

Part 1 General

1.1 DEFINITIONS

- .1 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.2 DESIGN REQUIREMENTS

- .1 Confirm with Departmental Representative that Design Criteria and Design Intents are still applicable.
- .2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Final Report: submit report to Departmental Representative.
 - .1 Include measurements, final settings and certified test results.
 - .2 Bear signature of commissioning technician and supervisor.
 - .3 Report format to be approved by Departmental Representative before commissioning is started.
 - .4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Departmental Representative in accordance with Section 01 78 00 - Closeout Submittals.
 - .5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide documentation, O&M Manuals, and training of O&M personnel for review of Departmental Representative before interim acceptance in accordance with Section 01 78 00 - Closeout Submittals.

1.5 COMMISSIONING

- .1 Do commissioning in accordance with Section 01 91 13 - General Commissioning Requirements.
- .2 Carry out commissioning under direction of Departmental Representative Commissioning Manager.
- .3 Inform, and obtain approval from, Departmental Representative in writing at least 14 days prior to commissioning or each test. Indicate:

- .1 Location and part of system to be tested or commissioned.
- .2 Testing/commissioning procedures, anticipated results.
- .3 Names of testing/commissioning personnel.
- .4 Correct deficiencies, re-test until satisfactory performance is obtained.
- .5 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
- .6 Load system with project software.
- .7 Perform tests as required.

1.6 COMPLETION OF COMMISSIONING

- .1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Departmental Representative and Commissioning Manager.

1.7 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION

- .1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

Part 2 Products

2.1 EQUIPMENT

- .1 Provide sufficient instrumentation to verify and commission the installed system.
- .2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.
- .3 Locations to be approved, readily accessible and readable.
- .4 Application: to conform to normal industry standards.

Part 3 Execution

3.1 PROCEDURES

- .1 Test each system independently and then in unison with other related systems.
- .2 Commission each system using procedures prescribed by the Commissioning Manager.

- .3 Commission integrated systems using procedures prescribed by Commissioning Manager.
- .4 Debug system software.
- .5 Optimize operation and performance of systems by fine-tuning PID values and modifying CDLs as required.
- .6 Test emergency and life safety procedures including operation and integrity of refuge systems under normal and emergency power conditions as applicable.

3.2 FIELD QUALITY CONTROL

- .1 Pre-Installation Testing.
 - .1 General: consists of field tests of equipment just prior to installation.
 - .2 Equip each Building Controller with sensor and controlled device of each type (AI, AO, DI, DO).
 - .3 Additional instruments to include:
 - .1 DP transmitters.
 - .2 DP switches used for dirty filter indication and fan status.
 - .4 In addition to test equipment, provide inclined manometer, digital micro-manometer, milli-amp meter, source of air pressure infinitely adjustable between 0 and 500 Pa, to hold steady at any setting and with direct output to milli-amp meter at source.
 - .5 After setting, test zero and span in 10 % increments through entire range while both increasing and decreasing pressure.
 - .6 DP switches to open and close within 2% of setpoint.
- .2 Completion Testing.
 - .1 General: test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.
 - .2 Include following activities:
 - .1 Test and calibrate field hardware including stand-alone capability of each controller.
 - .2 Verify each A-to-D convertor.
 - .3 Test and calibrate each AI using calibrated digital instruments.
 - .4 Test each DI to ensure proper settings and switching contacts.
 - .5 Test each DO to ensure proper operation and lag time.
 - .6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.
 - .7 Test operating software.
 - .8 Test application software and provide samples of logs and commands.

- .9 Verify each CDL including energy optimization programs.
 - .10 Debug software.
 - .11 Blow out flow measuring and static pressure stations with high pressure air.
 - .12 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and engineering units. This document will be used in final start-up testing.
- .3 Final Start-up Testing: Upon satisfactory completion of tests, perform point-by-point test of entire system under direction of Commissioning Manager and provide:
- .1 Technical personnel capable of re-calibrating field hardware and modifying software.
 - .2 Detailed daily schedule showing items to be tested and personnel available.
 - .3 Commissioning to commence during final start-up testing.
 - .4 O&M personnel to assist in commissioning procedures as part of training.
 - .5 Commissioning to be supervised by qualified supervisory personnel.
 - .6 Operate systems as long as necessary to commission entire project.
 - .7 Monitor progress and keep detailed records of activities and results.
- .4 Final Operational Testing: to demonstrate that EMCS functions in accordance with contract requirements.
- .1 Prior to beginning of 20 day test demonstrate that operating parameters (setpoints, alarm limits, operating control software, sequences of operation, trends, graphics and CDL's) have been implemented to ensure proper operation and operator notification in event of off-normal operation.
 - .1 Repetitive alarm conditions to be resolved to minimize reporting of nuisance conditions.
 - .2 Test to last at least 20 consecutive 24 hour days.
 - .3 Tests to include:
 - .1 Demonstration of correct operation of monitored and controlled points.
 - .2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.
 - .4 System will be accepted when:
 - .1 EMCS equipment operates to meet overall performance requirements. Downtime as defined in this Section must not exceed allowable time calculated for this site.
 - .2 Requirements of Contract have been met.

- .5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.
- .6 Correct defects when they occur and before resuming tests.

3.3 ADJUSTING

- .1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative, set and lock devices in final position and permanently mark settings.

3.4 DEMONSTRATION

- .1 Demonstrate to Departmental Representative operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs in accordance with Section 01 00 01 – General Requirements.

END OF SECTION 25 01 11