

Owner: [name]
Project: [name]
Location: [name]

Exhibit "A"

Existing Building Commissioning Statement of Work

The [Name - Owner] is committed to commissioning the [name of facility] existing building by investigating, analyzing, and optimizing the performance of building systems through the identification and implementation of low/no cost and capital intensive Facility Improvement Measures (FIMs) and ensuring their continued performance.

The Existing Building Commissioning process assists in making the building systems perform interactively to meet the Current Facility Requirements (CFR) and provides the tools to support the continuous improvement of system performance over time. The Retro-Commissioning process focuses on the dynamic energy-using systems with the goal of reducing energy waste, obtaining energy cost savings for the owner, and identifying and fixing existing problems. The Commissioning Authority (CxA) is the entity that leads, plans, schedules and coordinates the commissioning process and makes recommendations to the Owner regarding Facility Improvement Measures and assists in verifying their continued performance over time.

The following scope of work follows the requirements listed in the Building Commissioning Association's "Best Practices in Commissioning Existing Buildings."

Systems to Commission

The systems to be commissioned will include the following:

- HVAC systems
- Air terminal unit systems, VAV, PIU, AHU, etc.
- Variable frequency drives and motors
- Exhaust air systems and building pressurization controls
- Chiller and boiler systems
- Building automation systems, including controlled devise, sensors, control loops, logic, and graphical user interface
- Lighting and lighting control systems
- Domestic hot water system
- [other]

1.1 Technical Approach

The following tasks are included in the scope of this project and apply to all equipment listed above, unless specifically noted otherwise. Retro-Commissioning (RCx) process consists of the following phases:

1. Planning Phase
2. Investigation Phase
3. Implementation Phase
4. Turn-over Phase

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1. PLANNING PHASE	
<p>The CxA shall provide the following services during the Planning Phase. The objectives of the Planning Phase are to develop/confirm the owner's needs and requirements for the facilities and document them through the development of a Current Facility Requirements (CFR) document; and to develop a Retro-Commissioning Plan to define the commissioning process for the facility.</p>	
1.1	<p>Kickoff meeting – CxA will attend a preliminary kickoff meeting with the [OWNER] project manager, and the [OWNER] building manager. During this meeting, the following items will be discussed:</p> <ul style="list-style-type: none"> • Review goals of project • Identify key team members • Order and priority of buildings to be assessed • Access to facilities.
1.2	<p>Define Current Facility Requirements – CxA will develop an updated Current Facility Requirements (CFR) which defines the current operational needs and requirements of the building(s). For buildings that undertook a new building commissioning process, the CFR is the evolution of the Owner's Project Requirements (OPR) established during the original commissioning process. If the building has had its usage changed from the original design, or if a current CFR does not exist, the Commissioning Provider and Owner will develop a Current Facility Requirements (CFR). Items such as temperature, humidity, operating hours, filtration, sound, vibration, and/or specialty needs must be discussed and agreed upon in the CFR. The CFR will note any integrated requirements such as Controls, Fire & Life Safety, Staff Training, Warranty review, Service Contract review, Security Systems, etc. The CFR will become an attachment to the RCx plan.</p>
1.3	<p>Collect Existing Building Documentation – CxA will obtain existing building documentation such as; building plans and specifications, TAB reports, points list from the building automation system (BAS), Operations and Maintenance Manuals, maintenance documentation records, utility records, etc. The primary focus is to determine the availability of documentation for the RCx Investigation process.</p>
1.4	<p>Documentation Review – Review building drawings and documentation to understand the building energy usage, initial basis of design and evaluate the system integration. The review process includes the evaluation of all old and new drawings, specifications, Test, Adjust, and Balance Reports, Operations & Maintenance Manuals (typically related to mechanical, electrical and controls), and any past Commissioning Reports.</p>
1.5	<p>Perform a Cursory Walk-Through – CxA will perform a cursory walk-through and visit all major spaces to gain an understanding of the types of spaces, condition of spaces, occupancy levels, lighting and controls and prevalence of information technology related infrastructure and equipment.</p>
1.6	<p>Preliminary Building Utility Baseline Benchmark – CxA will provide preliminary building utility baseline benchmarks for the project building(s). This preliminary benchmarking can help uncover potential opportunities and can be used as a baseline to measure future performance improvements during the commissioning process.</p>

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1.7	<p>Develop Retro-Commissioning Plan – After reviewing the building package and gaining a clear understanding of the project objectives, CxA will develop the existing building commissioning Plan based on [OWNER]'s goals for the project and findings from the initial site visit and information gathering. The Plan will document project objectives, schedule, and CFR.</p> <p>The Plan will include the following information:</p> <ul style="list-style-type: none"> • Commissioning objectives • Commissioning team members and their roles and responsibilities (CxA, [OWNER], other Technical Partners) • Communication protocols between the team • Identification of documentation collected • Preliminary building utility baseline benchmarks • Major RCx activities • Schedule of major commissioning events • Scope of testing • CFR <p>It is important that the Plan give thoughtful consideration to the level of involvement of the [OWNER] and how communication with key [OWNER] staff will be handled to ensure consensus and success.</p>
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2. INVESTIGATION PHASE	
<p>The CxA shall provide the following services during the Investigation Phase. The objective of the Investigation Phase is to conduct the site investigation to compare the actual building conditions and system performance with the owner's current operational needs and requirements defined by the CFR. This phase concludes with the completion and review of a Master List of Findings that identifies Facility Improvement Measures (FIMs) that upon implementation will improve building and system performance to meet the CFR, reduce energy and O&M costs and/or improve the indoor environmental quality.</p> <p>RCx services will focus on projects with mainly low-cost no-cost improvements to the operating systems, including, diagnostic and functional tests of major systems and equipment, calibration and sequence modifications of energy management and control systems (CxA), water reduction, and operations and maintenance (O&M) tune-ups.</p>	
2.1	<p>Commissioning Coordination – During the Investigation Phase (and throughout the entire commissioning process) the commissioning team will meet periodically to discuss Commissioning status, system performance, and issues identified. Owner participation in these status meetings is critical to solicit additional input, build consensus as well as to help address any simple repairs or adjustments that need to be made during this phase.</p>
2.2	<p>Building Staff Interviews – Interview the owner's maintenance staff, utility staff, occupants, and other relevant parties to understand the current needs and issues related to system operations and maintenance. A formal interview process is recommended to systematically assist in understanding potential issues and problems, uncover potential improvement opportunities, confirm the CFR and to develop consensus on the commissioning process goals.</p>

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2.3	<p>Site Review/Survey/Condition Assessment – Conduct a thorough and detailed building walk through (maintenance staff participation is highly desirable) to evaluate the issues identified in the planning phase and observed during the drawing and documentation review. Important facility information not found during the Documentation Review may need to be recreated during the site survey (i.e., TAB analysis to determine current air/water flows, or if sequences of operation are unavailable, perform functional performance testing to determine how systems operate). During this step additional issues which are not captured through the documentation review will be noted.</p>
2.4	<p>HVAC TAB Validation – CxA will validate (not re-balance) the air and hydronic flows of the main HVAC systems. This will include AHUs, exhaust systems, chillers, pumps, air handler coils, circuit setters, valves and cooling towers. CxA will validate (not re-balance):</p> <ul style="list-style-type: none"> • Supply air flow and water flow readings on [100%] of AHUs and ERUs • Air flow readings on [20%] of the VAV terminals and associated diffusers/grilles. <p>The CxA will concentrate readings in spaces that maybe identified by the [Owner] as problems areas. Readings will be documented in the RCx report.</p>
2.5	<p>Sensor and actuator calibration – Using the trending capability of the existing digital control system for troubleshooting, testing and data gathering is a cost effective approach but only if the commissioning provider and building staff are confident that the sensors are reading properly.</p> <p>A list of sensors and actuators for calibration will be developed by CxA following a points list review. Example of critical control sensors to be calibrated include static pressure, outside air temperature, return air temperatures, mixed air temperature, discharge temperature, variable frequency drive (VFD) speed, damper actuators, valve actuators, humidity sensors, and space temperature sensors. The CxA shall calibrate the selected sensors and actuators. The calibration records shall be submitted with the RCx report.</p>
2.6	<p>Systems Diagnostic Monitoring – CxA will develop a diagnostic monitoring plan and then perform comprehensive system diagnostic monitoring. Diagnostic monitoring methods can include; building automation system trending, portable data logger trending, and energy and weather data collection. The collected data is analyzed to identify issues and improvement opportunities and highlight particular problems that may require more rigorous and focused investigation. Analyzing the diagnostic monitoring data will assist in determining if the system is meeting the CFR. As a minimum:</p> <ul style="list-style-type: none"> • Trend major equipment control loops for 24 hours to determine stability of control • Randomly trend [20%] of the room temperatures for 24 hours to determine stability of control.
2.7	<p>Test Development – Develop Functional Performance Test Procedures for the major HVAC and lighting systems identified in the project scope. Test plans shall focus on confirming that the system performance is meeting the performance requirements of the owner set forth in the CFR.</p>
2.8	<p>Functional Performance Testing – Perform functional performance testing of all major HVAC systems and lighting control systems to evaluate the building systems performance. In addition, any anomalies or issues identified in earlier Investigation Phase steps will be considered for further evaluation during system testing to determine root causes and possible solutions. CxA will tune and adjust systems as needed. Results</p>

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	of the functional performance testing shall be submitted with the RCx report, along with final setpoints.
2.9	Facility Performance Analysis, Performance Baseline Establishment, and FIM Savings Calculations – CxA will collect and analyze available energy, non-energy and other system performance data to establish baseline benchmarks for facility performance. Available facility performance baseline data may include utility billing data, sub-metering data, work orders, comfort complaint logs, indoor air quality parameters, occupant satisfaction survey results, building automation system trend data and/or stand alone data logger data. After developing a utility baseline, CxA will calculate the savings associated with each potential FIM improvement.
2.10	Optional – SIMPLE REPAIRS: <i>If appropriate and agreed upon by the commissioning team and [Owner], the CxA shall perform simple repairs or improvements identified during the Investigation Phase monitoring and testing [on a Time and Materials basis]. The Retro-Commissioning process is intended to be an iterative and flexible process, therefore, some implementation may occur during the Investigation Phase and conversely further investigation may occur during the Implementation Phase.</i>
2.11	Master List of Findings – CxA will create a Master List of Findings that identifies possible Facility Improvement Measures (FIMs) based on the findings from the steps above. The following information on each FIM is desirable so that [OWNER] has sufficient information to make an informed decision when selecting the FIMs for implementation; 1) Description of Finding, 2) The Solution/ Measure Description, 3) Benefits, 4) Drawbacks/Risks, 5) Implementation Cost, 6) Savings (details on the estimated electrical, fossil and demand energy savings may be desired), 7) simple payback analysis and 8) Commissioning Team recommendation for implementation. Budgetary implementation cost estimates are included in the Master List during the Investigation Phase with firm contractor quotes being obtained during the Implementation Phase once specific measures have been selected for implementation. The rigor of the energy saving calculation methodology utilized to estimate energy savings will vary. Factors that impact calculation methodology rigor may include; utility program requirements if applicable, owner expectations, the level of investment required to measure implementation.
2.12	Provide Investigation Phase RCx Report – CxA will provide an Investigation Phase Report. The report will include as a minimum: <ul style="list-style-type: none"> • Completed BAS instrumentation calibration record • Completed diagnostic monitoring results • HVAC TAB validation readings • Completed functional performance tests results • Master List of Findings and recommended Facility Improvement Measures (FIMs) including analysis showing savings, costs and simple paybacks • Recommendations for implementations.
2.13	Attend Meeting to Discuss Findings – CxA will attend a meeting with the [OWNER] project managers to discuss the findings of the investigation phase of the RCx project.

3. IMPLEMENTATION PHASE
The CxA shall provide the following services during the implementation phase. The intent of the Implementation Phase is to implement the Facility Improvement Measures (FIMs) that are selected from the Master List of Findings and to verify that the predicted results and system performance are achieved.

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3.1	Analyze, Prioritize and Select Facility Improvement Measures - The Implementation Phase begins with the prioritization and selection of FIMs for implementation. [OWNER], with any necessary support from the Commissioning Team, evaluates and prioritizes the measures that have been recommended for implementation by the Commissioning Team. The final selection of measures for implementation and implementation timing is frequently influenced by many factors, including ROI and simple payback, budgetary constraints, anticipated facility impacts, future capital plans, available implementation resources, etc.
3.2	Prepare an Implementation Plan – Upon measure selection, CxA prepares an Implementation Plan to guide the implementation process and provide details on steps to be followed to complete the implementation of the selected Facility Improvement Measures. This plan typically indicates which improvements will be made during the Implementation Phase and which ones will be deferred with a timetable for planned implementation as capital improvement projects, with the ultimate goal of having the systems perform efficiently to meet the CFR.
3.3	Optional - Measurement and Verification (M&V) Plan- Performance Assurance. <i>The CxA shall prepare a measurement and verification (M&V) plan. The plan shall evaluate methods of measuring system performance and verifying proper implementation to demonstrate the success of the FIMs implemented. Each measure will have a verification methodology appropriate to the size and complexity of the measure. The identified verification methodology is then incorporated into a Measurement and Verification (M&V) Plan. The M&V plan is intended to provide a comprehensive protocol to verify the performance of the measure/system and confirm that the predicted energy savings have been achieved upon the completion of implementation. Ongoing Building Automation System trending, portable data loggers, spot measurements, and functional testing may be utilized pre and/or post implementation as part of the M&V process.</i>
3.4	Implement Selected FIMs – CxA assists with or oversees the Implementation Plan, for the selected improvements to the systems and operations are undertaken and completed.
3.5	Verify Successful FIM Implementation – CxA provides testing or re-testing on modified or upgraded systems to demonstrate that the improvements are successful. Plans are also made for the future testing of the deferred capital improvement projects identified. If testing does not show that the improvements were successful, further modifications or refinements to the upgrades should be made to achieve acceptable results. CxA would revise estimated energy savings calculations as necessary.
3.6	O&M Manuals: The O&Ms and as-built drawings for FIMs are prepared, reviewed, and delivered to [OWNER].

4. TURN-OVER PHASE	
The CxA shall provide the following services during the turn-over phase. The intent of the turn-over phase is to ensure a smooth hand off and transition from the commissioning process/team to the personnel responsible for operating and maintaining the building over its life-cycle (the O&M personnel). Successful transitions ensure that all necessary documentation, knowledge and systems are provided to the O&M personnel, that the O&M personnel demonstrate the effective use of these tools, and that the implemented improvements become a part of the standard operating practice so that the CFR is met and the positive results persist into the future.	
4.1	Update O&M Manuals and As – Built Documentation – CxA supports updates to O&M manuals and as- built documentation as required. If [OWNER] has acceptable, up-to-

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	date O&M manuals, then O&M manuals only need to be modified to include any changes to equipment or operations that were made as part of the RCx project.
4.2	Develop Final Report & Update Documentation – CxA provides a final report as a record of the RCx activities and measures that were implemented for [OWNER] and will become an important document for the building and an invaluable resource to current and future building operators.
4.3	Optional - Execute the Measurement and Verification (M&V) plan – <i>Implement the M&V Plan developed during the Implementation Phase to evaluate project success and final energy savings as a result of the project. Provide a report of the results of the M&V.</i>
4.4	Training: The Owner's building operating personnel should be part of the Commissioning Team and be involved in all phases of the RCx process to understand the findings, changes and improvements stemming from the commissioning process. Training should be pervasive throughout the commissioning process. The Turnover Phase provides an excellent opportunity to provide focused training on the RCx process, the associated FIMs implemented, system optimization techniques and strategies for persistence and continuous improvement. Establish a Training Plan for future training based upon the current training needs, estimated future needs (including "refresher" training), and training for continuous improvement of skills.
4.5	Plan for Ongoing Commissioning – CxA shall provide a plan for a commissioning verification process on an ongoing basis to help the improvements to persist over time. Certain steps may be repeated at regular intervals to facilitate this.

Test Equipment

The CxA will perform functional testing using their own engineers, field technicians, and test equipment, in addition to [OWNER]'s own staff and O&M contractors. The [OWNER] will provide access to the direct digital control (DDC) system, and provide temporary use of one laptop with software required to locally check data values, sequences, setpoints, VAV settings, etc. The [OWNER] will provide temporary passwords to be able to access the systems.

Datalogging equipment, test equipment, monitoring devices, and specialized equipment, provided by the RCxA to test, monitor, confirm systems, will remain the property of the RCxA. Equipment provided will meet the minimum accuracy, calibration, and performance standards required by the performance test.

1.2 Schedule

A summarized version of the anticipated schedule for each phase of the project is shown in the table below.

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Retro-commissioning Project Schedule

Project Phase	Deliverable	Projected Schedule
Planning	Part 1. above	[insert date range]
Investigation	Part 2. above	[insert date range]
Implementation	Part 3. above	[insert date range]
Turnover Phase	Part 4. above	[insert date range]