SECTION 019119

BUILDING ENVELOPE COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Building Envelope Commissioning is the overall building enclosure quality assurance process and requirements in addition to quality assurance procedures specified in individual Sections.

B. Perform and document Building Envelope commissioning (BECx). This Section supplements but does not supersede specific testing requirements found elsewhere in the Contract Documents. Include below-grade and above-grade construction as follows:
   1. Below-grade construction including foundations, foundation walls, slabs-on-grade, and basements.
   2. Above-grade Building Envelope including assemblies of exterior walls (sheathing, insulation, framing, interior finish), windows and glazing systems, doors and other exterior wall penetrations.
   3. Roof construction, including roofing system, insulation, skylights, hatches, and other roof penetrations.
   4. Interconnection between materials, components, and systems including flashing, expansion joints, and sealants.

C. Related Sections:
   1. Section 014000 Quality Requirements
   2. Section 014339 Mock-ups
   3. Section 017900 Demonstration and Training
   4. Division 03 Concrete
   5. Division 07 Thermal and Moisture Protection
   6. Division 08 Openings
   7. Section 092236.23 Cement Plaster Lathing and Lathing Accessories
   8. Section 092400 Portland Cement Plastering

1.2 REFERENCE STANDARDS

A. ASHRAE Guideline 0-2005, ‘The Commissioning Process’

B. ASTM E2813-12, ‘Standard Practice for Building Enclosure Commissioning’

C. National Institute of Building Sciences ‘Building Enclosure Commissioning Process BECx’, Guideline 3, latest edition.

1.3 QUALITY ASSURANCE

A. Contractor shall employ a competent Building Envelope Commissioning Manager (BECM) as approved by the CxA.
   1. The BECM shall have 5 years of experience or at least 5 separate similar projects in performing the duties listed below. The Contractor shall submit to the BECM qualifications for review and approval prior to the commencement of work. The BECM shall be a representative of the Contractor and shall be a different individual than the Superintendent and the Project Manager. The BECM shall manage, coordinate and supervise the Building Envelope Commissioning activities including the following:

a. Coordinate submittals and requests for information pertaining to this specification section.
b. Coordinate inspection and testing activities with the CxA.
c. Create a detailed testing plan which identifies when the various tests will be completed and actions to be taken if deficiencies are found.
d. Supervise the Building Envelope commissioning process and coordinate the commissioning activities with all trades and the CxA.
e. Require each trade to assign a coordinator authorized as a representative of that trade in commissioning activities. Manage the coordinators and their BECx activities.

B. Coordination Meetings:
1. The BECM shall plan and conduct coordination meetings including, CxA, Architect, Inspector, Testing agency and all trades responsible for installing materials that make up the Building Enclosure as construction progresses.
a. A kick-off meeting shall be scheduled at least 30 days prior to the start of foundation installation. The objectives of the meeting are to review the building enclosure commissioning work scope, to clarify team member roles and responsibilities, and to plan the commissioning activities for the entire duration of the project.
b. Subsequent meetings shall be scheduled every two weeks or as needed during the completion of the building enclosure. The objective of these meetings is to facilitate coordination of the Work and resolve conflicts and deficiencies before performance testing of the Mockup and the following construction.

1.4 SUBMITTALS

A. Documentation supporting BECM qualifications as required above.

B. Documentation of testing agent's qualifications and experience. Submit documentation including qualified personnel and equipment necessary to conduct required testing.

C. Building Envelope Commissioning Plan and Schedule: Include a schedule for commissioning activities and provide specific information on the date and duration of individual tests for all components listed in paragraph 3.2 below and coordinated with Section 014339 Mock ups.

D. The Contractor shall provide all test reports, including failed test with deficiencies noted and repair recommendations / plan.

1.5 CONTRACTOR'S RESPONSIBLITIES

A. Provide all materials, labor and documentation to execute the Building Envelope commissioning activities described in the contract documents.

B. Coordinate the commissioning work included herein and ensure that all trades execute their responsibilities according to the Contract Documents.

C. Include Building Envelope Commissioning activities in the contract schedule.

D. Attend commissioning meetings and provide meeting notes of those meetings.

1.6 PERFORMANCE REQUIREMENTS

A. Testing
1. Perform Mock-Up testing (min 8 hours or as determined in the BeCx Plan) on the building during construction according to the approved Building Envelope Commissioning plan
2. Perform In-Place Building testing (min 24 hours or as determined in the BeCx Plan) on the building during construction according to the approved Building Envelope Commissioning plan.
3. Provide reports after each test, stating the results, and recommended re-testing if necessary.

4. Do not proceed with re-testing until CxA has completed its review and stated so in writing.

B. Mock-ups:
   1. Reference other Section(s) for location and specific configuration requirements.
   2. Conduct Mockup testing as specified in this and other applicable section(s).
   3. Upon approval of the mock-up, the Contractor shall be released to begin installation on the building.

C. In Place Building Testing:
   1. Coordinate in-place testing with the completion of exterior systems and prior to the closing-in of the interior of walls or ceilings related to the testing location to allow for results to be evaluated and any required correction of deficiencies complete within construction sequencing.

1.7 SYSTEMS PERFORMANCE TESTING

A. Make the following tests of the mock-up in the order listed:
   1. Preliminary loading at 20 psf.
   2. Air Infiltration (Static Pressure): ASTM E783- Field Measurement for Air Leakage through Installed Exterior Windows and Doors. Test pressure difference shall be 6.24 psf. Infiltration for entire assembly shall not exceed 0.1cfm/sf/min.
   3. Water Penetration (Cyclic Pressure): ASTM E 1105 - Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference. Test to full design pressure without de-rating. No water intrusion is acceptable. The definition of water intrusion includes any water visible from the finished building interior, whether or not defined as controlled.

B. The required tests for the final in-place building systems are as follows:
   1. Whole Building air leakage testing:
      a. ASTM E779: Standard Test method for Determining Air Leakage Rate by Fan Pressurization or
      b. ASTM E1827: Standard Test Method for Determining Air Tightness of Buildings Using an Orifice Blower Door
      c. Leakage rate range from 0.3 per LEED
   2. Water intrusion testing for sample of building envelope and penetrations via AAMA 501.1.
   3. Roof water intrusion tests via ASTM D5957.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 QUALITY CONTROL

A. All testing shall be witnessed by the CxA and Special Inspector. Notify the CxA of testing schedule 48 hours in advance.

B. Testing procedures:
   1. Contractor's testing agency shall conduct tests of mock-ups and final in place building systems in the presence of the CxA, the Contractor, the Installer and the Design Professional. Proceed with each test as coordinated with the BECM after Contractor's notification that systems are ready and the detailed outline of test procedure is accepted.
   2. Test protocol requires that air infiltration testing precede water tests. Should it be necessary for a water test to be performed in advance of the air test, the specimen must be allowed to completely dry before air test.

3. The testing documentation shall be distributed and approved prior to proceeding to the next stage of envelope construction and at completion of the envelope.
4. Test reports shall include a description of the specific building enclosure system at the time of testing, date and time of test, description of test performed, listing of testing results, and all supporting measures data along with corrective recommendations as required.

C. Corrective Measures:
1. Correct any deficiencies in the mock-up observed during testing and repeat tests as may be required to show compliance with the specified performance standards and the Contract Documents. Resubmit any submittals affected by these corrections. Resubmit Shop Drawings with changes made to assemblies to successfully complete preconstruction testing.
2. Deficiencies requiring repair or modification to the mock-up shall mandate a complete retesting of the mock-up beginning with the specified Preliminary Test unless otherwise requested by the CxA. If compliance with the performance standards is not achieved after 2 complete retests the Contractor shall replace mock-up completely with revised construction and start testing from the beginning.
3. Incorporate corrective measures indicated by the test report into the final exterior wall assemblies after review by the University's Representative.

D. Final Acceptance of the mock-up shall be done in writing:
1. Successful testing results and the completed test report are required for this acceptance and prior to start of work on final building systems in place.

3.2 BECx INSPECTIONS AND TESTING REQUIREMENTS

A. Provide all materials, labor, testing and documentation to execute the commissioning activities as described below and for elements of the building envelope as described in their individual Sections, including, but not limited to the following:

B. BeCx Third Party Testing and Inspection: Contractor shall provide 3rd Party Inspection and Testing as specified in the project specifications. Observation Reports and Testing Results shall be provided to the BeCx Agent for inclusion in the project Cx record
1. Below Grade
2. Above Grade Openings and Enclosure
3. Roofing

C. BeCx Acceptance Testing: Contractor shall provide testing of installed Work, documented by Testing Entities
1. In-Place Building Sampling: Perform water penetration testing on 10% of installed fenestration, of each type (glazed window, curtain wall and sloped glazing (skylight) systems).
2. Mockup Testing: The mockup shall included each type of penetration occurring on the in place building. Water penetration testing shall be performed on these penetrations.

3.3 SEASONAL / DEFERRED TESTING

A. Provide an allowance for 8 hours of BECM's time and 8 hours of Control Technician's time to assist the University's Representative with seasonal or deferred functional performance testing during the warranty period.

END OF SECTION