**RFP 121-060226DC-CRx**

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|---|---|
| **Department/Agency** | **Rowan-Cabarrus Community College** |
| **Project Title** | **Commissioning, Retro-Commissioning and Related Services** |
| **Service** | **Commissioning Agent** |
| **Scope** | **Commissioning Agent (Cx) and Retro-Commissioning Agent (RCx) and related services that are to be provided as per the Rowan-Cabarrus Community College Scope of Services/Work for Commissioning Agent (Cx) and Retro-Commissioning Agent (RCx) Services Scope of Work which is attached (*Attachment A*) on a routine or as needed basis for small, miscellaneous projects under $500,000. Annual fees may not exceed $150,000 in total value and no single project shall exceed a $36,000 fee. The base contract will be for a period of one year, with one possible one year extension.** |
| **Contact** | **Ronda Holland** |
| **Telephone** | **704-216-3455** |
| **Email** | **collegeenvironment@rccc.edu** |
| **Total Project Budget** | **$150,000** |
| **Source of Funds** | **State &/or local &/or private** |
| **Approved OC-25 #** | **N/A** |
| **Publish Date** | **June 2, 2026** |
| **Closing Date** | **July 14, 2026** |
| **Submittal Packages should be emailed to:** | **Electronic submissions only (Read Receipt Requested) to:**<br><br>**Email: collegeenvironment@rccc.edu**<br>**Subject Line: 121-060226DC-CRx** |
| **NC Licensing Statement** | In order to offer architectural, engineering, or landscape architectural services in response to this solicitation, the proposing firm must be properly licensed to practice Architecture, Engineering, or Landscape Architecture in the State of North Carolina. More information on the North Carolina state boards may be found at the following websites:<br>NC Board of Architecture: (http://www.ncbarch.org)<br>NC Board of Examiners for Engineers & Surveyors: (http://www.ncbels.org) NC Board of Landscape Architects: (http://www.ncbola.org)<br>**HUB Certified Firms are encouraged to submit a proposal.** |

It is the intent of Rowan-Cabarrus Community College to select up to two (2) firms to act as Commissioning Agent in support of the occasional needs in the construction and operation of its facilities.

## SELECTING CRITERIA

In selecting a Commissioning Agent, the College's Selection Committee will take into consideration qualifying factors addressed below with their relative weighting:

1. Expertise and previous experience in Building commissioning (Cx), Retro-commissioning (RCx), integration into New and Renovation Projects. 25%
2. Demonstrated understanding and implementation of integrated design, facilities audits, acoustics in the educational environment, indoor air quality, WELL Building Standards. 20%
3. Demonstrated mastery of the following critical concepts in the design and construction of public educational facilities: The North Carolina Energy Efficiency Code, the North Carolina State Construction Manual and related forms. 10%
4. Technical expertise including mechanical test and balance, building envelope testing, peer review of building design packages, BIM, Microsoft Project GANTT chart scheduling, life-cycle costing, and conceptual estimating. 10%
5. Demonstrated understanding of the College's Facilities Design Manual. 10%
6. Qualifications and experience of proposed staff and consultant team. 10%
7. Quality of the proposal, including inclusion of all the Submittal Requirements addressed below. 10%
8. Proximity to and familiarity with the College's service area (Rowan County and Cabarrus County). 5%
9. After Selection Committee Members votes have been tallied and averaged, one (1) additional point will be awarded to Historically Underutilized Business (HUB) certified proposers with an additional one half (1/2) point for each HUB certified subconsultant necessary to support the effort of this contract. A maximum of two (2) additional points may be granted under this criterion.

SUBMITTAL REQUIREMENTS

Proposing firms must submit one (1) electronic copy of the complete submittal package in Adobe.pdf format to the email address provided: **collegeenvironment@rccc.edu** Hard copies are not accepted at this time.

**Firms must be registered and active with the North Carolina Electronic Vendor Portal prior to submitting a proposal.** https://evp.nc.gov/ Failure to register may result in disqualification.

1. A Letter of Interest – no more than one page. Letter of interest should include Engineering License Number, E-Procure number, SCO Vendor Number.
2. An approach for commissioning a typical informal project from Schematic Design through Close-out, including Owner Designer/Contractor/SCO/Cx Team organizational chart.
3. An approach for providing Peer Review Services for design plans of various informal projects.
4. Three (3) single page (front and back counts as a single page) examples of appropriate commissioning projects, including; photos and/or renderings, a description of key elements and challenges, Owner, Architect, CM/GC point of contact (with phone number).
5. 3 letters of recommendation from prior institutional clients within the State of North Carolina, on their letterhead.
6. Resumes of key staff (Commissioning Agent, Commissioning Technician, Architectural Plan Reviewer, Structural Plan Reviewer, Mechanical Plan Reviewer, Electrical Plan Reviewer, Administrative Assistant, Electrical Engineer, Mechanical Engineer, and Civil Engineer) proposed to support the effort of this contract. Ensure Commissioning and peer review experience are highlighted.
7. A listing of key sub-consultants to support the effort of this contract (Architects, Engineers, Building Envelope Consultants, etc.).
8. Historically Underutilized Business (HUB) Certification for any entity proposed to support the effort of this contract.
9. Signed copies of all addendums issued to this advertisement.

**ATTACHMENT A**

# ROWAN-CABARRUS COMMUNITY COLLEGE

## Commissioning Agent Services

## Scope of Services/Work

**08/15/2024**

1. **Perform Commissioning Agent Services (CxA) for new construction and remodels/renovation projects.**

**1.1.** Perform commissioning agent services to satisfy the requirements of the enhanced commissioning required by the State Construction Office.

**1.2.** Services shall be provided in four (4) phases: Design, Construction, Acceptance, and Post-Acceptance.

**1.3.** The CxA shall coordinate participation of the Owner's Representative in all commissioning process activities. Schedule the commissioning process activities and integrate them into the master project schedule as prepared and maintained by the General Contractor.

**1.4.** Prior to the commencement of the Design Phase, the CxA shall:

**1.4.1.** Review the A/E Design Team's and the Owner's Project Requirements, The Form 3-1 Project Budget, the RCCC Facilities Design Manual and the Commissioning Requirements to develop the Project Objectives Document.

**1.4.2.** Develop a Commissioning Plan encompassing the four (4) phases outlined above.

**1.5. Design Phase**: During the Design Phase the CxA shall complete the following scope of work:

**1.5.1.** Perform Peer Reviews of each submission of the Design Team's plans (Schematic Design, Design Development, Construction Documents, Final "For Construction" Permitted Plans) to ensure compliance with the Owner's Project Requirements and the College's Facilities Design Manual, the Project Goals, and any other required criteria, acting as the Owner's Plan Reviewer. Peer reviews will include review of Architectural, Civil, Structural, Mechanical, and Electrical plans by individuals licensed by the State of North Carolina to perform design in those areas. Peer Review will occur in addition to State Construction Office Design Review on Formal Projects (in excess of $2,000,000 in construction value). Complete a thorough review of the construction documents. Submit written comments to the Owner, the Owner's Representative, and the AE design team. With each subsequent submission incorporation of previous comments will be tracked and documented.

**1.5.2.** Develop commissioning specifications for all appropriate equipment and systems. Coordinate this with the A/E design team and Owner. The specifications shall follow the intent of ASHRAE Guideline 0-2005, The Commissioning Process. The commissioning specifications shall include definitions of key terms; a detailed description of the responsibilities of all parties; details of the commissioning process; reporting and documentation requirements (including formats), alerts to coordination issues, deficiency resolution, construction checklist and startup requirements, the functional testing process, and specific functional test requirements including testing conditions and acceptance criteria for all equipment to be commissioned.

**1.5.3.** Ensure design correctly represents ADA compliance of all accessible routes and public amenities.

**1.5.4.** Ensure design correctly represents compliance with NC Energy Efficiency Code.

**1.6. Construction Phase:** During the construction phase the CxA shall complete the following scope of work:

**1.6.1.** Organize the commissioning process components and participate in the pre- bid meeting where the commissioning process requirements are reviewed with the bidders.

**1.6.2.** Coordinate, direct and document commissioning activities in a logical, sequential and efficient manner using consistent protocols, clear and regular communications and consultations with all necessary parties, updated timelines or schedules, and technical expertise. Conduct a pre-construction commissioning process meeting.

**1.6.3.** Perform site visits, as necessary, to observe and document component and system installations. Accomplish a statistical review of construction focusing on the Owner's design intent and quality requirements. Attend selected construction progress and pre-installation job-site meetings to obtain information on construction progress. Review construction progress meeting minutes for revisions/substitutions related to the Owner's design intent.

**1.6.4.** Assist in resolving any discrepancies.

**1.6.5.** With necessary assistance and review from the installing contractors, develop and write construction checklists. Submit to the contractors, Owner and Owner's Representative for review and approval.

**1.6.6.** Organize, conduct and document periodic commissioning team meetings to plan, develop the scope, coordinate, schedule activities, and resolve problems.

**1.6.7.** Review submittals of systems to be commissioned, concurrent with the A/E design professional's review. CxA's reviewed shop drawing submittals must be submitted to A/E consultants before the date set for consultant's final approval of shop drawings.

**1.6.8.** Work with contractors to complete construction checklists and track completions.

**1.6.9.** Statistically sample completion of construction checklists on a periodic basis to verify that contractors' quality processes achieve the Owner's project requirements.

**1.6.10.** Approve systems startup by reviewing start-up reports and by selected site observations.

**1.6.11.** With necessary assistance and review from installing contractors, write the test procedures. Submit to the contractors, the Owner, and the Owner's Representative for review and approval.

**1.6.12.** Coordinate witness and recommend approval of manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.

**1.6.13.** Recommend approval of air and water systems balancing through statistical sampling of the report and separate field verification.

**1.6.14.** Maintain a master issues log and a separate testing record. Provide the contractor, the A/E design team, the Owner and the Owner's Representative with written progress reports and test results with recommended actions.

**1.6.15.** Document corrections and retesting of non-compliance items by the contractors.

**1.6.16.** Review, recommend pre-approve, and verify the training proposed by the contractors for compliance with the project requirements.

**1.7. Acceptance Phase**: During the acceptance phase the CxA shall complete the following scope of work:

**1.7.1.** Review and inspect, on a sample basis, the testing, adjusting and balancing work that has been carried out by another agency.

**1.7.2.** Direct the execution of the tests by the contractors.

**1.7.3.** Conduct functional performance testing of sub-systems, systems, and interactions between systems, leading to acceptance of the completed work. Document results of all tests witnessed.

**1.7.4.** Conduct functional performance testing of seasonally deferred equipment test. Document results of all tests witnessed.

**1.7.5.** Coordinate and organize the training of the Owner's personnel.

**1.7.6.** Videotape the Owner's personnel training sessions. Provide record disks to the Owner.

**1.7.7.** Develop and review the Systems Manual for compliance with the Owner's project requirements.

**1.7.8.** Verify delivery of the final, approved Systems Manual to the Owner.

**1.8. Post Acceptance Phase**: During the post-acceptance phase the CxA shall complete the following scope of work:

**1.8.1.** Conduct functional performance testing of sub-systems, systems, and interactions between systems that could not be carried out prior to acceptance due to unsuitable weather or load conditions, or Owner occupancy requirements.

**1.8.2.** Prepare and submit a final Commissioning Process Report to the Owner.

**1.8.3.** Return to the site 10 months after the final Substantial Completion date. Review with Owner facilities staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview Owner's facilities staff and identify problems or concerns they have with operating the building as originally intended. Make suggestions for improvements and for recording these changes in the Systems Manual. Identify areas that may come under warranty or under the original construction contract. Assist Owner's facilities staff to develop reports and requests for services to remedy outstanding problems.

**1.9. Equipment/Systems:** During the scope of work as described in Articles above, provide commissioning for the following building equipment and systems.

| Equipment | Equipment or Systems Sampling Rate | Notes |
|---|---|---|
| **Building Envelope** | | |
| Roof | 100% | Thermographic Inspection |
| Flashings | 100% | Thermographic Inspection |
| Wall Sandwich | 100% | Thermographic Inspection |
| Windows/Doors/Storefront | 25% | Water Test |
| Air Tightness | 100% | Whole Building Air Leakage Test |
| **HVAC Systems** | | |
| Heat Exchangers | 100% | |
| Water Treatment System | 100% | |
| Heating Water Converter | 100% | |
| Fin Tube Radiation and Unit Heaters | 100% | |
| Pumps | 100% | |
| Air Handling Units | 100% | Including coils, filters, energy recovery, air flow stations. |
| Exhaust Fan Systems | 100% | |
| Transfer Fans | 100% | |
| Ventilation Fans | 100% | |

| | | |
|---|---|---|
| VAV Air Terminal Units | 100% | |
| DX Fan Coils | 100% | |
| DX Condensing Units | 100% | |
| MPSA Ductwork | 100% | Duct Tightness Test |
| EA Ductwork | 100% | Duct Tightness Test |
| HVAC System Piping | 25% | |
| Hot Water Reheat Coils | 100% | |
| Steam Humidifiers | 100% | |
| **Building Automation System** | | |
| System Controls | 100% | Ensure system functions properly and addresses all intended systems. |
| Temperature Sensors | 100% | |
| Pressure Sensors and Controllers | 100% | |
| Lighting Sensors | 100% | |
| CO2 Sensors | 100% | |
| Airflow Stations | 100% | |
| Air Handling Unit Dampers/Valve Actuators | 100% | |
| Lab Air Controls Systems – Air Control Valves | 100% | |
| Temperature and Air Controls | 100% | |
| **Plumbing and Fire Protection Systems** | | |
| Plumbing Equipment | 100% | |
| Plumbing Piping Systems | 25% | |
| Lab Gas Piping Systems | 100% | |
| Fire Protection Sprinkler System | 100% | |
| Hot Water Heaters | 100% | Include solar thermal systems |
| **Security & Access Systems** | | |
| Intrusion Detections Systems and Sensors | 100% | |
| Electric Locks | 100% | |
| Card Key Access Sensors | 100% | |
| Mechanical Locksets | 50% | |
| Door Opening Devices | 100% | Check ADA Compliance of Doors |
| Door Closers | 100% | Check ADA Compliance of Doors |
| **ADA Accessibility** | | |
| Ramps | 100% | Confirm compliance of all slopes, textures, etc. |
| Parking Areas | 25% | Confirm compliance of slopes, striping, accessible pathways. |
| Accessible Paths | 50% | Confirm compliance between public amenities. |
| **Electrical Systems** | | |
| Normal Power Electrical | 50% | |
| Electrical Panel Inspection and Thermography | 100% | Panel Schedules, Thermography |

| | | |
|---|---|---|
| Lighting Controls | 100% | Including occupancy sensors, photometric sensors, timed switches |
| Solar Photovoltaic Systems | 100% | |
| Emergency Power Systems | 100% | |
| Fire Alarm and Life Safety Systems | 100% | Including Mass Notification |

(1) CxA shall verify all air balancing reports and leakage testing of air all applicable systems.

(2) CxA shall verify water balancing, cleaning, and pressure testing of all applicable systems.

**2. Perform Retro Commissioning (and Re-Commissioning) Agent Services (RCx) for existing buildings. 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, water reduction, and operations and maintenance (O&M) tune-ups.**

**2.1. Phasing:** Retro-Commissioning services shall be provided in Four (4) phases: Planning, Discovery, Corrective, and Project Hand-Off.

**2.2. Planning Phase:** The RCx 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. During the Planning Phase the RCx shall complete the following scope of work:

**2.2.1.** Define Current Facility Requirements – RCx 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.

**2.2.2.** Collect Existing Building Documentation – RCx 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.

**2.2.3.** 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.

**2.2.4.** RCx 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.

**2.2.5.** RCx 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.

**2.2.6.** Develop Retro-Commissioning Plan – After reviewing the building package and gaining a clear understanding of the project objectives, RCx 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. The Plan will include the following information:

**2.2.6.1.** Commissioning objectives
**2.2.6.2.** Commissioning team members and their roles and responsibilities (RCx, [OWNER], other Technical Partners)
**2.2.6.3.** Communication protocols between the team
**2.2.6.4.** Identification of documentation collected.
**2.2.6.5.** Preliminary building utility baseline benchmarks
**2.2.6.6.** Major RCx activities
**2.2.6.7.** Schedule of major commissioning events
**2.2.6.8.** Scope of testing
**2.2.6.9.** CFR

**2.3. Discovery Phase:** The objective of the Discovery 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. During the Discovery Phase the RCx shall complete the following scope of work:

**2.3.1.** Commissioning Coordination – 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.

**2.3.2.** 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.

**2.3.3.** 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.

**2.3.4.** HVAC TAB Validation – RCx 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. RCx will validate (not re-balance:

**2.3.4.1.** Supply air flow and water flow readings on [100%] of AHUs and ERUs
**2.3.4.2.** Air flow readings on [20%] of the VAV terminals and associated diffusers/grilles.

**2.3.5.** 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. A list of sensors and actuators for calibration will be developed by RCx 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 RCx shall calibrate the selected sensors and actuators. The calibration records shall be submitted with the RCx report.

**2.3.6.** Systems Diagnostic Monitoring – RCx 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:

**2.3.6.1** Trend major equipment control loops for 24 hours to determine stability of control.
**2.3.6.2** Randomly trend [20%] of the room temperatures for 24 hours to determine stability of control.

**2.3.7.** 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.

**2.3.8.** 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. RCx will tune and adjust systems as needed. Results of the functional performance testing shall be submitted with the RCx report, along with final setpoints.

**2.3.9.** Facility Performance Analysis, Performance Baseline Establishment, and FIM Savings Calculations **–** RCx 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, RCx will calculate the savings associated with each potential FIM improvement.

**2.3.10.** Simple Repairs - If appropriate and agreed upon by the commissioning team and [Owner], the RCx shall per form 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.

**2.3.11.** Master List of Findings **–** RCx 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.

**2.3.12.** Provide Investigation Phase Report – RCx will provide a Discovery Phase Report.

**2.3.12.1** The report will include as a minimum:
**2.3.12.2** Completed BAS instrumentation calibration record.
**2.3.12.3** Completed diagnostic monitoring results.
**2.3.12.4** HVAC TAB validation readings
**2.3.12.5** Completed functional performance tests results.
**2.3.12.6** Master List of Findings and recommended Facility Improvement Measures (FIMs) including analysis showing savings, costs and simple paybacks
**2.3.12.7** Recommendations for implementations, including recommended prioritization.

**2.3.13.** Attend Meeting to Discuss Findings – RCx will attend a meeting with the [OWNER] project managers to discuss the findings of the investigation phase of the RCx project.

**2.4. Corrective Phase:** The intent of the Corrective 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. During the Corrective Phase, the RCx shall complete the following scope of work:

**2.4.1.** Analyze, Prioritize and Select Facility Improvement Measures **-** The Corrective Phase begins with the prioritization and selection of FIMs for implementation by the College, 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.

**2.4.2.** Prepare an Implementation Plan **–** Upon measure selection, RCx 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 Corrective 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.

**2.4.3.** Measurement and Verification (M&V) Plan- Performance Assurance. The RCx 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.

**2.4.4.** Implement Selected FIMs – RCx assists with or oversees the Implementation Plan, for the selected improvements to the systems and operations are undertaken and completed.

**2.4.5.** Verify Successful FIM Implementation – RCx 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. RCx would revise estimated

energy savings calculations, as necessary.

**2.4.6.** O&M Manuals: The O&Ms and as-built drawings for FIMs are prepared, reviewed, and delivered to the College.

**2.5. Project Hand-Off Phase:** The intent of the Project Hand-Off 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. During the Corrective Phase, the RCx shall complete the following scope of work:

**2.5.1.** Update O&M Manuals and As-Built Documentation – RCx supports updates to O&M manuals and as- built documentation as required. If [OWNER] has acceptable, up-to-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.

**2.5.2.** Develop Final Report & Update Documentation – RCx 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.

**2.5.3.** Execute the Measurement and Verification (M&V) plan – Implement the M&V Plan developed during the Corrective 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.

**2.5.4.** 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.

**2.5.5.** Plan for Ongoing Commissioning – RCx 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.

**2.6. Equipment/Systems:** During the scope of work as described in Articles above, provide commissioning for the following building equipment and systems.

| Equipment | Equipment or Systems Sampling Rate | Notes |
|---|---|---|
| **HVAC Systems** | | |
| Heat Exchangers | 100% | |
| Water Treatment System | 100% | |
| Heating Water Converter | 100% | |
| Fin Tube Radiation and Unit Heaters | 100% | |
| Pumps | 100% | |
| Air Handling Units | 100% | Including coils, filters, energy recovery, air flow stations. |
| Exhaust Fan Systems | 100% | |
| Transfer Fans | 100% | |

| | | |
|---|---|---|
| Ventilation Fans | 100% | |
| VAV Air Terminal Units | 100% | |
| DX Fan Coils | 100% | |
| DX Condensing Units | 100% | |
| Hot Water Reheat Coils | 100% | |
| Steam Humidifiers | 100% | |
| **Building Automation System** | | |
| System Controls | 100% | Ensure system functions properly and addresses all intended systems. |
| Temperature Sensors | 100% | |
| Pressure Sensors and Controllers | 100% | |
| Lighting Sensors | 100% | |
| CO2 Sensors | 100% | |
| Airflow Stations | 100% | |
| Air Handling Unit Dampers/Valve Actuators | 100% | |
| Lab Air Controls Systems – Air Control Valves | 100% | |
| Temperature and Air Controls | 100% | |
| **Plumbing and Fire Protection Systems** | | |
| Plumbing Fixtures/Equipment | 100% | |
| Hot Water Heaters | 100% | Include solar thermal systems |
| **Security & Access Systems** | | |
| Door Opening Devices | 100% | Check ADA Compliance of Doors |
| Door Closers | 100% | Check ADA Compliance of Doors |
| **ADA Accessibility** | | |
| Ramps | 100% | Confirm compliance of all slopes, textures, etc. |
| Parking Areas | 25% | Confirm compliance of slopes, striping, accessible pathways. |
| Accessible Paths | 50% | Confirm compliance between public amenities. |
| **Electrical Systems** | | |
| Normal Power Electrical | 50% | |
| Electrical Panel Inspection and Thermography | 100% | Panel Schedules, Thermography |
| Lighting Controls | 100% | Including occupancy sensors, photometric sensors, timed switches |
| Solar Photovoltaic Systems | 100% | |
| Emergency Power Systems | 100% | |
| Fire Alarm and Life Safety Systems | 100% | Including Mass Notification |

**2.7. Test Equipment -** The RCx will perform functional testing using their own engineers, field technicians, and test equipment, in addition to the College's own staff and O&M contractors.

- The College will provide access to the direct digital control (DDC) system. The College will provide temporary passwords to be able to access the systems.

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