DESIGN GUIDELINE 4.3
BUILDING COMMISSIONING

Scope

Most projects, especially those with extensive mechanical, electrical and plumbing (MEP) systems, will undergo a U-M building commissioning (Cx) process. The U-M Cx process is similar to Cx processes promoted by national trade organizations including ASHRAE, BCxA, NIBS and USGBC, but it includes more comprehensive design management and more extensive construction quality assurance. Detailed U-M Cx procedures ensure consistency among projects. Become familiar with, fully participate in and fully support this process.

Related Documents

U-M Design Guidelines:
DG 2.1 - Owner's Project Requirements (OPR) and Basis of Design (BOD)
DG 2.3 - Owner's Review
DG 3.1 - Sustainable Design and LEED® Requirements
DG 3.2 - Energy and Water Conservation
DG 4.2 - Building Envelope
DG 4.3.1 - Design-Phase Commissioning Procedure
DG 4.3.2 - MEP Design Management Procedure
DG 4.3.3 - Full Construction-Phase Commissioning Procedure
DG 4.3.4 - Reduced Scope Construction-Phase Commissioning Procedure
DG 4.3.5 – Commissioning Plan Procedure (future)
DG 4.3.6 – Commissioning Meetings Procedure (future)
DG 4.3.7 – Commissioning Reports Procedure (future)
DG 4.3.8 – O&M Manual Procedure (future)
DG 4.3.9 – Owner Training Procedure (future)

U-M Master Specification Sections:
MS 017823 – Operation and Maintenance Manuals
MS 019100 – Full Construction-Phase Commissioning
MS 019110 – Reduced Scope Construction-Phase Commissioning

Reference Documents:
ASHRAE Guideline 0, "The Commissioning Process"
ASHRAE Guideline 0.2, "Commissioning Process for Existing Systems and Assemblies"
ASHRAE Guideline 1.1, "HVAC&R Technical Requirements for the Commissioning Process"
ASHRAE Guideline 1.5, "Commissioning Process for Smoke Control Systems"
ASHRAE Standard 202, "Commissioning Process for Buildings and Systems"
Building Commissioning Association, "The Building Commissioning Handbook"
NIBS Guideline 3, "Building Enclosure Commissioning Process"
USGBC, "LEED® Reference Guide for Green Building Design and Construction"

General

Commissioning is a systematic quality assurance process to assure a project is designed to meet the needs of its Owners, and is built, operated and maintained as intended by its Design Team and its Owners.

- Cx helps a project achieve its schedule, budget and quality goals by utilizing the University's vast design, construction, operation and maintenance experience to proactively identify and help resolve issues as early and inexpensively as possible.
- Cx generally begins during Programming and ends after Occupancy.
- Cx focuses primarily on the project's utilities, mechanical systems, electrical systems, plumbing systems and "powered" architectural systems. Cx of the building envelope is also important to minimize air leakage, moisture migration and heat transfer, but Cx activities related to the building envelope require different skills. Thus building envelope design and construction Cx are addressed in Design Guideline 4.2.
- Cx verifies conformance with the project's design intent as documented in the Owner's Project Requirements (OPR) and Basis of Design (BOD) documents.
- Cx verifies compliance with U-M requirements for effluent, noise, vibration, cleanliness, efficiency, maintainability, operation and maintenance manuals, and Owner training.
- Cx verifies that completed systems and equipment perform as intended in all modes of operation and under all operating conditions. However, Cx does not duplicate or substitute for code inspection. Cx does not provide routine quality control such as routine inspections for material substitutions, point-to-point wiring checks or poor quality workmanship.

The U-M Building Commissioning Process

Large projects with complex and challenging MEP systems will undergo design-phase and construction-phase Cx. Most smaller projects with MEP scope will undergo construction-phase Cx only. Tunnel projects will undergo construction-phase Cx only, and only if they include powered mechanical equipment. Cx activities will be coordinated by the AEC Commissioning and Plan Review Group who will assign a Commissioning Authority (CxA) to each project.

Design-Phase Commissioning

Most projects with complex and challenging MEP systems will undergo design-phase Cx. The CxA will assist the U-M Design Manager by participating in the MEP design meetings, technical study reviews, Owner's reviews and value engineering (VE) efforts. See Design Guideline 4.3.1. Throughout design, the CxA will promote a clear and precise OPR and BOD to facilitate proper construction-phase Cx. The CxA will make recommendations regarding commissionable architectural and MEP systems, and require compliance with industry and U-M standards. The CxA will require inclusion of clear sequences of operation, setpoints, acceptance criteria and other details required for construction-phase Cx. Incorporate the CxA's input into the project's design.

New buildings, building additions, major building renovations and projects seeking LEED certification will undergo an expanded level of design-phase Cx called MEP design management. One or more CxAs will assist the U-M Design Manager by actively managing (not just participating in) all technical aspects of the MEP design. See Design Guideline 4.3.2. Final decisions related to the project's scope, schedule and budget will remain the responsibility of the Design Manager, but collaborate with the CxAs for technical direction on MEP issues.

- During the Construction Documents (CD) design phase, edit the U-M Operation and Maintenance (O&M) Manual Master Specification Section 017823 and the appropriate Commissioning Master Specification Section 019100 or 019110 to make these sections project specific. Insert these sections into the project's Division 01 specifications to define the Contractors' O&M manual and Cx requirements during construction. Reference these sections in the appropriate architectural, mechanical and electrical specification sections. To avoid conflicts with these sections, do not include any specific O&M manual or Cx requirements in the individual architectural, mechanical, electrical or plumbing specification sections.

Design-phase Cx generally will begin during the Programming phase and will continue until the project is bid and awarded.

Construction-Phase Commissioning

All projects with significant MEP scope will undergo construction-phase Cx. Construction-phase Cx will be performed by a commissioning team typically consisting of the U-M Project Manager and representatives from the A/E, the Construction Manager or General Contractor, the trade contractors, the Owners and Plant Operations. The team will be directed by and Cx meetings will be led by the CxA. Assign an A/E Representative to this Cx team.

Projects with complex and challenging MEP systems, especially those over $5 million in construction cost, will undergo full construction-phase Cx. See Design Guideline 4.3.3 for a list of Cx activities. Projects that involve a small number of MEP system or equipment will undergo reduced scope construction-phase Cx. See Design Guideline 4.3.4 for a list of reduced scope activities. Participate in and assist the CxA with these activities.

Construction-phase Cx generally will begin when the project is issued for bids. It will continue through initial occupancy and may continue through the first year of occupancy.

Quality Assurance

Throughout a project's design and construction, the CxA will gather "lessons learned". As a means of continually improving the U-M design, construction and Cx processes, these lessons learned will be incorporated in the U-M Design Guidelines, Master Specifications and Cx Documents.