSIONING TEAM

2.1 ORGANIZATIONAL CHART OF THE COMMISSIONING TEAM



2.2 ROLES AND RESPONSIBILITIES OF THE COMMISSIONING TEAM

The intent of commissioning is to “Verify that the Project’s energy-related systems are installed, calibrated and perform as intended” (CaGBC 122)¹. This process is managed and performed by the Commissioning Authority and Team. The following are the general responsibilities of the Commissioning Team.

2.2.1 COMMISSIONING AUTHORITY

The Commissioning Authority is responsible for the general supervision of the commissioning process. The Commissioning Authority is independent from the Design and Construction Team and is not responsible for the design concept, the design criteria, compliance with codes, design or general construction scheduling, cost estimating or construction management. The Commissioning Authority is responsible for working with the Design and Construction team to direct and coordinated the project commissioning activities and report to the owner. The Authority must also perform the following tasks during the commissioning process:

Design Phase

- Establish and lead the Commissioning Team
Incorporate the commissioning scope of work into the project schedule
- Perform a Design Review of the Design Documents and comment on the ability of the design/systems to permit commissioning to be implemented effectively
- Develop Draft Commissioning Plan
- Prepare commissioning specifications for inclusion in construction documents with review by design-bid-build team and Owner
- Update Draft Commissioning Plan as needed for the construction phase

Construction Phase

- Conduct a commissioning kick-off meeting to review the commissioning process and procedures with the Commissioning Team and Owner
- Chair and schedule additional commissioning meetings throughout the construction process
- Coordinate commissioning process and ensure commissioning activities are captured in the construction schedule
- Review factory acceptance test reports
- Develop and provide issues log
- Develop and provide the functional performance procedures
- Aid in development of performance test schedule with the commissioning team
- Provide direction and document the execution of the performance test plans by the commissioning team
- Coordinate a training schedule with the contractor
- Provide a list of seasonal tests to be performed during the first year of operation.

¹ Canada Green Building Council. [LEED Canada-NC](#). Ontario: Ottawa. 2007.

- Complete Final Commissioning Report at the end of the Construction Phase

2.2.2 OWNER OR OWNER'S REPRESENTATIVE

The Owner or Owner's Representative is responsible for facilitating and supporting the commissioning process, providing the final approval on commissioning work. The Owner may also be responsible for the following:

Design Phase

- Review completed design review report and provide comments
- Participate in the design phase commissioning scoping meeting
- Provide comments on Draft Commissioning Plan

Construction Phase

- Attend commissioning meetings as required
- Assign operations personnel and schedule them to participate in various construction phase commissioning activities such as:
 - Construction phase kick-off and consecutive commissioning meetings
 - System testing verification review
- Review functional test plans and attend functional testing (if desired)
- Attend Owner training sessions
- Review Final Commissioning Report at the end of the Construction Phase

2.2.3 DESIGN CONSULTANT

The Consultants are comprised of the design professionals such as the Architecture and the Engineers who are responsible for the preparation of design drawings and specifications. The Commissioning Process often requires that the design professionals work with the Commissioning Authority to integrate the Commissioning Process into the project.

Design Phase

- Prepare the contract documents and integrate the commissioning process provided by the Commissioning Authority
- Review Design Reviews provided by the Commissioning Authority
- Reviews shop drawing submittals, equipment parameters and equipment commissioning requirements
- Provide assistance to ensure proper performance requirements are included in procured equipment (mechanical and electrical)
- Review Draft Commissioning Plan, commissioning test scripts, and commissioning schedule
- Incorporate and review commissioning specifications into construction documents

Construction Phase

- Attend kick-off commissioning meeting to review the commissioning process with the

- commissioning team and Owner
- Attend additional commissioning meetings throughout the construction process as needed
- Assist in development of the start-up plans and documentation (including providing pre-functional checklists for the completion by the design-bid-build team)
- Complete site visits to ensure systems are in compliance with design codes and standard
- Provide start-up, piping test and flushing, duct testing and cleaning and testing, adjusting and balancing requirements as needed in the construction documents
- Aid in development of the functional performance procedures and seasonal testing
- Attend and review training provided by sub-trades as required by the construction documents
- Review Final Commissioning Report at the end of the Construction Phase

2.2.4 GENERAL CONTRACTOR

The General Contractor (GC) shall assist the Commissioning Authority in the finalization of the Commissioning Plan. When the Commissioning Plan is finalized and construction begins, the GC coordinates the Trades and ensures that the energy related systems are installed as per the Commissioning Plan requirements. The GC or Trades may also be responsible for the following tasks:

Design Phase

- Evaluate comments in the Design Review of the Schematic Design Documents
- Attend coordination meeting with the Owner and Commissioning Authority to resolve issues identified during design review
- Reviews the design phase commissioning process
- Provides shop drawing submittals for review
- Assist to ensure proper performance requirements are included in procured equipment (mechanical and electrical)
- Review and comment on Draft Commissioning Plan, commissioning test scripts, and commissioning schedule

Construction Phase

- Attend kick-off commissioning meeting to review the commissioning process and procedures with the commissioning team and Owner
- Attend additional commissioning meetings throughout the construction process
- Incorporate submittal reviews in accordance with Owner's Project Requirements and construction documents
- Execute commissioning process and include commissioning activities are captured in the construction schedule
- Complete the start-up plans and documentation including pre-functional checklists
- Execute the checklists and start-up in accordance to the plans and construction documents

- Complete piping test and flushing, duct testing and cleaning and testing, adjusting and balancing as needed
- Assist in development of the functional performance procedures and test schedule
- Execute the performance test plans and seasonal test plans in accordance with functional performance procedures
- Provide training to Owner Representatives
- Coordinate training as required by the construction documents
- Review Final Commissioning Report at the end of the Construction Phase

2.2.5 MANUFACTURERS

The Manufacturers shall assist the General Contractor and the Commissioning Authority in the execution of the commissioning process. The GC coordinates the Trades and manufacturers to ensure that the energy related systems are installed as per the manufacturer and construction document requirements. The manufacturer may also be responsible for the following tasks:

Construction Phase

- Provide all information required for the operation and maintenance of the system as part of shop drawing submittal
- Provide responses to submittal comments as required
- Include warranty requirements as part of submittal
- Coordinate and accomplish factory tests as per the construction documents
- Deliver training as detailed in the construction documents
- Demonstrate the operation and performance of the systems or equipment as per the construction documents

2.3 ROLES AND RESPONSIBILITY MATRIX

A Roles and Responsibilities Matrix summarizes the tasks, submittals and responsibilities from the Commissioning Team.

ROLES & RESPONSIBILITIES		OWNER	COMMISSIONING AUTHORITY	ARCHITECT	STRUCTURAL ENGINEER	MECHANICAL ENGINEER	ELECTRICAL DESIGN ENGINEER	LIGHTING DESIGN PROFESSIONAL	INTERIOR SYSTEMS DESIGN PROFESSIONAL	EXTERIOR ENCLOSURE CONSULTANT EXT. ENCLOSURE MANUFACTURERS	CONSTRUCTION MANAGER	GENERAL CONTRACTOR	EXTERIOR ENCLOSURE CONTRACTORS	MECHANICAL & TESTING CONTRACTOR	ELECTRICAL CONTRACTOR	INDOOR AIR QUALITY SPECIALIST	ACOUSTIC SPECIALIST	VIBRATION SPECIALIST	MOISTURE/MILDEW SPECIALIST	MEASUREMENT/VERIFICATION SPECIALIST	INFORMATION TECHNOLOGY SPECIALIST	PHYSICAL SECURITY SPECIALIST	BLAST (AND CHEM-BIO) SECURITY	FACILITIES MANAGEMENT	FACILITIES ENGINEER (O&M)	OCCUPANTS	KEY		
																											P	A	R
Design																													
1	Commissioning Plan Development	R/A	P	R		R	R								U														
2	Commissioning Specifications	R/A	R	P		P	P								U														
3	Design Reviews (Commissioning Focused)	R/A	P	R		R	R								U														
Construction																													
4	Commissioning Plan Update	R/A	P	R		R	R								U														
5	Submittal Review Comments	R/A	P	I		I	I								U														
6	Construction Checklists	R/A	P	R		R	R								U														
7	Commissioning Milestone Schedule	R/A	P	I		I	I								U														
8	Functional testing	R/A	P	I		I	I								U														
9	Test Data Reports	R/A	R	I		I	I								P		P	P											
10	Commissioning Meeting Record	R/A	P	R		R	R								U		U	U											
11	Test Verification Record	R/A	P	R		R	R								U		U	U											
12	Issues Log & Report	R/A	P	I		I	I								U		U	U											
13	Training Schedule	R/A	P	R		R	R								U		U	U											
14	Seasonal Testing	R/A	P	I		I	I								U		U	U											
15	Final Commissioning Report	R/A	P	I		I	I								I		I	I											

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2.4 COMMISSIONING TEAM CONTACT INFORMATION

The Commissioning Authority and Team contact information are identified in the table below.

Designation	Company	Name	E-Mail	Phone
Owner	City of Hastings			
Prime Architect	Brian Luey Architect Inc.	Farshid Niaki	fniaki@brianlueyarchitect.com	
Mechanical Consultant	Galang Consulting Services			
Electrical Consultant	e-Lumen International Inc.			
Commissioning Authority (Lead)	HRCx	Aaron Halberstadt	aaron.halberstadt@hidi.com	T. 416.364.2100 x321
Commissioning Authority	HRCx	Michael De Pinto	Michael.depinto@hidi.com	T. 416.364.2100 x316

3 THE COMMISSIONING PROCESS

The following describes management, communication and report tools and activities for the Commissioning Process. Each item listed below is a deliverable as part of the process and will be included in the Final Commissioning Report once complete. All deliverables are provided in the Appendices below.

3.1 SCHEMATIC DESIGN AND DESIGN PHASE

The development and incorporation of the Commissioning Requirements are applied into the construction documentation which then begins development of Commissioning Plan.

3.1.1 SCOPING MEETING – NOT IN SCOPE

During the design phase, a scoping meeting is coordinated between the Owner and the design consultants to review the commissioning process and include process requirements into the construction documents. Scoping Meeting Minutes shall be recorded, noting issues and assigning tasks and deadlines to the relevant parties. Scoping Meeting Minutes are provided in [Appendix C](#).

3.1.2 COMMUNICATION STRUCTURES

The method for communication protocol for each issue identified during the commissioning process is to be discussed during the Scoping Meeting. The general protocol used during the commissioning process is provided in [Appendix D](#).

3.1.3 DESIGN REVIEW REPORT

Design review is performed during the design of the drawings and specifications. Reviews are to be completed with commentary on the ability of the design/systems to permit commissioning to be implemented effectively. These findings are documented in the reviews required above. Design Review Reports can be found in [Appendix E](#).

3.1.4 COMMISSIONING SPECIFICATIONS

As part of the design-bid-build process, the requirements for commissioning were incorporated into the construction documents. The commissioning specifications are included in [Appendix E](#).

3.2 CONSTRUCTION PHASE

In the Construction Phase, the Commissioning Plan is further developed. Test plans for functional testing are created, and site visits are made; all our efforts to verify installation of systems and ensure the performance of systems are consistent with the designing intent. Once the start-up of systems is initialized, documentation of the start-up is created. Verification of start-up is captured on the checklists in accordance to the plans and construction documents.

3.2.1 COMMISSIONING MEETING MINUTES

Commissioning Meeting Minutes provide a chronological account of the construction and commissioning developments that take place over the course of the construction phase of the project. Minutes shall be taken at each meeting, noting issues and assigning tasks and deadlines to the relevant parties. Meeting Minutes are provided in [Appendix H](#).

3.2.2 START-UP AND PRE-FUNCTIONAL CHECK SHEETS

The General Contractor shall coordinate the start-up of all equipment within the commissioning scope. The Commissioning Authority will assist the contractor in the development of the start-up plan templates. The General Contractor and respective sub-contractors shall then perform the start-up, complete and submit the checklists with any necessary comments in a timely manner. The Commissioning Authority tracks start-up completion. The Commissioning Authority is not required to witness equipment system start-ups, however, may select to witness various tests during scheduled site visits. Start-up and pre-functional forms can be found in [Appendix J](#).

3.2.2.1 PROCEDURES FOR START-UP, FUNCTIONAL TESTING AND TESTING PROCEDURES

The GC and sub-contractors shall provide all materials, test equipment, utilities, etc., and sufficient responsible and knowledgeable personnel from each related trade as required demonstrating proper systems' operation.

1. The start-up checklists / plan shall be in addition to the requirements for contractor tests, Code official's inspection tests, Authority having jurisdiction requirements and operating instructions.
2. The GC and sub-contractors shall supervise, conduct, and document the start-up tests. The date for the start-up tests shall be prior to the anticipated date of the performance test and with sufficient time to permit proper and full execution of the performance tests prior to the substantial completion date. Any adjustments and/or alterations which the start-up tests indicate as necessary to demonstrate the functional performance of all equipment shall be completed prior to the functional performance test.
3. The GC shall provide a detailed commissioning schedule of completion indicating when each system is to be completed and outlining when and how tests will be performed. The commissioning schedule shall be submitted for review at least 60 days prior to the anticipated date of system start-up.
4. The scope of start-up, pre-functional and functional performance tests shall include, as a minimum, a complete and fully automatic demonstration of the sequences of control specified in **Section 22, 23 and 26** of the construction documents and as may be specified elsewhere in this Division.
5. The GC shall maintain completed Start-up and Pre-functional Checklists and report to the Commissioning Team on progress.

6. The GC shall ensure all Start-up and Pre-functional Checklists are submitted with all signatures and dates required to permit scheduling of the functional testing.
7. The Start-up and Pre-functional Checklist shall be reviewed for quality control by the Commissioning Authority. Work found not operating in accordance with the requirements specified in the Contract Documents shall be corrected and additional start-up tests made, all at no additional cost to the owner.

3.2.3 FUNCTIONAL PERFORMANCE TESTS AND PLANS

Functional Testing of equipment and systems is conducted once all pre-functional checks on equipment have been completed and all pre-functional check sheets have been completed and submitted. The Contractor performs the testing and the Commissioning Authority oversees witnesses and documents the functional testing of all equipment and systems according to the Specifications and contract documents.

Adjustment such as air balancing and water balancing are completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems and finally to interlocks and connections between systems.

3.2.3.1 PRE-REQUISITES FOR FUNCTIONAL TESTING

The following applicable prerequisite checklist items are required to be listed on each written test form and be completed and checked off by the Commissioning Authority prior to functional testing.

- All related equipment has been started up and start-up reports have been submitted and completed by Contractor. Start-up reports have been reviewed and approved as complete by the Commissioning Authority.
- All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final set-points and schedules with debugging, loop tuning and sensor calibrations completed.
- Piping system flushing complete and required report approved and indicated as complete by the Commissioning Authority.
- Water treatment system complete and operational.
- Test and balance complete and approved for the hydronic and air system. Report has been submitted for review and is approved by the Commissioning Authority.
- All design-bid-build team punch list items for this equipment corrected.
- Safeties and operating ranges reviewed by the Owner and respective Operators.
- Test requirements and sequences of operation attached.
- Approval by the Owner and design-bid-build team of the functional testing plans / MOPs have been obtained.
- Schedules and set-points attached.
- Sufficient clearance around equipment for servicing.

- Systems for testing are appropriately powered.
- Record of all values for pre-test set-points changed to accommodate testing has been made and a check box provided to verify return to original values (control parameters, limits, delays, lockouts, schedules, etc.).
- Other miscellaneous checks of the pre-functional checklist and start-up reports completed successfully.

3.2.3.2 FUNCTIONAL PERFORMANCE TESTING PROCEDURE

The Commissioning Authority will direct, witness and document the functional testing of all systems to be commissioned. The Functional Testing will be conducted by the GC and their respective sub-contractors. Any issues that arise during testing are compiled into an Issues Log for further resolution and re-testing.

The Functional Test Plans (FTP) are developed by the Commissioning Authority and commissioning team in order to provide specific methods of recording and verifying system performance. Each functional test is fashioned for a specific system or piece of equipment to ensure proper operation. Test Plans include the following information:

- A system description extracted from drawings and specifications summarizing the purpose and design of the equipment
- The sequence of operation provides information of system design
- Pre-start-up and start-up lists activities which must be performed by the Contractor
- Functional Tests describe routines used to verify system performance at a variety of expected conditions

3.2.3.3 SAMPLING PROCEDURES

At the discretion of the project scope, multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy.

3.2.3.4 OWNER PARTICIPATION

The facilities operating staff at the direction of the owner may participate in the testing process.

A summary of the results of the functional testing will be captured in the Site Visit Reports provided during the construction phase. Completed functional test plans will be provided in the [Appendix L](#).

3.2.4 ISSUES LOG AND DEFICIENCY RESOLUTION

All deficiencies identified during the functional performance testing are documented in the Commissioning Issues Log and reported to the Owner and commissioning team. The deficiency

report includes all details of the components or systems found to be non-compliant with the parameters of the test plans. The report details the adjustments or alterations required to correct system operation.

Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Authority with the concurrence of the Owner. In such cases the deficiency and resolution will be documented on the procedure form. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.

3.2.4.1 IDENTIFIED ISSUES

If there is no dispute on the deficiency and the responsibility to correct it:

- The Commissioning Authority documents the deficiency and the adjustments or alterations required to correct it. The contractor corrects the deficiency and notifies the Commissioning Authority that the equipment is ready to be retested and verified.

If there is a dispute about a deficiency or contractual responsibility:

- The item is documented on the issues form and a copy given the GM or where required the Owner. Resolutions are made at the lowest management level possible. Final interpretive authority is with the Owner. The CxA documents the resolution process.

Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the Commissioning Authority that the equipment is ready to be retested. When satisfactory performance is achieved the issue is closed on the Issues Log. The Issues Log is provided on [Appendix M](#).

3.3 OCCUPANCY AND OPERATIONS PHASE

Once the premises are ready for occupancy, building operators and maintenance staff are provided training organized by the General Contractor and the Final Commissioning Report is prepared and issued.

3.3.1 OPERATOR TRAINING

During the occupancy period as part of the turnover process, training is provided to the Building Operations and Maintenance personnel on the systems to be commissioned. Training is to be provided in accordance with the construction documents to operate and maintain the building systems and equipment. The training plan is to be provided during the early construction phase and carried through to the occupancy phase. The plan should contain all requirements for instruction, delivery and method, location, instructor qualifications, training materials required and a record of training. A copy of the Training Plan and Record is provided in [Appendix O](#).

Client: Brian Luey Architect Inc.
Project Name: Quinte West Affordable Housing
Project Number: 2023-0120
Date: 28/09/2023



3.3.2 FINAL COMMISSIONING REPORT

The Final Commissioning Report will be submitted by the Commissioning Authority to the Owner at the end of the commissioning process, developed from the Commissioning Plan.

END OF COMMISSIONING PLAN

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APPENDIX A

Owner's Project Requirements (OPR) (NOT IN SCOPE)

APPENDIX B

Basis of Design Requirements (BOD) Review (NOT IN SCOPE)

APPENDIX C

Scoping Meeting (NOT IN SCOPE)

APPENDIX D

Communication Structure

The following protocols will be used on this project:

General Management Protocols	
Issue	Protocol
For requests for information (RFI) or formal documentation requests:	The CxA goes first through the PM or OR
For minor or verbal information and clarifications:	The CxA goes direct to the PM or OR
For notifying contractors of deficiencies:	The CxA documents deficiencies through the GM or OR, but may discuss deficiency issues with contractors prior to notifying the PM or OR
For scheduling tests or training:	The CxA provides input and coordination of testing and training. Scheduling is done through the PM or OR.
For scheduling commissioning meetings:	The CP selects the date and schedules through the PM or OR.
For making a request for significant changes:	The CxA has no authority to issue change orders.
For making minor changes in specified sequences of operations:	Any required changes in sequences of operations required to correct operational deficiencies must be approved and documented by the GM/OR and A/E team. The CxA may recommend changes in sequences of operation to improve efficiency or control.
Subcontractors disagreeing with requests or interpretations by the CxA shall:	Resolve issues at the lowest level possible. First with the CxA, who obtains approval from the GM or OR then with the GC. Some issues may require input from the A/E team.

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Design Review Report

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Commissioning Specifications

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Shop Drawing Review (NOT IN SCOPE)

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