FACILITIES & OPERATIONS
ARCHITECTURE, ENGINEERING AND CONSTRUCTION
UNIVERSITY OF MICHIGAN

DESIGN GUIDELINE 4.3.1
DESIGN PHASE COMMISSIONING

This procedure defines the process for performing design-phase commissioning (Cx) on new building, building addition and building renovation projects. When performed by an external commissioning firm, it shall be performed in accordance with the U-M "Terms and Conditions for Professional Services".

Design-phase Cx is a process by which a building Commissioning Authority (CxA) assists the U-M Design Manager by participating in the technical aspects of the mechanical, electrical and plumbing (MEP) design. Final decisions related to the project's scope, schedule, budget and design will remain the responsibility of the Design Manager, but the CxA shall provide the Design Manager with recommendations on the MEP design to assure the MEP is designed as intended by its Design Team and its Owners. The scope of work shall consist of all activities identified below. Design-phase Cx shall begin during Programming and continue until the end of CD design.

All work shall be performed in accordance with Federal, State, University of Michigan, UMHHC and Construction Manager (CM) or General Contractor (GC) safety requirements for working on University property. These requirements include but are not limited to following security and access control procedures, wearing mandated personal protective equipment, and attending a site-specific safety training orientation prior to entering construction zones.

1. Become knowledgeable about the project.
   - Attend at least one presentation by the Architect/Engineer (A/E) to become familiar with the project's scope, schedule, budget and design intent.
   - Review available program documents to learn about the project scope, including:
     - Number of floors, square footage of each floor, extent of new building or addition work, extent of renovation work, division of space by function (clinical, laboratory, classroom, office, support space), division of space among departments, etc.
     - Connections to and interactions with surrounding buildings, including any related renovations in surrounding buildings.
     - Site requirements including proposed grade, roadway and utility changes.
     - Schedule for the schematic design (SD), design development (DD) and construction documents (CD) design phases, and for project bidding and award.

2. Become knowledgeable about and promote adherence to the U-M design standards (Design Guidelines, Master Specifications, Standard Details, Preferred Manufacturers Lists and Design Deliverables list). Recommend that deviations from these standards be approved by the Design Manager and documented in memos, emails or meeting minutes.

3. As early in design as possible, promote the incorporation of global sustainability issues. See Design Guidelines SID-3.2 and SID-3.1.
   - Explain SID-3.2 and SID-3.1 in detail to the A/E and promote the early identification of energy conservation measures.
   - Promote optimization of the building's aspect ratios, siting, glass orientation, glass area, glass type, exterior shading, daylighting features, roof sections, envelope insulation, air and water barriers, etc.

4. Participate in the A/E's development and maintenance of the Owner's Project Requirements (OPR) document.
   - Review User group meeting minutes and room data sheets produced by the A/E, Hospital Planner, Laboratory Planner, etc. for key project requirements that should be included in the OPR.
   - Help the A/E document the Users' expectations, goals, benchmarks and acceptance criteria for judging the project. Include issues such as indoor temperature and humidity limits, air change rates, air flow rates, sound and vibration limits, medical and laboratory gas needs, laboratory equipment needs, light levels and controls, telecommunications needs, audio/visual needs, access control and security needs, medical systems and equipment needs, training needs, etc.
     - Ask detailed questions to obtain specific acceptance criteria for systems and equipment.
     - Emphasize to the User groups the importance of establishing acceptance criteria early. Describe the high costs of expanding or changing acceptance criteria later.
   - Periodically review the OPR and identify missing, incomplete and incorrectly documented project requirements.

5. Participate in the MEP design meetings.
   - Help the Design Manager determine the appropriate U-M personnel to invite.
   - Review the A/E's latest design including their concepts, drawings and specifications.
   - Discuss the acceptability of the current concept for each system and the design proposed to achieve that concept.
   - Discuss code, OPR and U-M design standard compliance.
   - Explain that the construction-phase CxA will provide a project-specific specification Section 01715 for incorporation in the project's Division 1 specifications.
   - Recommend that all specification sections for systems and equipment which require commissioning reference Section 01715.
   - Identify incomplete design issues and non-compliance with the Design Deliverables list.
   - Recommend the A/E publish detailed meeting minutes.
   - Recommend the meeting minutes include an action items list at the end.

6. Recommend the A/E request proposals on technical studies, including studies on sound, vibration, smoke purge, dispersion, electrical capacity, and energy and water conservation. Emphasize the study reports will dictate many design issues, so they should be completed ASAP to minimize redesign.

7. Recommend Plant Operations, Department of Public Safety (DPS), Occupational Safety and Environmental Health (OSEH), UH FP&D, and other U-M non-User personnel be contacted for their input on MEP issues.

8. Participate in the A/E's development and maintenance of the Basis of Design (BOD) document.
   - Periodically review meeting minutes, the latest design drawings and specifications, and the room data sheets. Verify the BOD reflects the Owner's project requirements as stated in the OPR.
   - Periodically review the BOD for clarity, completeness, and documentation of deviations from the U-M design standards. Identify missing, incomplete and incorrectly documented bases of design.
   - Recommend the BOD contain adequate sequences of operation and acceptance criteria to commission the MEP systems and equipment.

9. Become fully knowledgeable of and promote adherence to the U-M design standards. Evaluate deviations for acceptability. Recommend that deviations be documented in memos or meeting minutes, and in the BOD.

10. Provide the A/E with typical U-M controls drawings and promote adherence to these drawings.

11. Promote adherence to the U-M energy and water conservation measures and sustainability initiatives. See Design Guidelines SID-3.2 and SID-3.1.
    - Review the A/E's Energy and Water Conservation Reports and Energy Impact Statements for errors and omissions.
    - Recommend that major energy conservation measures such as envelope insulation and fenestration be optimized.

12. Provide "lessons learned" from previous U-M projects.

13. Promote the use of construction mock-ups and other quality assurance techniques, and participate in the evaluation of MEP-related mock-ups.

14. Recommend that equipment maintenance access spaces, such as coil and tube pull spaces and electrical working spaces be accounted for in the MEP design and blocked out on plan drawings.

15. Recommend means are provided for performing MEP maintenance.
    - Verify lifting rails are provided above boilers and chillers for hoisting end caps.
    - Verify means exist for replacing large pumps, large motors and other heavy equipment.
    - Verify building egress paths exist for large equipment such as boilers, chillers and substations.

16. Review and submit written comments to the A/E on the project's SD design documents during the Owner's review of the SD documents. See Design Guideline SID-2.3.

- Verify the documents accurately reflect the OPR and BOD.
- Identify errors or omissions related to design, code, the U-M design standards, agreements made during MEP design meetings, and good engineering practice.

17. Assist the Design Manager by assigning action codes to the MEP-related SD, DD and CD phase Owner's review comments.
    - Resolve conflicting review comments related to the MEP design.
    - Inform the Design Manager of special requests from Users and other U-M reviewers that are not cost effective or that will result in scope creep.
    - Indicate which comments should be incorporated and which ones should not be incorporated.

18. Participate in the SD, DD and CD phase cost estimate reconciliation efforts.
    - Spot-check for estimate errors and omissions.
    - Check for line items duplicated in multiple sections and line items assigned to the wrong funding sources.

19. Participate in the SD, DD and CD phase value engineering (VE) efforts.
    - Recommend VE measures if they have little or no effect on compliance with the OPR.
    - Discourage proposed VE measures that significantly reduce OPR compliance, energy or water conservation, reliability or maintainability.
    - Verify that approved VE measures appear in the next phase of design documents.

20. Review and submit written comments to the A/E on the project's DD design documents during the Owner's review of the DD documents.
    - Verify the documents accurately reflect the OPR and BOD.
    - Review comments submitted during the SD phase Owner's review and verify they were addressed.
    - Identify errors or omissions related to design, code, the U-M design standards, agreements made during MEP design meetings and VE meetings, and good engineering practice.
    - Verify the documents include complete testing and acceptance criteria for the systems and equipment being commissioned. Resolve issues that will otherwise inhibit commissioning of the project.

21. During the CD design phase, the construction-phase CxA must edit a U-M Master Specification Section 01710 or 01715 on Commissioning. Recommend this Cx spec section be incorporated by the A/E into the project's Division 1 specifications.

22. Assist with the Owner's review of technical studies, including studies on sound, vibration, smoke purge, dispersion, electrical capacity, and energy and water conservation. Review reports and identify obvious erroneous assumptions or conclusions and return the comments to the A/E.

23. Review and submit written comments to the A/E on the project's CD design documents during the Owner's review of the CD documents.

- Verify the documents accurately reflect the OPR and BOD.
- Review comments submitted during the DD phase Owner's review and verify they were addressed.
- Identify errors or omissions related to design, code, the U-M design standards, agreements made during MEP design meetings and VE meetings, and good engineering practice.
- Verify the documents reflect recommendations contained in the technical studies. This includes recommendations on architectural issues such as envelope and fenestration improvements which affect MEP issues such as energy efficiency.
- Verify the documents include complete testing and acceptance criteria for the systems and equipment being commissioned. Identify issues that will inhibit commissioning of the project.