

Appendix: Consultant Scope of Work

Commissioning Authority

The primary objective of the Commissioning Authority (CxA) is to help ensure The City receives the greatest value on its investments into buildings systems by ensuring they are designed, constructed, calibrated, and operating to the highest standard.

As construction methods and building systems have increased in complexity, commissioning has become a critical, if not an indispensable step in any construction project. The City is committed to commissioning future facilities to verify that buildings are designed, constructed, and handed over in a manner that meets the Owner's Project Requirements (OPR) for energy, water, indoor environmental quality, and durability; and ensures City staff have the information and training required to operate the building effectively.

Abbreviations

- APEGA (Association of Professional Engineers and Geoscientists of Alberta)
- ASHRAE (The American Society of Heating, Refrigerating and Air-Conditioning Engineers)
- ASTM (American Society for Testing and Materials)
- BE (Building Envelope)
- BIPV (Building Integrated Photovoltaics)
- BIST (Building Integrated System Testing)
- BoD (Basis of Design)
- CxA (Commissioning Authority)
- HVAC&R (Heating Ventilating, Air Conditioning and Refrigeration)
- LEED (Leadership in Energy and Environmental Design)
- MEP (Mechanical Electrical and Plumbing)
- NIBS (National Institute of Building Sciences)
- OPR (Owner's Project Requirements)

Qualifications

The commissioning team will be led by an individual appointed as the CxA lead. The CxA lead must be a professional engineer registered with APEGA. The CxA lead will be responsible for directing the commissioning team in the completion of the commissioning requirements as identified in the "Mechanical, Electrical, and Plumbing (MEP) Commissioning Requirements" and "Building Envelope (BE) Commissioning Requirements" sections provided below. The CxA lead will serve as the main point of contact to the owner, design consultants, and contractors. The CxA lead will be responsible for reporting results, findings, and recommendations directly to the owner. The CxA lead will act as signatory for any LEED letter templates required for submission.

The commissioning team may be made up of multiple subject matter experts to address all the systems required to meet the commissioning requirements. The Consultant's lead MEP commissioning agent must be a professional engineer registered with APEGA. The Consultant's lead BE commissioning agent must be a professional engineer registered with APEGA or be a registered architect in Alberta with CxA experience. The CxA lead must have at least five years of commissioning experience on at least five projects. All other team members must demonstrate they have commissioning experience on at least two projects within the past five years.

Firms acting as part of the design or construction team will be ineligible to act as part of the commissioning team.

Requirements

The scope of services of the CxA includes, but may not be limited to, the following anticipated requirements. Projects that are required to comply with the Sustainable Building Policy are required to complete LEED level enhanced commissioning on energy and building envelop systems regardless of certification objectives.

General Requirements

Commissioning work must be done in accordance with the ASHRAE 0, ASHRAE 0.2, ASHRAE 1.1, ASHRAE 202, NIBS Guideline 3 or ASTM E2947 and LEED with respect to the LEED Energy & Atmosphere (EA) prerequisite fundamental Commissioning and Verification and EA credit Enhanced Commissioning (excluding monitoring-based commissioning). Exact standard versions shall be confirmed at the commissioning kick-off meeting.

Systems to be commissioned include at a minimum: mechanical (including HVAC&R equipment and controls), plumbing (including domestic hot water, pumps, and controls), electrical (main service, power distribution, lighting, and lighting controls), renewable energy and power generation (including solar photovoltaics, solar heating, BIPV, cogeneration and controls), specialty recreation center systems (including arena refrigeration, aquatics, and associated controls), data centres and building envelope (including assemblies, fenestration, openings, operable elements and automated shading systems). Building Integrated System Testing (BIST) shall be priced an optional service. Exact systems included shall be discussed and determined on a project-by-project basis.

Mechanical, Electrical, and Plumbing Commissioning Requirements

The commissioning process activities for MEP and renewable energy systems will be completed in accordance with standards referenced above. Items that are of particular importance or specific to The City require the CxA to:

- Develop a Commissioning Plan which includes the identification of the roles and responsibilities of the commissioning team members (which includes the CxA, City personnel, design team members, and contractors).
- Review existing project documents and create and update a commissioning specific OPR document and review the Basis of Design (BoD) against the OPR.
- Review the Schematic Design (SD), Design Development (DD) and Contract Documents (CD) at project defined milestones. Exact milestones for review will be determined on a project-by-project basis.
- Provide specification sections required to ensure contractor participation and compliance with commissioning tasks.
- Prepare installation verification checklists for all equipment, assemblies, and systems included in the commissioning scope.
- Develop systems test procedures for all systems included in the commissioning scope.
- Coordinate, in conjunction with the construction team, and chair regular commissioning team meetings. Record and distribute commissioning meeting minutes to commissioning team members including The City.
- Conduct shop drawing reviews of all equipment, assemblies, and systems included in the commissioning scope.
- Conduct construction site reviews on a project specific basis. An example includes once per month and bi-weekly (every two weeks) three (3) months prior to substantial completion for compliance with The City project requirements and the Issued for Construction documents. Identify any observed deficiencies.
- Review requests for information and proposed change orders for impact on commissioning and OPR objectives.
- Verify the installation and functional performance of the systems to be commissioned, including seasonal testing. Be present at all major equipment start-ups.
- Review the operation and manual(s) for all commissioned equipment, systems, and assemblies.
- Verify operation and maintenance criteria for the facility reflect The City's expectations and capabilities.

- Verify equipment and system expectations, describing the desired level of quality, reliability, type, automation, flexibility, and maintenance requirements, noise, and vibration requirements, for each of the commissioned systems, and when known, efficiency targets, desired technologies, or preferred manufacturers of building systems.
- Verify that the requirements for training operating personnel and building occupants are sufficient and completed.
- Maintain and distribute an issues log at regular intervals for review and updating throughout the commissioning process. The issues log shall track identified deficiencies and discuss risk. Issues shall not be closed until confirmed by The City.
- Complete a Final Commissioning Report.
- Develop a systems manual (scope and format as outlined in ASHRAE Guideline 0) which gives future operating staff the information needed to understand and optimally operate the commissioned systems.

Building Envelope Commissioning Requirements

The commissioning process activities for building envelope components will be completed in accordance with the standards referenced above. Items that are of particular importance or specific to The City require the building envelope commissioning team to:

- Incorporate building envelope commissioning activities into the Commissioning Plan.
- Review existing project documents and create and update a commissioning specific Owner's Project Requirements (OPR) document and review the Basis of Design (BoD) against the OPR with regard to the proposed air/moisture/thermal strategies for the envelope.
- Review the Schematic Design (SD), Design Development (DD) and Contract Documents (CD) at project defined milestones. Exact milestones for review will be determined on a project-by-project basis.
- Based on the proposed design, identify the requirements for prototype/lab testing, construction mock-ups, and building envelope performance testing including thermal scans and airtightness testing.
- Conduct reviews of shop drawings and submittals for building envelope components.
- Complete relevant prototype/lab testing for air, water, thermal, structural, condensation resistance, R-values and U-values of building envelope components.
- Review and comment on the construction of mock-ups for typical envelope assemblies.
- Complete field reviews and provide quality assurance services at project specific defined intervals.
- Conduct installed building envelope performance testing including air tightness testing, water penetration resistance, adhesion testing, and compatibility.
- Confirm thermal performance of installed building envelope using infrared thermography.
- Review requests for information and proposed change orders for impact on commissioning and OPR objectives.
- Maintain and distribute an issues log at regular intervals for review and updating throughout the commissioning process. The issues log shall track identified deficiencies and discuss risk. Issues shall not be closed until confirmed by The City.
- Provide building envelope related components for the Final Commissioning Report.

Communication Protocol

- On most building construction projects, the City of Calgary establishes a Prime Consultant for design phase and construction period services. The City also establishes a construction contract with a Prime Contractor to provide construction services. Both contracts are administered by a City of Calgary Project Manager. On most projects, the authority to modify any contract is strictly limited to the City of Calgary Project Manager and their designated representative.

- All communications on contractual issues are strictly limited to communications between the City Project Manager, the Prime Consultant and the Prime Contractor. It is the practice of the City to require that communication between other parties to the contracts (Sub-Consultants, Subcontractors and Vendors) be routed through the City Project Manager, the Prime Consultant and the Prime Contractor.
- Building Commissioning is a process that requires high levels of communication and collaboration between all parties to the construction process. By its nature, the levels of communication and cooperation between the CxA and all other parties to the construction process (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort. In the absence of these relationships, cooperation and support created by this communication, the Commissioning Protocol will likely fail to achieve its ends.
- This protocol has been developed to recognize that, in the execution of the Commissioning Process, the CxA must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the City of Calgary.
- The CxA may maintain a continuous open communication with the Prime Consultant, Sub-consultants, the Contractor and Subcontractors and the Project Team to facilitate a collaborative commissioning process subject to the specific limitations outlined below:
 - All communications shall be copied to the City of Calgary Project Manager.
 - No communications (verbal or written) from the CxA will be deemed to constitute direction that modifies the terms of any contract between the City of Calgary and any party to the construction project.
 - Commissioning issues communicated in writing from the CxA to the Contractor or Consultant and copied to the PM Project Manager are provided to all parties to the contract to expedite communication. All issues must be understood as the professional opinion of the CxA and recommendations for issue resolution only until approved as direction by the Project Manager.
 - If any Commissioning Issues and suggested resolutions from the CxA are deemed to require either an official interpretation of the construction documents or are determined to require a modification of the contract documents, the Project Manager will issue an official directive to this effect.
 - Authority for design and construction issues resolution rests solely with the City of Calgary Project Manager and their designated representative with appropriate technical guidance from the Prime Consultant Team and/or CxA.

Deliverables

Provided deliverables shall follow the scope and standards provided above include but are not limited to the following:

- Commissioning Plan (drafts and final)
- CxA design reviews
- Commissioning specifications
- Commissioning reports (including inspection reports)
- Commissioning meeting minutes
- Issues Log
- LEED prerequisite/credit deliverables

Project specific deliverables shall be further defined in the CxA created Commissioning Plan. Deliverables defined in the LEED v4 Fundamental and Enhanced Commissioning prerequisite and credit are to be submitted to The City PM and the Policy Steward.

References

Actual versions of the reference standards provided below shall be confirmed at the commissioning kick-off meeting.

- ASHRAE Guideline 0: The Commissioning Process, ASHRAE
- ASHRAE Guideline 0.2: Commissioning Process for Existing Buildings Systems and Assemblies, ASHRAE
- ASHRAE Guideline 1.1: HVAC&R Technical Requirements for The Commissioning Process, ASHRAE
- ASHRAE Standard 202: Commissioning Process for Buildings and Systems, ASHRAE
- ASTM E2947: Standard Guide for Building Enclosure Commissioning, ASTM
- NIBS Guideline 3: Building Enclosure Commissioning Process BECx, NIBS
- LEED v4 Reference Guide, U.S. Green Building Council, 2017
- LEED v4.1 Reference Guide, U.S. Green Building Council, 2019