

COMMISSIONING

Overview: The Facilities & Services Quality Assurance, Commissioning and Inspections Services (C&I) Group is assigned to each major Capital Project. The Quality Assurance, Commissioning and Inspections Group are responsible for ENSURING that the commissioning process is executed in accordance with the Professional Services Agreement, and meets the requirements of the Owner's Project Requirements (OPR).

The University of Illinois at Urbana-Champaign is committed to commissioning the mechanical and electrical systems for the reliable, safe, and secure operation of each facility. This process will verify that systems are complete and functioning properly upon substantial completion and that the U of I staff has appropriate system documentation and training as required per the Bid Documents.

Commissioning occurs at three levels:

1. Basic commissioning of all systems and equipment regardless of project size is required to assure compliance with the project Drawings and Specifications. All projects at the U of I will be commissioned.
2. LEED Fundamental (Pre-requisite) commissioning will be applicable on all LEED Certified projects. Documentation in accordance with the US Green Building Council will be the responsibility of the Commissioning Team.
3. LEED Enhanced commissioning will be required on all projects greater than \$5,000,000 and/or as directed by the PSA. Documentation in accordance with the USGBC will be the responsibility of the Commissioning Team.

Clarification: The U of I encourages an integrated building design. As such, Commissioning may extend beyond the mechanical and electrical systems to include building components. Commissioning of the envelope or other building components will be described in the PSA.

General and Pre-requisite commissioning activity typically begin at the end of the design phases. Enhanced Commissioning activities will begin no later than during the early design phase of the project and proceed through the warranty period.

Overview of Responsibilities of the Commissioning Team: These are found in more detail in other sections of these Standards but are designated as follows:

LEED Requirements shall be determined by the U of I.

The Initial OPR shall be completed by the U of I and updated by the AE.

Basis of Design shall be completed in response to the OPR (and updated) by the AE.

Commissioning Plan shall be initiated by the U of I but updated by the AE during Design and Construction.

Commissioning and verification and documentation shall be completed by the Contractor.

U of I Commissioning and Inspections personnel will observe commissioning.

LEED documentation will be submitted by the AE.

See *Exhibit 01 91 13 -1, Commissioning Roles and Responsibilities Template* for information. This exhibit identifies the roles of the Owner and Commissioning Agent in the commissioning process and provides a template for the Contractor to edit and complete roles and responsibilities of their Commissioning Team members.

LEED As part of the commissioning process, the U of I will define requirements for US Green Building Certification under LEED 2009 for Fundamental Building Systems Commissioning; and for Enhanced Commissioning. A portion of the enhanced commissioning LEED point is obtainable by providing a Re-commissioning Management Manual. The Re-commissioning Management Manual is outlined in the LEED requirements to include nine (9) distinct sections, all intended to document the original system design intent and operation

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and to help the Owner operate the building as efficiently and effectively as possible throughout the life of the facility.

Scope of Commissioning work will include: [Note to AE: Insert language in the Contract Documents to address the following]:

1. Description of Commissioning by AE
2. Responsibilities of Commissioning Team by AE / Contractor
3. Submittals and Deliverables
4. Startup Process and Procedures
5. Functional Performance Tests and Documentation
6. Testing Documentation, Non-Conformance and Approvals
7. Operation and Maintenance Manuals
8. Training of Using Agency Personnel
9. Deferred Testing
10. Written Work Products

Commissioning is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meet defined objective and criteria. The commissioning process begins at the pre-design phase and continues through the life of the project. The commissioning process includes specific tasks to be conducted during each phase in order to verify that the design, construction, and training meets the Owner's Project Requirements.

The members of the Commissioning Team normally consist of an independent (a separate division of the Owner or an Owner – contracted) commissioning Authority (CxA), the owner's representative typically a Project Manager (PM) and/or Construction Manager (CM), the General Trades Contractor (GTC), the Architect and design Engineers, the Mechanical Contractors (MC), the Electrical Contractor (EC), the Testing And Balancing (TAB) Contractor, the Controls Contractor (CC), the Ventilation Contractor (VC), the facility operating staff, and any other installing subcontractors or suppliers of equipment. All team members work together to fulfill their contracted

responsibilities and meet the objectives of the contract documents.

The fundamental objectives of the Commissioning Process are to:

1. Clearly document the Owner's Project Requirements;
2. Provide documentation and tools to improve the quality of deliverables;
3. Verify and document that systems and assemblies perform according to the Owner's Project Requirements;
4. Verify that adequate and accurate system and assembly documentation is provided to the owner;
5. Verify that operation and maintenance personnel and occupants are properly trained,
6. Provide an overall uniform and effective accountable process for delivery of construction projects to the Owner;
7. Deliver buildings and construction projects that meet the owner's needs, at the time of completion;
8. Utilize quality-based sampling techniques to detect systemic problems;
9. Verify proper coordination among systems and assemblies, and among all Contractors, subcontractors, vendors, and manufacturers of furnished equipment and assemblies.

Owners Project Requirements: The OPR will be utilized to establish a baseline of performance expectations to which the actual installed performance is compared. The OPR reflects the underlying assumptions and requirements that become represented in the construction documents. The OPR will be initially edited from the Project Program Statement and provided to the AE by the U of I.

The Commissioning and Inspections Group and Commissioning Authority observe and verify the AE and Contractor commissioning and are not responsible for design concept, design criteria, designer's calculations or compliance with codes. The Commissioning and Inspections Group and Commissioning Authority observes and verifies that

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construction is in compliance with Contract Documents and that testing, startup, balancing and system operation are in accordance with the design.

Comment: The Commissioning Authority uses his or her knowledge to provide input into the areas checked. For example, the Commissioning Authority does not verify appropriate pipe or duct sizing, but may provide comments on unusually tight or restrictive duct layouts and bends or a poor location of a static pressure sensor.

The OPR is intended to be updated by the AE during the design, to reflect design information that is provided by the Owner as the project develops. Updating is to be documented by issuing addend to the OPR.

Owner's Responsibilities [Note to AE: Insert project-specific language in the Contract Documents to address the following]:

Provide the OPR documentation to the CxA and each Contractor for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.

Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:

1. Coordination meetings.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Testing meetings.
4. Witness demonstration of operation of systems, subsystems, and equipment.

Provide utility services required for the commissioning process.

Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

Basis of Design: The Basis of Design (BOD) is a document that records the concepts, calculations, decisions, and

product selections used in the design to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document generally includes both narrative descriptions and lists of individual items that support the design process. The BOD is developed by the Architect/Engineer of Record and is updated throughout the design phases of the project.

Project Commissioning Plan: The Commissioning Plan provides a general description of the commissioning process to be used for the project. The goals, intent, requirements, and timing of the process are included in the plan to provide a guide on how the process is to be executed and documented. Additional detailed requirements and procedures are provided in the project specifications, under *Section 01 91 13 - General Commissioning Requirements*. A listing of the systems included in the commissioning process scope of work for the project is to be included in one of the appendices.

The AE shall provide a list of systems and equipment (in their design) to the Contractor that will be commissioned.

This plan shall be updated regularly and redistributed to the commissioning team for review and comment.

Commissioning activities in the Construction Phase shall proceed from lower to higher levels of complexity. For each discrete subsystem or system, testing at the lower level shall be completed prior to starting the next higher level of tests.

Notification of Field Activities: [Note to AE: Insert project-specific language in the Contract Documents to address the following]: [

Many of the Commissioning Procedures which will be performed by the Contractors need to be witnessed and signed-off by either the CM/GC and/or CxA. Selected Commissioning Procedures may also be witnessed by the Owner. See *Section 01 91 13 - General Commissioning Requirements* for specific requirements regarding these procedures.

To facilitate witnessing of these procedures, the Contractor must provide advance notice to the CM and CxA prior to procedure execution. The amount of advance notice required will be jointly agreed to by the CM, CxA and Contractor. Typical intervals are 72 hours; with 48 hours advance notice for follow-up witnessing post corrections. In no case will notification be less than 24 hours prior to procedure execution. Scheduling for required witnessing is not to be presumed automatically accepted. Examples of specific items which need CM and or CxA witnessing include, but are not limited to, the following:

1. Sub-grade piping installation before it is covered;
2. Delivery of major pieces of equipment;
3. Completion of rough-in before walls are covered;
4. Completion of above-ceiling equipment before ceilings are installed;

Procedures which are not witnessed and signed-off by the CM and/or CxA due to inadequate notification by the Contractor shall be repeated by the Contractor (with witnesses present) at no cost to the Owner and without delay to either the construction or commissioning schedules and are still subject to corrections.

Verification during the Construction Phase: Verification is a process of ensuring that all building systems perform

interactively according to the OPR and operational requirements of the facility. This process begins in the Construction Phase and continues through the occupancy and operations period with numerical verification of performance prior to occupancy.

Verification during the construction of this project is intended to achieve the following specific objectives according to the Contract Documents:

1. Prove that applicable equipment and systems are installed properly and receive adequate operational checkout by installing contractors.
2. Measure and document proper performance of equipment and systems.
3. Prove that O&M documentation is complete.
4. Prove that systems and assemblies perform according to the OPR.
5. Check that adequate and accurate system and assembly documentation is provided to the owner.
6. Document that operation and maintenance personnel and occupants are properly trained.
7. Prove that quality-based sampling techniques were used to detect systemic problems.
8. Demonstrate that there is proper coordination among systems and assemblies.