Facility Design Guidelines: Workplace, Architecture & Engineering

Commissioning: Cx Roles and Responsibilities
MasterFormat Section 01-91-13

The guidelines described herein shall be used on all projects, unless USAA’s Project Variance Request process has been used to secure an approved, project-specific variance.

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<td>Clarification of commissioning authority responsibilities</td>
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Relevant Documents

A. GENERAL

Commissioning Process During Design
1. This document is to be used in conjunction with USAA division specific commissioning guidelines.
2. The commissioning authority/firm (Cx) is contracted directly by owner at the same time as the A/E is contracted.
3. Cx assists the owner in developing the owner’s project requirements.
4. A/E will provide adequate written design intent, basis of design and full sequences of operation for all equipment and systems for the O&M manuals and for the Cx to use in writing functional tests.
5. The Cx develops the commissioning plan for the construction phase during design.
6. The Cx develops commissioning specifications for the construction documents, with review by the design team, for inclusion in project construction specifications.
7. The Cx performs a design review at 50% and 80% completion of the drawings and specifications to ensure compliance with owner’s project requirements, USAA guidelines and efficient operations and maintenance.
8. The Cx will perform all tasks and provide documentation necessary to satisfy LEED fundamental commissioning prerequisite (applies only to LEED project).

Commissioning Process During Construction and Warranty
1. A scoping meeting is conducted by the Cx where the commissioning process is reviewed with the general contractor, the commissioning team members, and key subcontractors (at minimum electrical, mechanical and plumbing) to plan, scope, coordinate, schedule and review future activities and discuss process to resolve issues.
2. Cx (working in conjunction with A/E) reviews submittals and other documentation pertaining to equipment designated for commissioning to ensure all equipment meets design specifications, owner’s project requirements and USAA guideline requirements and provides comments to A/E and owner.
3. The Cx works with the Subcontractors (Subs) in developing start-up plans and start-up documentation formats, including providing to the subs prefunctional checklists to be completed during the startup process.

4. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.

5. The subs, under their own direction, execute and validates the prefunctional checklists and perform startup and initial checkout. The Cx documents that the checklists and startup were completed per the approved plans. This includes the Cx witnessing startup of selected equipment.

6. The Cx develops specific equipment and system functional performance test procedures. The performance test procedures are executed by the subs, under the direction of and verified by the Cx.

7. Cx develops and maintains a master deficiency/resolution list and items of non-compliance are corrected at the subs’ expense and the system retested.

8. The Cx reviews the O&M documentation for completeness and coordinates the training provided by the subs and verifies that it was completed.

9. The Cx completes a commissioning report upon the completion of construction and turnover to the Owner of all commissioning related documents in searchable electronic (PDF) format, including Cx plan, itemization of products and equipment comprising the systems being commissioned, checklists and field observation reports, FPT results, deficiency log(s), and training related documents.

10. Cx must conduct a post acceptance commissioning review into occupancy to ensure there are no lingering issues and the systems can be verified in opposite season conditions or correction of deferred items and submit a post commissioning report to owner.

11. Cx will provide a system manual.

12. The Cx develops a recommissioning manual per LEED requirement if applicable to project.

B. COMMISSIONING AUTHORITY RESPONSIBILITIES

The commissioning authority/firm (Cx) will have the following responsibilities:

1. The primary role of the Cx is to develop and coordinate the execution of a design review and develop a testing plan, and to observe and verification of performance—that is determine whether systems are functioning in accordance with the documented design intent, OPR, construction documents and owners’ guidelines.

2. The Cx is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management.

3. The Cx may assist with problem solving or resolving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E.

4. The Contractors will provide all tools or the use of tools to start, check out and functionally test equipment and systems, except for specified testing with portable data loggers, which shall be supplied and installed by the Cx.

During Preliminary Design Phase (Schematic Design and Design Development)

1. Develop a draft project specific commissioning plan for the construction phase and distribute to A/E and owner.

During Final Design Phase (Construction Documents)

1. Coordinate the commissioning work during this phase.

2. Perform a focused review of the drawings and specifications at 50% and 80% and provide comments to A/E and owner.
3. Participate in coordination meeting with owner and A/E team to assist in resolving issues identified during design if required.
4. Update and expand the draft project-specific commissioning plan for the construction phase and distribute to A/E and owner.
5. Develop full commissioning specifications for all commissioned equipment listed below in the section “Systems to be commissioned”. The commissioning specification must include:
   a. Detailed description of the responsibilities of all parties included in the commissioning process;
   b. Details of the commissioning process;
   c. Reporting and documentation requirements, including formats;
   d. Deficiency resolution;
   e. Prefunctional checklist and startup requirements;
   f. Functional testing process;
   g. Specific functional test requirements, including testing conditions;
   h. Acceptance criteria for each piece of equipment being commissioned.
6. Have the commissioning specifications approved and included in construction specifications.
7. Develop and maintain a master deficiency and resolution log.

**During Construction and Acceptance Phase**

1. Coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the general contractor (GC) and project manager (PM), ensure that commissioning activities are being scheduled into the master schedule.
3. Revise, as necessary, the current construction phase commissioning plan developed during final design and distribute to A/E and owner.
4. Plan and conduct a commissioning scoping meeting.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and approve normal contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute prefunctional test scripts and checklists.
9. Develop a start-up and initial systems checkout plan with subs.
10. Perform site visits as necessary based on the project, to observe component and system installations, start up and functional testing. Attend selected planning and job-site meetings (virtually or by phone) to obtain information on construction progress, review construction meeting minutes for revisions/substitutions relating to the commissioning process.
11. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports or by direct site observation.
12. Approve systems startup by reviewing start-up reports and by selected site observation.
13. Review testing, adjusting and balancing (TAB) execution plan.
14. Oversee sufficient functional testing of the controls system and approve it to be used for TAB, **BEFORE** TAB is executed.
15. Approve air and water systems balancing by spot testing and by reviewing completed reports and by selected site observation.

16. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. Submit to A/E, owner and PM for review and comment.

17. Analyze any functional performance trend logs and monitoring data to verify performance.

18. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.

19. Continually maintain master deficiency and resolution log and develop a separate testing record. Provide to the owner and PM written progress reports and test results with recommended actions.

20. Witness performance testing of smoke control systems by others and all other owner contracted tests or tests by manufacturer’s personnel over which the Cx may not have direct control. Document and include in commissioning report.

21. Review equipment warranties to ensure that the owner’s responsibilities are clearly defined.

22. Oversee and approve the training of the owner’s operating personnel.

23. Compile and maintain a commissioning record and building systems book(s).

24. Review and approve the preparation of the O&M manuals.

25. Provide a final commissioning report.

**During Warranty Period**

1. Cx must conduct a post acceptance commissioning review at 6 months into occupancy to ensure there are no lingering issues and the systems can be verified in opposite season conditions or correction of deferred items and submit a post commissioning report to owner.

**C. SYSTEMS TO BE COMMISSIONED:** including all components and controls (but not limited to)

1. Building automation systems, including reporting to remote monitoring and other control sites (including any security related control systems or interlocks).

2. All equipment of the heating, ventilating, air conditioning systems.

3. HVAC, Exhaust systems and controls.

4. Kitchen, serveries and any other special construction.

5. Central plant systems (boilers, chillers, pumps, etc.).

6. Life safety systems (fire alarm, egress pressurization, fire protection, etc.).

7. Domestic and process water pumping systems.

8. Emergency power systems, UPS systems, PDU’s, solar arrays and any other alternate systems.

9. Main electrical system, automatic transfer switches and any lighting control systems.

10. Public address system, white noise or any other sound mitigation system.

The following outlines the level of effort expected for each commissioned system:

The functional testing shall include operating the system and components through each of the written sequences of operation and other significant modes and sequences, including startup, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure, security alarm when impacted and interlocks with other systems or equipment. Sensors and actuators shall be calibrated during preffunctional checklist testing by the installing contractors and spot checked by the commissioning authority during functional testing.

Tests on respective HVAC equipment shall be executed during both the heating and cooling season. However, some overwriting of control values to simulate conditions may be allowed, if
used judiciously. The central plant shall have its efficiency bench marked for later use by operations staff. Functional testing shall be done using conventional manual methods, control system trend logs and read outs or standalone dataloggers, to provide a high level of confidence in proper system function, as deemed appropriate by the commissioning authority and the owner. The functional testing process and equipment shall be coordinated with the building’s energy management control system and long-term monitoring objectives. Long term continuous measurement and verification of performance shall be based on the *International Performance Measurement and Verification Protocol - Option B Methods by Technology* for the following:

- Lighting systems and controls, UPS, PDU’s, ATS
- Constant and variable motor loads
- Variable frequency drive (VFD) operation
- Chiller efficiency at variable loads (kW/ton)
- Cooling load
- Air and water economizer and heat recovery cycles
- Air distribution static pressures and ventilation air volumes
- Boiler efficiencies
- Kitchen/serveries-specific systems

**D. Cx DELIVERABLES**

**Preliminary Design Phase**
1. Draft Commissioning Plan
2. The Draft Commissioning Plan shall include the following elements:
   a. A brief overview of the commissioning process
   b. A list of proposed commissioned features and systems
   c. Identification of primary commissioning participants and their responsibilities
   d. A description of the management, communication, and reporting for the commissioning plan, as well as for resolution of issues identified during commissioning.
   e. An outline of the commissioning process scope including submittal review, observation, start-up, testing, training, O&M documentation, and warranty period activities
   f. A list of the expected written work products
   g. An activity schedule

**Final Design Phase**
1. Design Review at 50% of Final Design
2. Design Review at 80% of Final Design
3. Construction Phase Commissioning Plan
   This expanded version of the Draft Commissioning Plan shall include the following based on the 80% Final Design construction documents and specifications:
   a. A detailed overview of the commissioning process
   b. A list of all proposed commissioned features, systems, elements and equipment
   c. Identification of primary commissioning participants and their responsibilities
   d. A description of the management, communication, and reporting for the commissioning plan
USAA Commissioning: Cx Role & Responsibilities

e. A description of the commissioning process scope including submittal review, observation, start-up, testing, training, O&M documentation, and warranty period activities
f. A description of the expected written work products
g. An activity schedule
h. A description of the rigor and scope of testing

This plan shall also include a dedicated section detailing the commissioning requirements that the Cx recommends be included in the general contractor bid documents.

Construction Phase
1. Commissioning Report
2. The report shall include an executive summary, list of participants and roles, building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the Cx regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas:
   1) Equipment meeting the specifications,
   2) Equipment installation,
   3) Functional performance and efficiency,
   4) Equipment documentation and design intent, and
   5) Operator training.

All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

Appendices shall contain acquired sequence documentation, logs, meeting minutes, progress reports, deficiency lists, site visit reports, findings, unresolved issues, communications, etc. Prefunctional checklists and functional tests (along with blanks for the operators) and monitoring data and analysis will be provided in a separate labeled binder.

3. Documentation Required for LEED Fundamental Commissioning Prerequisite (applies only to LEED project).
The Cx shall provide the following:
   a. Provide a copy of the commissioning plan highlighting the five fundamental commissioning procedures as listed in the credit requirements.
   b. Provide a signed letter of certification by the Cx confirming that the commissioning plan has been successfully executed and the design intent of the building has been achieved.

4. Documentation Required for LEED Additional Commissioning Credit 3 (applies only to LEED project).
The Cx shall provide the following:
   a. Provide a copy of the commissioning plan highlighting the five additional commissioning tasks as listed in the credit requirements.
   b. Develop a recommissioning management manual.
   c. Provide a signed letter of certification by the Cx confirming that the additional commissioning credit tasks have been successfully executed and the design intent of the building has been achieved.
5. Documentation Required for LEED Measurement and Verification Credit 5 (applies only to LEED project).
   The Cx shall provide the following:
   a. Develop and provide a copy of the Measurement and Verification Plan.
   b. Develop and provide a summary schedule of the instrumentation and controls for the ten required monitoring categories, highlighting the I/O data points to be collected.
   c. Collect and provide cut sheets of sensors and the data collection system used to provide continuous metering per IPMVP standards.

Warranty Phase
1. Post warranty commissioning report shall include an executive summary, list of participants and roles, building description, overview of seasonal commissioning, deferrals, testing scope and a general description of testing and verification methods applied. Appendices shall contain acquired sequence documentation, logs, meeting minutes, progress reports, deficiency lists, site visit reports, findings, unresolved issues, communications, etc. Functional tests and monitoring data and analysis will also be provided.

END OF SECTION