

Solicitation #BC-21259-M
Commissioning Services for Sherman Hall Renewal Project
March 10, 2022

The University of Maryland, Baltimore County (UMBC) is soliciting proposals from qualified firms for commissioning services for the Sherman Hall Renewal project. Commissioning services are required for the building enclosure, as well as for the mechanical, electrical, and plumbing (MEP) components of the project.

UMBC Background: The University of Maryland, Baltimore County, one of the 11 degree-granting institutions of the University System of Maryland, is a public research university located in suburban Baltimore County, on the I-95 corridor between Washington, D.C., and Baltimore. In 2020-21, UMBC enrolled approximately 10,932 undergraduates and 2,565 graduate students (full-time: 10,436; part-time: 3,061). Minority enrollment includes: African American: 19%, Asian American: 20%, Hispanic: 8.2%, Other: 4.9% (total 52.1%). The University employs approximately 2,000 full-time and part-time faculty and staff. Additional information concerning UMBC is available through the UMBC home page, www.umbc.edu.

The Sherman Hall project is located within the original ten block academic core of the UMBC campus (see the campus map for this building Sherman Hall which is available at <https://about.umbc.edu/visitors-guide/campus-map/>).

Project Summary: UMBC's renewal of the 44-year old 122,545 GSF / 59,707 NASF Sherman Hall will extend the useful life of the building. The project will replace the building envelope, correct barriers to accessibility, and replace and upgrade mechanical, electrical, plumbing, and life safety systems. Limited reconfiguration of existing spaces will be undertaken to address programmatic deficiencies. Building finishes will be renewed. The construction work will be phased as the building will remain occupied during the project. The project will be designed to meet LEED silver requirements.

Specific project components incorporated in the scope of the project include:

- Replacement of the exterior wall system;
- Installation of exit egress protection and replacement of exit stair railing systems;
- ADA restroom accessibility and replacement of noncompliant door hardware;
- Replacement of domestic hot water heaters, deteriorated parts of the plumbing distribution system, and outdated plumbing fixtures;
- Replacement of entire HVAC system and building controls;
- Replacement of building transformer and obsolete electrical distribution equipment; expanding electrical closets; replacement of lighting fixtures and control; and emergency power;
- Communications system closets and inside plant distribution of communication circuits;

- Replacement of fire suppression sprinkler system;
- Replacement of fire alarm system;
- Security cameras and access control system;
- Renovation of the exterior courtyard; and
- Limited interior modification and finish upgrades to provide a safe, functional, maintainable, and aesthetically pleasing interior environment for building users.

For more information on the goals and details of the project refer to the following documents, which are provided separately but are part of the solicitation documents for this procurement:

- *Sherman Hall Renewal Part II Facility Program dated March 2021*
- *Facilities Assessment Consultant Services for Sherman Hall dated September 8, 2020*
- *Sherman Hall Façade Condition and Recommendations report dated October 31, 2018*
- *Evaluation of Modular Brick Masonry Unit and Masonry Systems dated December 15, 2017.*

These documents are available in the following box folder:

<https://umbc.box.com/s/coljgi2sbxai9ypvxyuwifp4sl9ozpjm>

Scope of Work:

There are two different commissioning scopes of work for this project: MEP and building enclosure. The detailed scopes of work for each component are attached to this solicitation as Attachment A and Attachment B. The selected firms shall perform all commissioning activities as specified in the applicable Scope of Work.

Upon award, the commissioning firms shall become part of the Project Team, which includes the University, Design Team, and the Construction Management at Risk firm. This Team shall work from the beginning of this project through construction completion. The awards for the A/E and the CMAR were completed on March 9, 2022 and the project kick-off for design is scheduled for March 14, 2022. The project schedule provides for: 15 months for design, 3 months for bidding, and 36 months for construction. Upon award of these contracts by BPW, the commissioning firms shall immediately join the Project Team.

Schedule:

Solicitation issued: March 10, 2022

Technical Proposals Due: April 5, 2022

Interviews: May 5, 2022

Price Proposals Due: May 16, 2022

BPW award: (anticipated) June 22, 2022

Contract:

The contracts shall be executed upon BPW's approval and shall be effective through the entire project. The University anticipates awarding separate contracts for each scope of work.

Firm's Response Requirements:

Firms may submit for one or both of the commissioning scopes of work. All responses shall be provided electronically by Tuesday, April 5, 2022 by 11:59 p.m. EST to:

Technic.4str57cwx3k4bfdh@u.box.com.

Firms shall submit the following information:

1. A cover letter signed by an officer or member authorized to bind the firm to the proposed fees, rates, and terms. The cover letter shall include the name, address, and email address for the contact for the solicitation. The cover letter shall clearly identify the scope of work for which the firm is submitting a proposal.
2. Summary of the qualifications and experience of the firm. Provide brief narrative describing your firm's experience performing commissioning services. Provide brief narrative describing your firm's experience commissioning the applicable equipment or building exterior. Provide information for at least three (3) commissioning projects that have been performed with a similar scope. Describe the work that was performed, the dates of the work, and the tasks that were involved. Indicate the size of the project, the construction method (CM, GC, other), and equipment that was included within the commissioning scope. Provide contact information for each of these projects including the owner's name, contact name, contact phone number, and contact email address. References may be contacted at any time during this process to determine an offeror's responsibility.
3. Lead consultant/Key staff. Include an organizational chart detailing the individuals that will be working on the project and demonstrating the reporting relationships. Provide a resume for the lead consultant and, if applicable, any other key staff proposed, detailing qualifications and experience suitable for the project and describing how the Offeror's team will interface with UMBC.
4. Workplan/Timeline. Provide information regarding the approach that the firm will take and the tools to be utilized to perform the scope of work. Provide a recommended schedule/level of effort for the engagement. The schedule/level of effort should be resource loaded so that UMBC is able to understand the anticipated level of effort for each member of the Offeror's team, as well as the required level of effort for UMBC staff. Include a timeline to accomplish the work.
5. Subconsultants/Partners. There may be areas for use of subconsultants or partners in this Project. UMBC encourages the use of small businesses and MBE firm whenever possible. If a firm is utilizing a subconsultant or partner, the firm shall list the subconsultant/partner, the area of expertise of the subconsultant/partner, and all other applicable information regarding key personnel for that firm.

6. Samples. Provide samples of the following:
- A 50% CD review comments for a similar project
 - A commissioning site visit report for a similar project
 - A commissioning deficiency or issue log for a similar project
 - An executed functional performance test checklist of an air handling unit (for MEP Cx)
 - An executed functional performance test checklist of a heating hot water system (for MEP Cx).

These samples may be from one of the projects described in the narrative project. The samples may be submitted as a separate document, but should clearly indicate the Offeror's name.

Evaluation Process:

Firms shall be shortlisted based on their proposal responses. Shortlisted firms may be required to attend an interview either in person or via WebEx. These sessions are anticipated to be held on May 5, 2022. The Lead Consultant and Key Personnel are to set aside this date on their calendar to avoid conflicts.

Firms that remain shortlisted after the second technical evaluation shall provide a price proposal on May 16, 2022. This shall be a fixed fee for the engagement. There are no reimbursables under the resulting contract. The fee and hourly billing rate are to include all costs, including domestic travel, for the engagement.

If you have any questions regarding this solicitation, please contact Elizabeth Moss, Executive Director of Procurement and Strategic Sourcing at emoss@umbc.edu. It is preferable that questions be provided in writing via email for ease of distribution within UMBC. Responses shall be provided to all other proposers, but without identification of the inquiring firm. All questions shall be submitted by Thursday, March 24, 2022 by 5:00 pm to allow for sufficient time to respond before proposals are due. To maintain the integrity of the procurement, Elizabeth Moss shall be the sole point of contact for this solicitation.

Building Enclosure Commissioning Scope of Work - Attachment A

Abbreviations –

BECxA– Building Enclosure Commissioning Agent

All commissioning activities shall be completed in accordance with ASHRAE Guideline 0-2013 and ASTM E2947-16: Standard Guide for Building Enclosure Commissioning. In addition, the activities shall be completed in accordance with the NIBS Guideline 3-2012: Building Enclosure Commissioning Process BECx.

A. Design Phase

1. Design Phase Project Team Commissioning is a crucial phase in the design/commissioning process, as the concept of the building is well enough established to allow resolution of the building enclosure design against highly defined and precise owners criteria. In this phase more detailed drawings, large-scale wall sections, elevations and details and preliminary specifications for the building enclosure systems are developed.
2. Design BECx Meeting
 - a. Upon award of contract as part of the Cx Team, the BECxA shall lead the Project Team through a meeting to address objectives for commissioning of the building enclosure.
 - b. At completion of DD, all surfaces of the building enclosure, including below grade, should be identified as a complete assembly with all layers identified. The air, water, thermal and vapor control layers as well as means to meet all other criteria included in the OPR should be identified.
3. Design Building Enclosure Technical review (x4)
 - a. BECxA shall review the Design at Design Development, 50% and 95% CDs with a backcheck of 100% CDs for all enclosure requirements related to the OPR and standard industry practices with special attention to air and water infiltration.
 - b. The BECxA shall review the design documents for conformance with the owner's requirements and standard environmental requirements for the building site – with special attention to ground water and water and air leakage around the building assemblies. The building HVAC system requires a tight envelope for humidity and moisture control.
 - c. Provide advice to the project team on technical matters, recommendations for the development of details, systems and assemblies, and review the CD documents for completion and coordination.
 - d. Perform a comprehensive technical peer review, including the development of detailing appropriate to achieve the OPR. Review shall include project drawings and specifications.
 - e. The architect will assemble and the BECxA shall review a description of each system option considered, such as type of building enclosure system, sub-systems, materials and components and the interaction of the building

Building Enclosure Commissioning Scope of Work - Attachment A

exterior enclosure system with the heating, cooling, mechanical and natural ventilation, daylighting, lighting, building interior and other systems. The description should explain how the designer intends to meet the building enclosure-related Owner's Project Requirements.

- f. The BECxA shall review the BOD to verify that solutions presented fulfill the OPR requirements, both for enclosure requirements and integrating the enclosure with other building systems.
- g. The BECxA shall review the design documents for comparison of building enclosure assemblies and details, required testing and typical details for interfacing continuity.
 1. Details to be reviewed should include, but are not limited to:
 - a. Typical details for roof to wall,
 - b. foundation-to-wall,
 - c. fenestration,
 - d. wall to floor,
 - e. wall to column,
 - f. Penetrations and other features that are common or highly repeated for the various enclosure assembly layering options.
 - h. Review and provide advice on laboratory and field mock-ups, testing and inspection procedures.
 - i. BECxA shall review OPR at end of CD Phase. Review the CD phase activities to verify fulfillment of OPR. Review the Commissioning Activities going forward into procurement and construction.
4. Attend Design Review Comment Meeting (x5)
 - a. Owner shall schedule design review comment meetings after CxA submits Design Development, 50%, 95% and 100% CD review comments, with an additional interim meeting prior to the 95% design submission.
 - b. The following people shall attend Design Review Comment Meeting to resolve all open Cx Design Review comments:
 1. A/E
 2. CM
 3. CxA
 4. UMB PM
 5. UMB Cx Manager
 6. UMBC Representatives
 - c. Design Review Comment Meeting may be combined with design workshops or design reviews.
5. BECxA Progress Meeting

Building Enclosure Commissioning Scope of Work - Attachment A

- a. Conduct a Project Team review meeting to address whether the objectives for Design phase have been met. Outstanding issues should be documented, and the resulting issues list becomes a resource for beginning the Construction Documentation phase.
- 6. BE Commissioning Plan and Specifications
 - a. The BECxA shall write a Building Enclosure Commissioning Plan and specification section 07 08 00 Facility Exterior Closure Commissioning. The extent of laboratory mock-ups with associated testing protocols, the number, size and disposition of field mock-ups with associated testing protocols, independent inspection and special inspections should be determined. Special requirements for the CM's /Contractor's quality programs should be written into the specifications. The Commissioning Plan should be coordinated against the Owner's Project Requirements (OPR) and customized to the building design.
 - b. The BECx Plan should include:
 - 1. A list of systems to be documented and tested including frequency of testing.
 - 2. A roles and responsibility matrix of all building envelope commissioning tasks to provide an overview perspective of the roles of the various team members throughout the commissioning process.
 - 3. Outline of inspection protocols and testing procedures with acceptance requirements.
 - 4. A preliminary Schedule of building enclosure related Commissioning Process activities for the Construction Phase and the Occupancy and Operations Phase. The schedule should identify critical times for witnessing testing activities, building enclosure systems and activities relative to substantial completion/project closeout.

B. Construction Phase

1. Submittal Review

- a. Perform technical reviews of the Building Enclosure Submittals, assist in the evaluation of substitution requests and provide documentation. Thoroughly review submittals, including: shop drawing(s), mockups, initial installation, sample constructions, project schedule and sequencing, and all building enclosure components allowing for revisions as necessary to provide the level of performance as specified in the contract documents.
- b. Review the Contractor's and Subcontractors' Site-Specific Performance Implementation Plans for the building enclosure, including but not limited to the implementation and use of quality control/ quality assurance

Building Enclosure Commissioning Scope of Work - Attachment A

processes including but not limited to daily field inspections, first work testing, documentation, weekly audits and the use of project specific installation checklists for each crew.

2. Field Review & Testing
 - a. Conduct additional field testing as required if failures occur during the laboratory mock up, field mock up, or the field tests performed during the construction phase. Additional testing may also be needed if substitutions of materials and systems are accepted during the construction submittal phase.
 - b. Conduct field review of the aesthetic and performance of mock-up(s). Review of the unique interface conditions with differing materials to verify they meet the design intent and will provide the performance levels and functionality of the building enclosure as specified in the contract documents. Mock-ups construction and testing must be scheduled with float time allowed for the remediation of unforeseen issues by way of iterative repair submittals and field performance testing of the mock up repairs prior to actual construction. Assume 4 pre-installation/field review meetings/visits.
3. Installation Checklists
 - a. Develop project specific checklists related to the installation of components and systems that comprise the building enclosure.
4. Issues Log
 - a. Implement an Issues / Non Conformance Log to be updated after each field visit, test, or observation of non-conforming items.
5. Field Visits
 - a. Conduct construction observation of building enclosure systems,
 1. at initial installation of work,
 2. milestone observations throughout construction,
 3. performance testing and verification of components and systems, interfaces and
 4. whole building performance test (if required).
 - b. BECxA shall recommend testing protocols during design phase.
6. BECxA Meetings
 - a. Conduct regularly scheduled BECx meetings and review/discuss the Building Enclosure schedule and the Issues Log with UMB, UMBC, the CM and Subcontractors.
7. Field Performance Testing
 - a. Observe, coordinate and/or perform and document field performance testing as outlined by the building enclosure commissioning specification

Building Enclosure Commissioning Scope of Work - Attachment A

and related sections. Interpret test results and recommend additional testing if deemed necessary due to failure or systemic conditions.

8. Verify Building Enclosure Performance Verification Program
 - a. Verify the implementation of the CMs/GCs Site Specific Building Enclosure Performance Verification Program for (the quality control and quality assurance) procedures and compliance with contract documents.
 - b. Verify field testing, including type, location and frequency as outlined by the specification and associated building enclosure sections in the Project Manual. Protocols to address failures, repeat tests and additional testing as warranted.
 - c. Implement a project specific plan that includes testing, who is to perform the testing, when testing will occur, criteria for acceptance, how testing will be documented and who will receive the documentation of the testing.
 - d. Verify the test procedures validate the various systems and assemblies that comprise the building enclosure deliver the intended Owner's Project Requirements.
 - e. Verify the manufacturers performance testing performed by an independent third party certified laboratory per the Contract Documents. Verify that the testing agency meets requirements of the certifying authority.
 - f. Confirm all submittals required by the contract documents for each building enclosure system and each sample construction have been submitted and approved.
 - g. Verify that Contractor and the BECx QC Checklists are utilized and proper documentation implemented throughout the enclosure construction phase by the CM/ GC and their subcontractors.
 - h. Verify mock up construction in the field to demonstrate workmanship has been completed and the work in place on the building complies with the manufacturer's installation instructions, design intent and specifications.
9. Schedule BECx Process Activities
 - a. Review Project Schedule for inclusion of BECx activities, including but not limited to:
 1. Schedule of submittals
 2. Laboratory testing
 3. Sample construction
 4. Mock up testing
 5. Field performance testing (possible repairs)
 6. Inspection by the Jurisdiction Having Authority or Code Authority.
10. Building Enclosure Systems Manual

Building Enclosure Commissioning Scope of Work - Attachment A

- a. Verify that the Building Enclosure Systems Manual is updated to incorporate information generated during the Construction Phase.
- b. Verify that the Manual includes an overview of all enclosure types and systems.
- c. Include in the Manual the purpose and general overview of each enclosure type and location installed, in addition to maintenance and inspection schedule. The general description section should meet the knowledge needs of the Engineering and Maintenance staff, occupants, and owners.
- d. The Manual should include,
 - 1. general maintenance requirements, including periodic inspection of the building enclosure, and
 - 2. a replacement schedule, based upon the service life of the building enclosure system and the individual materials and subcomponents.

11. Construction Phase Documentation Requirements:

- a. Documentation of the building enclosure to include:
 - 1. Action Item logs (including resolution and unresolved items),
 - 2. Testing results and areas where testing was performed,
 - 3. Remediation of problems encountered during construction, and verification of as-built documents,
 - 4. Final BECx Plan,
 - 5. Final OPR
 - 6. Building Enclosure Maintenance Manual.

C. Warranty Period

- 1. Walk-Through Inspection (x2)
 - a. The Warranty Period walk through inspection for the Building Enclosure should be scheduled at 10 and 20 months after substantial completion and should include representatives from the Owner, A/E, Facilities Management, CM, GC, subcontractors and manufacturers.

Mechanical, Electrical, and Plumbing Commissioning Scope of Work – Attachment B

All commissioning shall be performed in accordance with ASHRAE Guideline 0-2013 and ASHRAE Guideline 1.1-2007 for HVAC&R Systems.

1. Design Phase Services

- a. Design Phase Kickoff and Scoping Meeting
 - i. UMB/UMBC Representatives
 - ii. CxA
 - iii. A/E
 - iv. CM
- b. Write the Commissioning Plan based on project requirements.
 - i. Provide draft for review at 50% design document phase.
 - ii. Provide final Plan for inclusion in the design documents at 100% submission.
 - iii. UMB Cx Plan Table of Contents and/or Master Cx Plan will be provided [is located on the university website]
 - iv. Prepare Commissioning Specifications
 - v. As part of the plan, include a commissioning responsibility matrix which details all commissioning tasks and the associated responsible party
- c. Review Owner's Project Requirements (OPR) document at start of design review
 - i. Coordinate with owner to confirm that Owner's Project Requirements stated in the project Program document are still accurate.
- d. Review Owner's Project Requirements with owner after bid documents are complete.
 - i. Note any changes made during design.
- e. Review Basis of Design (BOD) document
 - i. BOD shall be generated by the A/E
 - ii. CxA shall review BOD against OPR to confirm that design complies with owner requirements
- f. Perform Cx Design Reviews of the design documents at Design Development, 50% CD and 95% CD stages with a backcheck of bid documents.
 - i. Reference: "UMB Cx Design Review Scope" Attachment
 - ii. Reference: Project Design/Construction Schedule
 - iii. LEED v4 Requirement: CxA needs to be brought on prior to end of DD and a DD review is needed
- g. Attend Design Review Comment Meeting (x4)
 - i. Owner shall schedule design review comment meetings after CxA submits DD review, 50% and 95% design review comments, with an additional interim meeting prior to the 95% design submission.
 - ii. The following people shall attend Design Review Comment Meeting to resolve all open Cx Design Review comments:
 1. A/E
 2. CM

Mechanical, Electrical, and Plumbing Commissioning Scope of Work – Attachment B

3. CxA
 4. UMB PM, Reviewers, and Cx Manager
 5. UMBC Representatives
 - iii. Design Review Comment Meeting may be combined with design workshops or design reviews.
 - h. Organize Control Integration Meeting
 - i. CxA shall coordinate with Owner to schedule a Control Integration Meeting to discuss integration issues between equipment, systems, and disciplines to ensure that integration issues and responsibilities are clearly described in the design documents.
 - ii. The following people shall attend the Control Integration Meeting:
 1. UMB PM, Reviewers, and Cx Manager
 2. UMBC Representatives
 3. CxA
 4. A/E
 5. CM
 6. ATC Contractor Representative [If on board]
 - i. Generate Cx specification sections:
 - i. 01 91 00 General Commissioning Requirements
 - ii. 22 08 00 Commissioning of Plumbing Systems
 - iii. 23 08 00 Commissioning of HVAC Systems
 - iv. 26 08 00 Commissioning of Electrical Systems
- 2. Bid Phase Services**
- a. Respond to Questions and RFIs generated during Bid Phase.
 - b. Any allocated time not used will be transferred to construction phase commissioning.
- 3. Construction Phase Services**
- a. Review and Update Cx Plan and Owner's Project Requirements at the start of construction.
 - b. Lead Commissioning Kick-Off Meeting with Construction Cx Team
 - i. At a minimum, the following people shall attend the Cx Kick-Off Meeting
 1. UMB/UMBC Representatives
 2. A/E
 3. CxA
 4. CM
 5. HVAC Subcontractor
 6. ATC Subcontractor
 7. Electrical Subcontractor
 8. TAB Subcontractor

Mechanical, Electrical, and Plumbing Commissioning Scope of Work – Attachment B

- ii. Kick-off Meeting shall include Cx requirements during the Construction Phase and Requirements for the Controls Review and Meeting.
- c. Coordinate and Direct Cx Activities as described in the Cx Plan with Owner, Construction Manager (CM) and Subcontractors.
- d. Review submittal register and identify submittals which require a Cx review.
- e. Review Product Submittals for equipment in Cx Scope concurrently with Engineer of Record.
- f. Review ATC Submittal
- g. Organize Controls Coordination Meeting
 - i. Controls Coordination Meeting shall be scheduled after ATC submittal has been reviewed, but prior to release of ATC for manufacture.
 - ii. The following people shall attend the Controls Coordination Meeting to confirm that all systems associated with the building systems will operate per the design documents and the Owner's Project Requirements:
 - 1. UMB/UMBC Representatives
 - 2. Mechanical Engineer
 - 3. CxA
 - 4. CM
 - 5. ATC Contractor
 - 6. HVAC Manufacturer Representative [if packaged controls are used]
 - 7. HVAC Contractor
 - iii. All issues shall be resolved and submitted as part of the final ATC shop drawings.
 - iv. CxA shall confirm in the field that the ATC technicians are using the final approved ATC submittal.
- h. Generate and Update Commissioning Issues Log
 - i. Issues Log shall be updated after each phase of testing
 - ii. CxA shall upload Issues Log to E-Builder after each update.
- i. Write Functional Performance Tests based on approved submittals.
 - i. FPTs shall include all design sequences in the approved ATC submittal.
- j. Use of an online Cx database for the project team to track commissioning progress is preferred
- k. CxA shall post all Cx Documents on E-Builder or approved online Cx database for access by all Cx Team Members
 - i. Cx Team shall post required Cx documents throughout the construction and testing process, including the following documents:
 - 1. Meeting Minutes
 - 2. HOT List – Coordinate with UMB Cx Manager
 - 3. Start-up Checklists by CM

Mechanical, Electrical, and Plumbing Commissioning Scope of Work – Attachment B

4. Pre-Functional Checklists
5. Functional Performance Test Procedures
6. Issues Log
7. Current Cx Plan
- ii. CxA shall post all commissioning documentation to E-Builder at the end of the project for final record.
- l. Inspect and verify installation of equipment included in Cx Scope for workmanship and required clearances.
 - i. Observe and note LEED IAQ requirements are being met.
 - ii. Report deficiencies immediately to CM and Owner.
- m. Perform functional testing of equipment using during construction.
 - i. Include water treatment and recommended preventative maintenance requirements.
 - ii. Final FPTs of the equipment shall be done at the end of the project as part of the regular operation of the equipment as designed.
- n. Verify performance of installed equipment included in Cx Scope.
- o. Plan and Conduct Commissioning Meetings and Distribute Meeting Minutes. Assume one meeting per month outside of FPTs. The current expected construction duration for the project is 36 months.
 - i. Cx Meeting schedule will be determined by CxA in coordination with Owner and CM.
 - ii. As much as possible, Cx Meetings shall be scheduled to occur directly after Construction Progress Meetings to limit required travel by team members.
- p. Assist with creation and coordination of a commissioning schedule that will be updated and tracked throughout the construction process.
- q. Attend Construction Progress Meetings as requested by Owner or CM. Progress Meeting attendance shall be coordinated with scheduled Commissioning Meetings as much as possible.
 - i. Provide updates on Cx Progress at meetings
- r. Review Start-up Documents provided by Contractors and Manufacturers prior to use during equipment start-up.
 - i. Contractor shall submit Start-up Documentation as a regular submittal.
- s. Write and Distribute Pre-Functional Checklists for Commissioned equipment
 - i. Pre-Functional Checklists shall be uploaded to E-Builder
- t. Witness Start-up of Selected Equipment
 - i. Witness 10% of start-ups.
 - ii. CxA shall select equipment start-ups to witness. Selected equipment will include at a minimum:
 1. Air Handling Units

Mechanical, Electrical, and Plumbing Commissioning Scope of Work – Attachment B

- 2. Generator
- 3. Heat Exchangers
- u. Review Start-up Documentation of all Equipment
 - i. CM shall upload completed start-up checklists and documentation to E-Builder
- v. Witness Pre-Functional Testing
 - i. Witness 25% of Pre-Functional Tests
- w. Review Pre-Functional Test Reports
 - i. CM shall upload completed Pre-Functional Test checklists and documentation to E-Builder
- x. Perform TAB Verification
 - i. Cx shall review pencil copy of TAB Report
 - ii. Cx and TAB contractor shall perform TAB verification of 20% of reported values. Include both air and water side systems.
- y. Develop a list of points for the ATC subcontractor to trend.
- z. Review Trend Logs prior to start of Functional Performance Tests.
- aa. Review final point-to-point inspection reports
- bb. Direct, Witness, and Document Functional Performance Tests
 - i. Assist, witness, test and document Functional Performance Tests of all equipment in Cx Scope.
 - ii. Testing shall be done by installing contractors.
- cc. Direct Retesting of failed systems.
 - i. CxA shall include an allowance of 10% testing hours for retesting and performance of functional performance tests.
- dd. Perform Off-Season Testing
 - i. HVAC equipment shall be tested during both heating and cooling season.
- ee. Verify Owner Training by CM
 - i. CM shall upload Training Documentation to E-Builder or approved online portal. This will include sign-in sheets from training classes.
- ff. Review O&M Manuals
 - i. O&M Manuals shall include complete Preventative Maintenance Plan generated by CM.
- gg. Write Commissioning Report
- hh. Current Facilities Requirements and Operations & Maintenance Plan
 - i. Coordinate with the contractor, facilities staff, and design team to prepare and maintain a current facilities requirements and operations and maintenance plan that contains the information necessary to operate the building efficiently. The plan must include the following:
 - ii. Sequence of operations for the building;
 - iii. The building occupancy schedule;

Mechanical, Electrical, and Plumbing Commissioning Scope of Work – Attachment B

- iv. Equipment run-time schedules;
 - v. Set points for all HVAC equipment;
 - vi. Set lighting levels throughout the building;
 - vii. Minimum outside air requirements;
 - viii. Any changes in schedules or setpoints for different seasons, days of the week, and times of day;
 - ix. A systems narrative describing the mechanical and electrical systems and equipment;
 - x. A preventive maintenance plan for building equipment described in the systems narrative; and
 - xi. A commissioning program that includes periodic commissioning requirements, ongoing commissioning tasks, and continuous tasks for critical facilities.
 - ii. Generate Cx Systems Manual
 - i. Electronic copy only.
 - ii. Commissioning Report will be part of the Systems Manual.
4. Warranty Phase Services
- a. Perform Off-Season Testing.
 - b. Return to Site Twice at 10 and 20 months after substantial completion and review current building operation with facilities staff.
 - i. Interview Facilities Staff to identify problems and concerns with existing building systems.
 - ii. Make suggestions for improvements
 - c. Facilitate a Lessons Learned Meeting
 - i. The following people shall attend the Lessons Learned Meeting
 - 1. UMB/UMBC
 - a. Design Team
 - b. Facilities and Operations
 - 2. A/E
 - 3. CxA
 - 4. CM
 - ii. Write summary of Lessons Learned and distribute to team members.
5. Systems to be Commissioned
- a. The following systems shall be commissioned:
 - i. All HVAC System equipment (100% of major equipment – except air terminal units – 25%)
 - 1. Heating Hot Water System
 - a. Heat Exchangers
 - b. Pumps
 - c. Integration to High Temperature Hot Water System Plant

Mechanical, Electrical, and Plumbing Commissioning Scope of Work – Attachment B

2. Chilled Water System
 - a. Pumps
 - b. Integration to Chilled Water Plant
3. Air Distribution System
 - a. Air Handling Units & Accessories
 - b. Exhaust Fans
4. Air Terminal Equipment – 25% sample
 - a. If after three failed attempts at testing 25%, all remaining units shall be tested at the contractor's expense
5. Terminal Heating & Cooling Equipment
 - a. Unit Heaters
 - b. Split System Air Conditioning Units
 - c. Fan Coil Units
- ii. Central Building Automation Systems
 1. Include connections and coordination with Central Campus System
- iii. Domestic Hot Water System
- iv. Miscellaneous Plumbing Pumps
 1. Elevator Sump Pumps
 2. Sump Pumps
- v. Electrical Systems
 1. Normal Power Distribution Systems
 - a. Switchgear/Switchboards
 - b. Panelboards – 25% sample
 - c. Transformers – 25% sample
 2. Emergency Power Distribution Systems
- vi. Lighting Controls System
 1. Occupancy Sensors – 25% sample
 2. Daylight Harvesting Sensors – 25% sample
- vii. Full Building Blackout Test
- viii. Metering
 1. Energy
 2. Electricity
- ix. Electric metering and monitoring equipment – coordinating with M&V requirements and campus energy monitoring.