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Part 1 GENERAL

1.1 General

.1 A formal commissioning process is in place for this project. Work shall include but not limited to the implementation of coordinated commissioning activities, executed by the Contractor and Commissioning Provider (CxP).

.2 This section describes the commissioning of the building components, equipment and systems and outlines the duties and responsibilities of the Commissioning Team.

.3 The commissioning process shall be applied to listed building components, and all products, equipment and systems provided under Division 23 through Division 28.

.4 The Commissioning Provider, as directed by the Owner, shall develop a Commissioning Plan.

1.2 Related Sections

.1 Project Documents (reference and information only):

.1 Owner's Project Requirements

.2 Basis of Design

.2 Guidelines and Industry Standards:

.1 ASHRAE Standard 202: Cx Process for Building and Systems

.2 CAN/CSA Z320-11: Building Commissioning Standard & Check Sheets

.3 IES DG-29-11: The Cx process applied to the lighting and control systems

.4 Building Cx Association: New Construction Building Commissioning Best Practices, November 2015

.3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

Part 2 PRODUCTS

2.1 Definitions

.1 Commissioning Team

.1 Personnel that will be directly involved in the building commissioning process. The Commissioning Team shall comprise of Commissioning Provider, Owner's Representatives, Contractors, the Consultants and Independent Third-Party Testing Agencies.

.2 Commissioning Plan

.1 The Commissioning Plan defines the scope and approach to the Total Building Commissioning Program that is to be executed for the project.

.2 The Commissioning Provider shall develop the Commissioning Plan once the IFC drawings and specifications are ready.

.3 General Contractor

.1 The contracting firm responsible for management of the construction process for the project.

.4 Contractor

.1 The electrical and mechanical construction firms and their sub-contractors that are responsible for physical construction of the project.

.5 Consultants

.1 The architects / engineers that are responsible for production of the design drawings and specifications for the project as well as the base contract administration, inspection, quality assurance and acceptance activities.

.2 The design consultants are not required to be involved in any of the commissioning verifications or performance testing programs, but may witness these activities at their discretion.

.6 Independent Testing Organization (ITO)

.1 Specialty firms or agencies retained to conduct acceptance tests on a system or component and provide a certificate of acceptance and conformance to governing standards.

.7 Out of Contract Tests

.1 Testing requirements that are not covered as part of the construction documents but are required to be carried out by certified agencies. Examples would be high voltage testing programs, building envelope testing, and air quality testing.

.8 In Contract Tests

.1 Testing requirements that are defined in the contract documents and are the contractors responsibility to carry out. Tests may be witnessed by the Consultant, Owner's Representative and Commissioning Providers. Documented test results are turned over for review.

.9 Commissioning Check Sheets

.1 Electrical and mechanical check sheets that are specific to systems and components for the project that are used for verifying and testing of the work. These shall be generated by the Commissioning Provider.

.2 The commissioning checksheets will be laid out to record three types of site information; technical equipment data, static installation checks, and operational checks.

.3 The checksheets will have the equipment's specified and approved shop drawing information input by the Commissioning Provider. The Contractors shall be responsible for completing the technical data section

by verifying through the equipment nameplates on site that the equipment installed matches the approved shop drawings.

.4 The checksheet manuals will be turned over to site following approval of shop drawings. Checksheets will be prepared for all electrical and mechanical systems with the exception of the BMS Controls.

.5 The Commissioning Provider will use copies of the BMS Contractor's point verification forms for commissioning of the BMS Systems.

.10 Contractor Start-Up Program

.1 Contractor / Supplier checking of the physical installation of the work and reviewing the completeness of system installation and readiness for start-up prior to Commissioning verification activities occurring.

.2 Contractor start-up program activities are conducted by the electrical and mechanical contractors or their sub-trades and their equipment suppliers, and may be witnessed by the Consultant and / or Commissioning Agents.

.11 Static Inspections

.1 Systematic detailed inspections of electrical and mechanical systems and components carried out under the Commissioning Program by personnel from the Commissioning Team. Site personnel will utilize check sheets for recording installation readiness or deficiencies on a component and system bases. Timing of static inspections is tied to construction progress and occurs once contractor checks have been completed.

.12 Acceptance Inspections

.1 A series of formal inspections carried out by the Consultants for systems that result in acceptance of the Work as complete.

.13 Performance Testing

.1 Performance tests are specific hand-on tests conducted with test instruments, to prove that the systems as installed meet both the specified performance requirements for major pieces of equipment and that installed system performance meets the design intent and specified operating requirements.

2.2 The Commissioning Team

.1 The Commissioning Team shall consist of:

.1 The Commissioning Provider (retained by the Owner).

.2 Owner's Representatives

.3 The Consultant

.4 General Contractor

.5 Electrical and Mechanical Contractors and Sub-Contractors

.6 Independent Testing Organization (ITO)

2.3 Duties of the Team

.1 Commissioning Provider:

.1 Assemble Commissioning Team and ensure coordination of activities with the team in carrying out the Commissioning Plan.

.2 Assists in the preparation of the Owner's Design Intent documentation and reviews the Consultant's Basis of Design Report.

.3 Conducts detailed Design Reviews of the electrical, mechanical, and control construction documents prior to project tender. Provide comments to the Owner and the Consultant. Track comments for resolutions (For the projects with construction budget above $2M only).

.4 Develop commissioning specifications for inclusion in tender package.

.5 Development of the Commissioning Plan including involvement of Owner's personnel, Out-of-Contract testing requirements, and overall commissioning team responsibilities.

.6 Convene and chair commissioning meetings.

.7 Review all electrical and smechanical equipment shop drawings and provide reports as necessary to the Owner and the Consultant. The BMS shop drawings require a separate detailed review and report submission. Track the issues and record resolutions.

.8 Liaison between Project Management, the Construction and Design Team and coordinates all related correspondence.

.9 Commissioning Agents shall witness major electrical and mechanical equipment start-up procedures. Witness equipment start-ups onsite and provide reports to the Owner. All findings shall be summarized in Master Issue Log.

.10 Issue Commissioning Reports on system completeness/deficiencies and after each site visit. All findings shall be summarized in Master Issue Log.

.11 Review all contractor's electrical and mechanical submittals including insulation resistance test reports, contact resistance test reports, pressure test reports, cleaning/flushing reports, air/water balancing reports, O&M manual. A separate report shall be submitted to the Owner for each. All issues shall be recorded in Master Issue Log. e

.12 Review the equipment installations in the field and complete and sign off equipment static checks on the commissioning checksheets after contractor completion.

.13 Adjusts as required the Commissioning Plan after Tender and prepares Commissioning Manuals complete with equipment check sheets and performance testing scopes for mechanical systems once shop drawings are approved.

.14 Perform detailed Functional Performance Testing on each equipment and the whole system together. The Commissioning Provider shall develop the functional testing scripts in the beginning of the construction phase and discuss the scenarios and steps with the respective contractors throughout the Commissioning Meetings.

.15 Verify, through performance testing, that systems operate as per design intent and contract documents. Document results in the operation checks section of the commissioning forms.

.16 The commissioning Provider shall document all findings in a Master Issue Log. The Commissioning Provider shall return on site to double check the issues and retest as necessary, record each item's resolution and report to the Owner.

.17 Development of a Commissioning Schedule in conjunction with the Construction Schedule.

.18 Turnover of Final Commissioning Manual c/w with signed-off check sheets, verification results, system descriptions, and contractor testing documentation.

.19 Issues a final commissioning summary report.

.2 Owner's Representatives

.1 Copied with all commissioning reports

.2 Reviews and implements, as deemed necessary, all recommendations and suggestions identified in the commissioning reports.

.3 Review and comments on the Commissioning Reports as prepared by Commissioning Provider and follow up with the Contractors as needed.

.3 Consultant

.1 Conduct periodic construction reviews to determine that the work is in general conformance with the contract documents.

.2 Review as-built records as required to the Contract Documents.

.3 Provide support to the Commissioning Provider as a part of the commissioning process. This shall include providing adequate space for equipment installation and maintenance.

.4 Prepare and submit the final as-built design intent and operation parameters documentation for inclusion in the O&M manuals.

.5 Review and approve the O&M manuals.

.6 Provide a design narrative and sequence documentation requested by the CxP, and assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

.7 The Design Professional retains responsibility for system evaluation, adequacy of the system to meet design intent, capacity of the system, quality check or any of the other elements of the design.

.8 Attend commissioning scoping meeting and other selected commissioning team meetings as necessary.

.9 Review as-built record as required by the Contract Documents and turn them over to the CxP for inclusion in final project documentation.

.10 Witness testing of selected pieces of equipment and systems

.4 General Contractor and Contractors

.1 Cooperate fully with Commissioning Provider in execution of the Commissioning Plan.

.2 Provide copies of all shop drawings and equipment start-up reports to the Commissioning Provider.

.3 Coordinate with the Commissioning Provider and provide dates for commissioning activities for development of the commissioning schedule.

.4 Prepare and issue the equipment start-up plan.

.5 Provide advanced notice at least seven (7) days prior to commencement of each procedure or series of procedures to allow the Commissioning Provider to arrange for witnessing of tests as required.

.6 Verify that equipment and system start-ups have been completed by the contractors / equipment representatives and notify the Commissioning Provider that commissioning of systems can commence.

.7 Should Commissioning Provider arrive on-site for a scheduled site visit/testing, or be called to site, it is assumed that the contractors and all parties will be prepared for the proposed work and the commissioning activities can take place with no issue.

.8 All commissioning activities and tasks are designed to take place once and are single occurrence. In the event that the Commissioning Provider arrives on site at a prearranged time and equipment is not ready or task has been cancelled without notifying the Commissioning Provider, the contractor will be charged for additional fees for missed readiness based on time and material.

.9 Provide completed Start-up forms/reports to the Commissioning Provider within five (5) days after completion of the task.

.10 Utilizing the equipment check sheets prepared by the Commissioning Provider, complete the contractor’s portion of the commissioning checks by completing the technical data sections verifying the installed equipment matches the specified and shop drawing requirements.

.11 Completion of deficiencies as listed on the Commissioning Reports.

.12 Submit all required documents to the commissioning Provider, i.e. insulation resistance test reports, duct/pipe pressure test reports, pipe flushing/cleaning reports, equipment start-up reports, air/water balancing reports, BMS point to point verification report, BMS sequence of operation verification report, O&M manual, and as-built drawings etc to Commissioning Provider, the Owner and the Consultant.

.13 Assign the required manpower onsite as necessary to perform all commissioning activities.

.14 Respond to the Commissioning Provider's questions, reports and comments on timely fashion.

.15 Assign the required manpower to retest the deficiency and provide resolutions.

.16 Assign electricians and electrical technicians onsite to work with Commissioning Provider to perform Functional Performance Testing. The electricians and technicians shall be familiar with project and have the site-specific information.

.17 Assign HVAC and BMS technicians onsite to work with Commissioning Provider to perform Functional Performance Testing. The technicians shall be familiar with project and have the site-specific information.

.18 The Contractor is responsible for verifying that all installed equipment is as per the electrical and mechanical shop drawings. The Contractor is to initial and date the check sheets when the equipment technical checks are complete and also when equipment installations are complete (static checks). The Commissioning Provider will check-off that the technical data is correct, and will fill in the site-specific data for all static and operation checks. When all deficiencies are complete and the piece of equipment is operating as designed, the Contractor and Commissioning Agents will sign off the form. Provide Record Drawings and

.19 When thorough testing of loading, staging, and capacities in the construction phase can't be completed during the initial functional testing, testing is deferred to the appropriate season or load condition during occupancy. General Contractor and Contractors shall assign the required manpower onsite as necessary to perform all commissioning activities, respond to the Commissioning Provider's questions, reports and comments on timely fashion. Shall provide technical support and assist within their contract scope to remedy issues. Conducting a final Warranty Review to ensure there is sufficient time to remedy any noted outstanding items issues relating to the commissioned equipment.

.20 Where practicable, when electrical loading is insufficient to complete initial functional testing, then Contractor shall provide suitably-sized resistive load banks to supplement the building loads to 100% of rated

capacity. Functional Performance Testing shall be conducted under 100% rated load.

.21 Subsequent to providing the O&M Manuals and draft as-built drawings and completing all commissioning tasks and prior to applying for a certificate of substantial completion, shall provide all specified trainings.

.22 Record in digital video format all demonstrations and specified training sessions, and provide one (1) complete copy on a Flash Drive to the Board.

Part 3 EXECUTION

.1 The Commissioning Provider shall plan, organize and implement the commissioning process.

.2 Duties as outlined in section 2.3 Duties of the Team, .1 Commissioning Team.

END OF SECTION