

**SPECIAL SPECIFICATION**

**SECTION 01715S**

**COMMISSIONING DEFINITIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section of the specification provides definitions for common terms and abbreviations used throughout Division 17 commissioning specifications, the Commissioning Plan - Construction Phase and in certain Division 15 and Division 16 sections.

**1.2 RELATED SECTIONS**

- A. Division 1
  - 1. 01311S Project Schedule
  - 2. 01700 Contract Closeout
  - 3. 01710-S Commissioning Requirements
- B. Division 11
  - 1. 11012-S House Cleaning Vacuum
  - 2. 1160-S Laboratory Fume Hoods
- C. Division 13
  - 1. 13100-S Lighting Protection Systems
  - 2. 13203-S Above Grade Fuel Tanks
  - 3. 13852 Intelligent Fire Alarm System
  - 4. 13860-S High Sensitivity Smoke Detection
  - 5. 13943 Controls
  - 6. 13980-S HFC-227ea Agent Extinguishing System
- D. Division 14
  - 1. 14211-S Electric Elevators – Freight
  - 2. 14212-S Electric Elevators – Passenger
- E. Division 15 (Inclusive)
- F. Division 16
  - 1. 16001 Electrical Work
  - 2. 16269 Variable Frequency Controllers
  - 3. 16310 15kV Metal-Enclosed Stand-Up or Pad-mounted Switchgear
  - 4. 16425 Low Voltage Switchgear
  - 5. 16441 Electrical Lighting and Appliance Panelboards
  - 6. 16442 Electrical Power Panelboards
  - 7. 16465-S Power Distribution Units
  - 8. 16601-S Ionization
  - 9. 16610-S Uninterruptible Power System
  - 10. 16670 Lightning Protection
  - 11. 16920 Motor Control Centers
  - 12. 16995 Electrical Systems Commissioning

**1.3 DEFINITIONS**

- A. Definitions: The following is a list of common definitions used in the Specifications and the Commissioning Plan - Construction Phase.

1. Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.
2. Architect / Engineer (A/E) - the prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.
3. Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.
4. Commissioning (Cx). Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent, basis of design, contract documents and SNL's system operational needs. This is achieved by beginning in the design phase, documenting design intent and continuing through construction, building acceptance and the warranty period with actual verification of performance.
5. Commissioning Plan - an overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.
6. Construction Management Engineer (CME): - SNL's representative in charge of construction of the project. The main interface between the contractor and other Sandia team members.
7. Construction Observer - The persons who are authorized by SNL to witness all construction activities to insure that the construction is accomplished in a safe manner according to the contract documents. They are to ensure that all safety procedures are followed, be present for witness tests, conduct independent tests as deemed necessary, review and monitor contractor certifications, and stop work if required to ensure the safety of personnel and the compliance of the contractor to the contract documents.
8. Contract Documents - the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, *Cx Plan*, etc.).
9. Contractor - the general contractor and/or their authorized representative.
10. Controls Contractor (CC) - subcontractor performing all building controls work defined in Div. 15.
11. Commissioning Authority (CA) - SNL's representative in the commissioning activities of construction. The Commissioning Authority (CA) is hired by SNL and is a member of the Cx team who shall have direct significant mechanical engineering, controls, and commissioning experience. The Commissioning Authority (CA) is SNL's representative verifying the adequacy of the commissioning process. The CA will be involved in the witnessing portions of the process (selected start-up and functional tests) and reviewing documents (test approvals, etc.).
12. Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.
13. Deferred Functional Performance Tests - FPT's that are performed later, after final acceptance, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.
14. Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not comply with the design intent).
15. Deputy Project Manager (DPM) - the SNL facilities representative responsible for managing the scope, schedule, and budget for the project.
16. Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.
17. Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.
18. Electrical Contractor (EC) - subcontractor performing the Division 16 contract work.

19. Facility Control System (FCS) - the central building energy management control system
20. Final Acceptance - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents and there are no outstanding punchlist issues or deficiencies. The system is turned over to the Owner.
21. Functional Performance Test (FPT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The test engineer develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FPT's are performed after prefunctional checklists and startup is complete.
22. General Contractor (GC) - the prime contractor for this project. Generally refers to all the GC's subcontractors as well. Also referred to as the Contractor, in some contexts.
23. Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.
24. Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
25. Mechanical Contractor (MC) - subcontractor performing the mechanical work in Division 15.
26. Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.
27. Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."
28. Owner - The owner for the MESA project will be Sandia National Laboratories (SNL).
29. Owners Representative - All persons authorized by Sandia National Laboratories to interface with the contractor on its behalf.
30. Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.
31. Plumbing Contractor (PC) - subcontractor performing the plumbing work in Division 15.
32. Prefunctional Checklist (PFC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the TE to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for

most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

33. Sandia Delegated Representative (SDR) – the person or persons who have the authorization of SNL to make contract changes or direct the contract in the field.
34. Sandia Contract Representative (SCR) – the SNL purchasing agent in charge of the Project.
35. Statistical Sampling - Functionally testing a statistically representative quantity (i.e. 15%) of identical or near identical pieces of equipment. Subject to 3% failure threshold whereby if there are greater than 3% testing failures of randomly chosen equipment, the testing shall be noted as failed and the Contractor shall re-verify the startup of 100% of the equipment. An additional identical statistically representative quantity of equipment shall again be tested which shall include a retest of 25% of the failed equipment and 75% randomly chosen untested equipment. This shall be repeated until the testing is noted as passing. Any proposed statistical sampling shall be identified in the construction phase commissioning plan and approved by the SSE and CA.
36. Seasonal Functional Performance Tests - FPT that are deferred until the system(s) will experience conditions closer to their design conditions.
37. Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).
38. Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.
39. SNL System Engineer (SSE) – Owner of the systems after final acceptance.
40. Specifications - the construction specifications of the Contract Documents contained in the Project Manual.
41. Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.
42. Subs - the subcontractors to the GC who provide and install building components and systems .
43. Substantial Completion - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents. Occurs prior to final acceptance.
44. Test and Balance Contractor (TAB) – The work performed by the general contractor directly or under a subcontract that tests and balances the air and water side of the building systems as well as the vibration and balance requirements.
45. Test Engineer (TE) - an independent commissioning firm, not otherwise associated with the A/E team members or the Contractor, who is hired as a 1<sup>st</sup> tier subcontractor to the GC. The TE directs and coordinates the day-to-day commissioning activities. The TE is part of the Commissioning team.
46. Test Procedures - the step-by-step process, which must be executed to fulfill the test requirements.
47. Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures.
48. Trending - monitoring over time using the FCS.
49. Vendor - supplier of equipment.
50. Warranty Period - warranty period for entire project, including equipment components as specified in the contract documents.

#### 1.4 ABBREVIATIONS

- A. Abbreviations: The following is a list of common abbreviations used in the Specifications and the Commissioning Plan - Construction Phase.

1. AABC = Association of Air Balancing Contractors
2. A/E = Architect/Engineer
3. ASHRAE = American Society of Heating, Refrigeration, and Air Conditioning Engineers
4. Cx = Commissioning
5. CA = Commissioning Agent/Authority
6. Cx Plan = Commissioning Plan - Construction Phase
7. CC = Controls Subcontractor
8. CM = Construction Manager
9. EC = Electrical Subcontractor
10. FPT = Functional Performance Test ( protocols )
11. FPC = Fire Protection Subcontractor
12. GC = General Contractor
13. MC = Mechanical Subcontractor
14. NEBB = National Environmental Balancing Bureau
15. PBC = Plumbing Subcontractor
16. PFC = Prefunctional Checklist
17. PE = Project Engineer
18. PM = Project Manager
19. SC = Sheetmetal Subcontractor
20. TAB = Test, Adjusting, and Balancing Subcontractor
21. TE = Test Engineer

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION