

Standard of Practice - A15.2 Building Commissioning

GENERAL

Designers shall verify that all applicable portions of these standards are incorporated into the project's design, drawings, specifications and final construction. Requests for variances from these standards shall be submitted in writing to the DCM Project Manager, using the KU Standards Variance Request Form found in [Appendix A1.1](#), for review and written approval or rejection as indicated on the form.

OBJECTIVE OF STANDARD

The University of Kansas, Lawrence Campus, is pursuing a building commissioning program to support both remodeling and new construction on campus. The program has been developed with the specific intent of testing, verifying, and documenting building utility system performance to ensure that the finished facility operates as intended. As envisioned by the University, commissioning is essentially a quality control and quality assurance process for insuring that building utility systems are designed, installed, tuned, and maintained to provide the appropriate environment for the use of the building space.

DEFINITIONS

Acceptable Performance: A component or system being able to meet specified design parameters under actual load.

Commissioning Authority: The qualified person, company, or agency that will plan and carry out the overall commissioning process. There are many options as to which party to the commissioning process will be the "authority". The design professional, contract, or owner may be the commissioning authority.

Commissioning Plan: The overall document, usually prepared by the commissioning authority, which outlines the organization, scheduling, allocation of resources, documentation, etc., pertaining to the overall commissioning process.

Design Professional: The architect, architect-engineer, or engineer responsible for the design and preparation of contract documents for the mechanical and electrical systems.

Functional Performance Testing: That full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems function in accordance with the contract documents. In this context, "function" includes all modes and sequences of control operation, all interlocks and conditional control responses to abnormal emergency conditions.

REFERENCES

- ASHRAE Guideline 1-1989 – Guideline for Commissioning of HVAC Systems (or current edition)
- NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems, Current Edition
- AABC National Standards for Field Measurements and Instrumentation, Total System Balance, Current Edition

SCOPE OF SERVICES FORMAT

This document includes two principle sections. *Section One – Commissioning Purpose and Scope - General* is a discussion of the University's overall commissioning program and its objectives. *Section Two – Commissioning Purpose and Scope – Project Specific* summarizes commissioning requirements for a specific project.

Considered alone, Section One forms the University standard of practice for providing building utilities systems commissioning services. Section One should be reviewed by persons involved in the preparation of fee proposals to gauge the general level of effort expected of commissioning agents proposing to be involved in campus projects. In addition, all project deliverables that the commissioning agent will be expected to generate during completion of the commissioning processes are listed in Section One of this document.

Each request for proposal will also be accompanied by *Section Two – Commissioning Purpose and Scope – Project Specific*. It identifies commissioning requirements of a specific project. The level of detail to which the various building systems are described in Section Two will depend upon the phase of the project at which the commissioning agent is asked to become involved. Regardless of the stage of the project when the commissioning agent first becomes involved, the agent's primary objectives shall be to:

- Prepare an overall plan for the commissioning process.
- Establish appropriate criteria for determining acceptable performance for building utility systems.
- Complete all functional testing verifying acceptable systems performance.
- Train the building users in the operation and maintenance of the building utility systems.

TYPICAL PROJECT TEAM

University capital improvements projects typically include the following project team members:

- DCM Project Manager
- DCM Construction Manager
- DCM Engineering Support Manager
- DOAS Project Manager

- Architect/Engineer's Project Manager
- General Contractor's Project Manager
- Project Manager, University Contract Provider of Building Automated Control Systems
- Project Manager, University Contract Provider of Campus-wide Fire Alarm Systems
- Associate Director, University Facilities Operations, or his representative

SECTION ONE - GENERAL COMMISSIONING PURPOSE AND SCOPE

General

In general, it is the University's intent to involve the project's commissioning agent as early in the design process as is feasible. Because of the diversity of project sizes, complexities, and budgets, no single Scope of Services is applicable to all projects. The commissioning process for major capital improvement projects is expected to extend through all phases of a project, from concept through occupancy. On smaller projects the commissioning agent may be requested to assist only during the construction and occupancy phases. Project phases that may involve the services of a commissioning agent include pre-design phase, design phase, and construction phase. The intent is to have the same firm involved with all phases. Individuals who have been requested to prepare a proposal for providing commissioning services to the University should refer to *Section Two – Commissioning Purpose and Scope – Project Specific* for detailed requirements for each project phase.

Approved Commissioning Agents:

- Doyle Field Services
- Toombs and Associates

PRE-DESIGN PHASE

Commissioning agents who are retained for the pre-design phase will have the following responsibilities:

- Define the roles of the design and construction team during all phases of commissioning.
- Review the University program for the project.
- Review the designer's conceptual design, design assumptions, design criteria, and the performance standards of proposed building utility systems.
- The commissioning agent will be expected to attend schematic design review and design development review meetings.
- During pre-design phase, the commissioning agent shall identify any commissioning activities that must be scheduled based on seasonal operation or loading of a building system. These special requirements shall be included in the subsequent report.

The commissioning agent will be required to submit a design development report that includes, at a minimum:

- A listing of all utility systems that will be included in the project, and thus will require commissioning.
- A critical path evaluation, omitting schedule dates, of the commissioning steps required for each identified system, designating the responsible design and construction team party for each step.
- A summary identifying any required system for which funding was not specifically identified in the University program.
- A summary of any inappropriate or missing assumptions or criteria in the designer's preliminary calculations.

DESIGN PHASE

Commissioning Agents who are retained for design phase commissioning activities will be required to review each preliminary construction document submittal and prepare a commissioning plan that addresses commissioning requirements for all systems that are a part of the project design.

Prior to the scheduled final submittal date for construction documents, the commissioning agent will be required to submit a project-specific commissioning plan that will include the following information, at a minimum:

- A listing of the detailed procedures for the tests to be performed by each party in the commissioning process.
- A functional performance test procedure for each building system being commissioned.
- Calibration data for test equipment that will be used during the system testing.
- Sample report forms that will be used to submit test data and results.
- Functional test plan submittals must be complete and project-specific. Plans that fail to address any of the following will be returned for revision:
 - The plan must identify all building systems that require commissioning.
 - The plan must be organized so as to describe procedures for documenting acceptable system performance in a sequence starting with components and progressing to complete systems, as follows:
 - Individual Components
 - Sub-systems
 - Systems
 - Interfaces between systems
- The plan's functional test procedures must address methods of testing the systems under all modes of operation and sequences of control, including emergency and alarm

conditions.

- Testing shall include an infrared survey on all main electrical switchgear (both new with the project and existing), distribution panels, and all mechanical equipment.

CONSTRUCTION PHASE

Following issuance of the Notice To Proceed, the commissioning agent shall work with the project's General Contractor to develop a project-specific commissioning schedule. The schedule shall be based upon the General Contractor's schedule for construction completion and shall include the following pre-test activities, at a minimum:

- Completion of any required code authority inspections.
- Flushing, cleaning, disinfecting, and hydrostatic testing of piping systems.
- Energizing, start-up and activation of equipment and systems.
- Testing, adjusting and balancing of air and water systems.
- Calibration and testing of automatic controls.

It should be understood that during the project construction and systems commissioning activities, no step on the critical path of building commissioning will be commenced until the commissioning agent has documented that acceptable performance has been demonstrated for the previous step. Commissioning agents who are retained for construction phase commissioning activities will be responsible for:

- Attending routine progress meetings.
- Observing building systems' start-ups.
- Completing and documenting all testing, adjusting and balancing of building systems.
- Completing and documenting all functional performance testing.
- Preparing and issuing final acceptance documentation upon successful completion of functional performance testing for all building utility systems in the project.

OCCUPANCY PHASE AND OPERATOR TRAINING

The commissioning agent shall use the designer-furnished system conceptual design, design assumption, and design criteria information, as well as manufacturer-furnished shop drawing and equipment manual information, to prepare a comprehensive building operations manual.

The commissioning agent shall provide training for University personnel on appropriate operation and maintenance of the building utility systems. This training shall include:

- Instructions on the use of the building operations manual.
- Demonstration of the system operational procedures for all modes of operation.

- Acceptable tolerances for system adjustments
- Procedures for dealing with abnormal and emergency situations.

SECTION TWO – PROJECT-SPECIFIC COMMISSIONING PURPOSE AND SCOPE

General

This section of the commissioning scope of service document is to be edited by the University to identify the specific commissioning requirements of each specific project, which may be in addition to or in lieu of those indicated below.

Electrical Commissioning

Commissioning of electrical systems shall follow the HVAC commissioning plan when the systems are interconnected and related.

All electrical systems shall be specified in detail to follow a commissioning plan which shall be similar in format to the HVAC Commissioning Plan when they are not interconnected with the HVAC systems and thus not covered by that Plan.

This Electrical Systems Commissioning Plan shall require the following as a minimum:

- Testing required by the NEC
- Review resistance tests of the grounding systems
- Trip testing of all ground fault systems/equipment
- Point-by-Point demonstration and test of all special electrical systems
- Point-by-Point readout and calibration testing of all electrical monitoring systems
- Demonstration test of all aspects of all fire alarm systems in accordance with NFPA.
- Test light levels and all special features of emergency lighting system
- Complete performance testing in all aspects all emergency power systems
- Review hi-pot testing of medium-voltage conductors

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