

## SECTION 01 91 15 – FACILITY ENCLOSURE COMMISSIONING

### Part 1 – GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.
- B. Owner's Project Requirements (OPR) and Basis of Design (BOD) documentation are included for information only.

#### 1.02 SUMMARY

- A. This Section includes exterior enclosure commissioning procedures, including substructure, superstructure, exterior enclosure and roofing construction that protects climate-controlled spaces from unconditioned spaces and the exterior environment as follows:
  - 1. Below-grade construction including foundations, basements, and slab-on-grade that functions as part of the exterior enclosure system but excluding structural systems and components.
  - 2. Superstructure floor and roof construction that functions as part of the exterior enclosure system
  - 3. Exterior enclosure construction, above grade, including exterior opaque walls, windows and doors including sheathing and framing, and interior finish materials attached to the exterior wall.
  - 4. Roofing, including roofing system, roofing insulation, and skylights, hatches and other roof openings.
  - 5. [If part of OPR] Interior partitions or walls within the building surrounding areas with different ambient conditions than the rest of the interior space.
- B. Related Sections
  - 1. Division 01 Section "General Commissioning Requirements" for general requirements for commissioning including definitions, commissioning team membership, Owner's responsibilities, Contractor's responsibilities and Commissioning Authority's responsibilities.
  - 2. Division 03 through 14 Sections for facility exterior enclosure commissioning requirements specific to Work of each section.

#### 1.03 COMMISSIONING TEAM

- A. Owner and his Consultants
- B. General Contractor

- C. Designer and design engineers
- D. Commissioning Authority
- E. Exterior enclosure sub-contractor and their sub-contractors
- F. Specialty sub-contractors

#### 1.04 COMMISSIONING AUTHORITY

- A. The Commissioning Authority shall be approved and engaged by the Owner at the time of BOD.
- B. The Commissioning Authority shall have, at a minimum, [10] years of experience in the practices that encompass exterior enclosure commissioning including understanding systems design intent, performing architectural and shop drawing peer reviews, evaluating submittal compliance, administering pre-construction meetings, performing/supervising field performance testing, fulfilling field construction administration responsibilities, evaluating component/assembly compliance and performing forensic evaluations as relating to Divisions 03 through 14 Sections for facility enclosure commissioning requirements specific to Work of each Section.
- C. The Commissioning Authority shall hold facility accreditation with a minimum of two of the following, International Accreditation Services, Inc. (ISA), American Architectural Manufacturers Association (AAMA), (International Standards Organization) ISO/IEC 17025. If the Commissioning Authority does not meet these requirements, a subcontractor or vendor responsible for testing under direction of the Commissioning Authority must satisfy these same requirements.
- D. The Commissioning Authority cannot be financially associated with any of the Division 01 through 14 contractors or vendors prior to engaging this contract.

#### 1.05 CONTRACTOR'S RESPONSIBILITIES

- A. Attend [design and] pre-construction and construction phase building enclosure coordination meetings
- B. Provide schedule and perform field quality control tests and inspections required by the Contract Documents to Commissioning Authority.
  - 1. Update [weekly] [bi-weekly] [monthly] <insert frequency> throughout the construction period.

- C. Submit field quality control testing and inspection reports on exterior enclosure construction to the Commissioning Authority
- D. Submit operation and maintenance data for systems, subsystems and components to the Commissioning Authority.
- E. Provide cut sheets and shop drawing submittals of commissioned systems to the commissioning authority.
- F. Provide input for final commissioning documentation to the Commissioning Authority.
- G. Participate in testing/inspection procedures meetings
- H. Provide complete set of Coordination Drawings showing the complete coordination and integration of all Work of commissioned systems to the commissioning authority.
- I. Permit Commissioning Authority to access locations of installed systems, subsystems and component for testing and inspection
- J. Reimburse Owner for non-compliant tests and inspections as outlined in Division 01 through Division 14
- K. Provide test data, letters of incompatibility and certificates to Commissioning Authority
- L. Participate in maintenance orientation and inspection
- M. Participate in operation and maintenance training sessions
- N. Address current Owner and Designer punch list items
- O. Participate in final review at acceptance meeting

#### 1.06 DESIGNER/ENGINEER RESPONSIBILITIES

- A. Provide [paper and] electronic copies of project drawings and specifications to the Commissioning Authority
- B. Provide written responses to design review comments from the Commissioning Authority or other parties requested
- C. Attend design, pre-construction and construction-phase coordination meetings
- D. Participate in testing procedures meetings

- E. Provide resolution for items for which the Commissioning Authority and Contractor may be in disagreement

#### 1.07 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

- A. Provide project-specific construction checklists and commissioning process test procedures
- B. Witness systems, assemblies, equipment and component startup
- C. Compile test data, inspection reports and certificates and include them in the systems manual and commissioning process report.
- D. Review project drawings and specifications at [25] [50] 100% completion for constructability, durability performance and exterior enclosure conformance
- E. Review coordination drawings
- F. Attend design, pre-construction and construction phase meetings
- G. Perform or facilitate mock-up performance testing
- H. Document construction of commissioned components at the completion of mock-up testing
- I. Review proposals and requests for substitutions and changes for compliance with Contract Documents, and for compatibility with Work of other sub-contractors
- J. Review exterior enclosure work for compliance with Contract Documents
  1. Maintain list of observed deficiencies and discrepancies
  2. Develop protocols for functional performance testing
  3. Perform or facilitate functional performance testing
- K. Issue letter of compliance, assuming all non-complaint items are addressed.

#### 1.08 COMMISSIONING DOCUMENTATION

- A. Provide the following information to Commissioning Authority for inclusion in the Commissioning Plan
  1. Submittals, information for system manuals and other required documents and reports.
  2. Identification of installed exterior enclosure components, assemblies, systems and equipment, including design changes that occurred during the construction phase.

3. Certificate of completion, certifying that exterior enclosure assemblies, systems, equipment and associated controls are complete and ready for testing
  4. Test and inspection reports and certificates
  5. Corrective action documents
- B. The Commissioning Authority will provide regular reports to the Owner and distribute to other parties as requested by the Owner, as construction and commissioning progresses
- C. A final summary report (including backup documentation) and a letter of compliance will be provided by the Commissioning Authority to the Owner upon completion of exterior envelope construction and resolution of unaddressed non-compliant items. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc. will be compiled in appendices and provided with the summary report.

#### 1.09 PRECONSTRUCTION TESTING

- A. Preconstruction Mockup Testing: [Insert commissioning procedures governing mockups and phased mockup testing]

#### 1.10 COMMISSIONING SUBMITTALS

- A. Submit commissioning submittals to Commissioning Authority. Submittals requiring Architect's action will be returned to Commissioning Authority through Architect.

#### 1.11 QUALITY ASSURANCE

- A. Quality Assurance and Control: Specific commissioning and control requirements for individual construction activities are specified in the Sections that specify those activities. Specified commissioning tests, inspections and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
- B. Preconstruction Commissioning Conference: Commissioning Authority will schedule a pre-construction commissioning conference before construction of the exterior enclosure starts, at a time convenient to the Owner [, Construction manager] Contractor and Architect. Allow for the conference to be held at the Project site or another convenient location. The Commissioning Authority will conduct the meeting to review commissioning responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, [ Construction Manager,] Commissioning Authority, Architect and consultants; Contractor and its superintendent; major subcontractors; suppliers; and

other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to commissioning.

2. Agenda: Discuss items of significance that could affect progress including the following:
  - a. Commissioning plan and related specifications
  - b. Tentative construction schedule per Contractor
  - c. Phasing
  - d. Critical work sequencing and long lead times per Contractor
  - e. Designation of key personnel and their duties
  - f. Mockup construction and testing
  - g. Procedures for testing and inspecting
  - h. Submittal procedures
  - i. LEED requirements
  - j. Preparation of record documents
  - k. Owner's occupancy requirements
  - l. Security
  - m. [Add item(s) to suit Project]

#### 1.12 FUNCTIONAL PERFORMANCE TESTING

- A. Objectives and Scope: The objective of functional performance testing is to demonstrate that each exterior enclosure assembly/system is functioning according to the documented design intent of the Contract Documents and in accordance with the OPR. Functional testing facilities bringing the material assembly from a state of substantial completion to full operation. Additionally, during the testing process, areas of non-compliant performance are identified and corrected, improving the operation and functioning of the building envelope/assemblies.
- B. Development of Test Procedures: Before specific test protocols and procedures are developed, the Commissioning Authority will request all documentation and a current list of change orders affecting the exterior enclosure/assemblies, including an updated points lists and parameters. The Commissioning Authority shall develop specific test protocols and procedures to verify and document proper operation of each piece of exterior enclosure/assemblies.
- C. Functional Performance Testing: All functional performance testing of building envelope/assemblies shall be performed by the Commissioning Authority, unless otherwise specified by the Commissioning Authority. Any subcontractor or vendor responsible to execute a test shall provide assistance to the Commissioning Authority in developing the procedures review (answering questions about assemblies and sequences, etc.). Prior to execution, the Commissioning Authority will provide a copy of the test

procedures to the General Contractor and subcontractor(s) who will review the tests for feasibility, building enclosure/assemblies and warranty protection.

- D. Test Methods:
1. A mock-up test(s) must be included to verify component and assembly performance prior to commencing with construction or during the first phase of construction. [Refer to Section 01 XX XX PRECONSTRUCTION TESTING]
  2. Functional performance testing and verification may be achieved by manual testing (persons manipulating equipment and observing performance). The Commissioning Authority may substitute specified methods or require additional methods to be executed other than what was specified. The Commissioning Authority will determine which method is most appropriate for tests that do not have a method specified.
  3. Simulated Conditions: Simulating conditions shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
- E. Sampling: Multiple identical pieces of assemblies may be functionally tested using a sampling strategy. Significant application differences and significant sequence or functional differences in otherwise identical materials or assemblies invalidates their common identity. A small size or capacity difference alone does not constitute a difference. It is noted that no sampling by contractors and their subcontractors is allowed in pre-functional checklist execution.
- F. The Contractors and their subcontractors shall provide sufficient notice to the Commissioning Authority regarding their completion schedule for the assemblies or exterior enclosure systems. The Commissioning Authority will schedule functional tests through the General Contractor [Project Manager].
- G. The Commissioning Authority shall perform/administer and document the results of all functional performance tests.
- H. The Commissioning Authority may recommend solutions to problems found; however the burden of responsibility to solve, correct and re-test problems is with the General Contractor, subcontractors and their subcontractors and the Designer.

#### 1.13 NON-CONFORMANCE

- A. All deficiencies or non-conformance issues shall be noted and reported by the Commissioning Authority to the General Contractor and Designer.
- B. Corrections of minor deficiencies identified during functional performance testing or inspections may be made at the time of testing/inspection at the

discretion of the Commissioning Authority. In such cases, the deficiency and resolution will be documented.

- C. Failure Due to Manufacturer Defect: If [insert number] of identical pieces (size alone does not constitute a difference) of materials or assemblies fail to perform to the Contract Documents (physically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units must be considered unacceptable by the General Contractor, subcontractor, sub-subcontractor, Commissioning Authority, Designer or Owner [Project Manager].

## Part 2 – PRODUCTS

### 2.01 COMMISSIONING AUTHORITY

- A. Architectural Testing. 130 Derry Court. York, PA 17406. Phone (717) 764-7700. Website <http://www.archtest.com>
- B. Other authority, as approved by Owner

### 2.02 BUILDING ENVELOPE PROTECTION SYSTEM

- A. Provide a complete building envelope protection system warranted by a single manufacturer, consisting of building envelope protection sub-systems, including their respective transitions, as listed in article 2.03.
  - 1. NVELOP™LUS by Carlisle Roofing Systems, Inc. P.O. Box 7000. 1285 Ritner Highway. Carlisle, PA 17013. Phone 1-800-479-6832. Website <http://www.carlislvelop.com>

### 2.03 BUILDING ENVELOPE PROTECTION SUB-SYSTEMS

- A. Single-ply membrane roofing as manufactured by Carlisle Syntec Incorporated. P.O. Box 7000. 1285 Ritner Highway. Carlisle, PA 17013. Phone 1-800-479-6832. Website <http://www.carlisle-syntec.com>
  - 1. Section 07 53 23 Ethylene-Propylene-Diene Monomer Roofing
  - 2. Section 07 54 19 Polyvinyl-Chloride Roofing
  - 3. Section 07 54 23 Thermoplastic Olefin Roofing
- B. Section 07 55 63 Vegetated Protected Membrane Roofing
  - 1. Single-ply membrane system as manufactured by Carlisle Syntec Incorporated
  - 2. Hot fluid-applied rubberized asphalt system as manufactured by Carlisle Coatings & Waterproofing Incorporated



- C. Air Barrier as manufactured by Carlisle Coatings & Waterproofing Incorporated. 900 Hensley Lane. Wylie, TX 75098. Phone 1-800-527-7092. Website <http://www.carlisle-ccw.com>
  - 1. Section 07 27 13 Modified Bituminous Sheet Air Barrier
  - 2. Section 07 27 26 Fluid-Applied Membrane Air Barrier
  
- D. Section 07 21 13 Board Insulation
  - 1. Expanded polystyrene foam as manufactured by Insulfoam LLC/ a Carlisle Company. 6004 North Westgate Boulevard. Suite 120. Tacoma, WA. Phone 1-800-248-5995. Website <http://www.insulfoam.com>
  - 2. Polyisocyanurate foam as manufactured by Hunter Panels LLC/ a Carlisle Company. 15 Franklin Street. Portland, ME 01401. Phone 1-888-746-1114. Website <http://www.hpanels.com>
  - 3. Extruded polystyrene foam as provided by Building Envelope Protection System Manufacturer
  
- E. Waterproofing as manufactured by Carlisle Coatings & Waterproofing Incorporated
  - 1. Section 07 13 26 Self-Adhering Sheet Waterproofing
  - 2. Section 07 13 54 Elastomeric Sheet Waterproofing
  - 3. Section 07 14 13 Hot Fluid-Applied Rubberized Asphalt Waterproofing
  - 4. Section 07 14 16 Cold Fluid-Applied Waterproofing
  - 5. Section 07 17 16 Bentonite Composite Sheet Waterproofing
  - 6. Section 07 18 13 Pedestrian Traffic Coatings
  - 7. Section 07 18 16 Vehicular Traffic Coatings

### Part 3 – EXECUTION

- 3.01 Commissioning Authority shall issue a written report certifying that building exterior enclosure systems, subsystems and construction have been completed according to the Contract Documents and comply with BOD and OPR.
- 3.02 Building Envelope Protection System Manufacturer shall issue a minimum [] year warranty covering design, material and installation of Building Envelope Protection System specified in Article 2.02.
- 3.03 Commissioning Authority shall perform or facilitate and document field quality control tests and inspections.
- 3.04 Commissioning Authority shall confirm that field quality control testing of exterior enclosure has been completed and approved, that discrepancies have been corrected, and corrective work approved.