DESIGN GUIDELINE 4.3.6
GENERAL COMMISSIONING PROCEDURES

Scope

This procedure covers the minimum commissioning requirements for:

- Conducting commissioning (Cx) meetings
- Providing Cx reports
- Obtaining operation and maintenance (O&M) manuals for the Owner
- Managing and conducting Owner training

Related Documents

U-M Design Guidelines:
DG 4.3 - Building Commissioning
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

U-M Master Specification Sections:
MS 017823 – Operation and Maintenance Manuals
MS 019100 – Project Commissioning

Commissioning Meetings

Soon after becoming assigned or hired as the project's Commissioning Authority (CxA), contact the U-M Project Manager and schedule a Cx kick-off meeting.

- On large projects, the Cx meetings shall be separate from but perhaps directly after the Project Manager's construction meetings.
- On reduced scope construction-phase Cx projects, the Cx meetings should be held as part of the regular project construction meetings.

Commissioning meetings should have the entire Cx Team in attendance: U-M Project Manager, Construction Manager (CM) or General Contractor (GC), and the applicable contractors. Invite U-M trades (such as U-M Plant DDC Shop) that are performing work on the project when their responsibilities will be discussed at the meeting.

Take attendance at the Cx meetings.

At the Cx kick-off meeting, give an overview of the Cx process including reviewing the Cx specification and all the requirements outlined in the Cx Plan. Establish the reoccurrence of the Cx meetings.

At subsequent meetings, discuss the current status of each system being commissioned. Utilize the project's Cx Status Check Sheet as a guide.

- Discuss design, construction, and equipment issues affecting Cx.
- Discuss the Cx schedule. Identify issues that may prevent completion of Cx before Substantial Completion.
- Establish clear action items, dates, and responsible parties.
- Periodically review the progress of assembling the project O&M.
- Finalize Cx event dates, e.g. equipment start-ups, functional testing, owner training sessions, etc.
- Generally limit discussion to resolving issues that will allow each system to progress to functional testing and ultimately to final CxA sign-off.
- For design and construction issues that impact Cx and require lengthy discussion, schedule separate meetings inviting only those parties that need to be directly involved in the resolution.

Within a few days after the meeting, issue meeting minutes to the Cx team.

- List the Cx team and identify who attended the meeting.
- Organize the minutes to match the meeting agenda.
- Summarize the meeting discussions
- Include an action items list with responsible party and completion date.

Alert the U-M Project Manager of critical issues that are preventing the execution of the Cx process in a timely manner or that could prevent successful final commissioning and sign-off; do not rely entirely on meeting minutes for this purpose.

Commissioning Reports

Prepare an electronic Cx report and update it periodically. See the last pages of the Design Guideline for a suggested Cx report format (for interim and final reports). Other formats are acceptable if they present the information in a similar manner and contain the same information.

Each Cx report shall include the following:

- Report Data
    - Sequential report number and date of report
    - Building Name
    - Project Name
    - U-M Project Number
    - Report author and distribution list
- Executive Summary - Each report shall begin with an executive summary that indicates, since the last report issued:
    - The functional tests that have occurred
    - Major issues discovered
    - Any new or on-going impediments to commissioning

    - the overall Cx progress
- Issues Discovered - This shall be followed by a updated list of all issues discovered during the Cx process

Quality control issues (code violations, material substitutions, poor workmanship, damage, etc.) that do not affect system function, functional testing, or that are not a significant concern or impediment to the Cx process should be included in the project's QC log. If no such QC log is available and the issue is significant, include it in the Cx report.

If a significant issue is found that exceeds the project scope, document it and discuss with the U-M Project Manager (resolution may or may not occur as part of the project).

Each issue should be assigned a unique number to allow ease of tracking. In the sample report format presented at the end of this Design Guideline, each issue is assigned a number consisting of the system tab number followed by a sequential number.

Periodically transmit an electronic copy of the Cx report to the Cx team including the U-M Project Manager and any others identified with an action item. **Issue a report at least monthly.**

Final Cx Report

Immediately before Substantial Completion issue a draft final commissioning report. Label the report "Final" and "Preliminary and Advisory". If Cx activities will occur after Substantial Completion, label the report "Provisional Final Report" (and "Preliminary and Advisory") and note the Cx activities that make the report provisional. In either case, provide an executive summary (same as for routine reports), and group remaining open issues in the report as follows:

- Cx Activities Still Outstanding. Identify incomplete Cx and its reasons (e.g. system not complete, addition to scope, etc.).
- Open issues directly related to the scope of the project (e.g. unresolved Contractor deficiencies, vendor equipment deficiencies, OPR/BOD requirements not met due to design deficiencies or other reasons (explain reasons), etc.).
- Issues beyond the scope of the project. Provide recommendations on how to resolve the issues when possible.
- Recommendations and Lessons Learned. Summarize any Cx recommendations and lessons learned.
- This shall be followed by a updated list of all the issues discovered during the Cx process.

Transmit an electronic copy of the final report to the Cx team, including the U-M Project Manager, for review and comment. Require comments within one week.

After the final report has been reviewed, revise the report to reflect any comments received as appropriate. Remove the "Preliminary and Advisory". Insert a copy of the report into the Cx

Plan. Electronically transmit the Cx Plan along with the final report (separated from the Cx Plan) to the following:

- U-M Project Manager
- Project's Commissioning Team
- U-M Plant Engineering (UPE): Ron Crawford <rfc@umich.edu>
- Project's Facility Manager
- Electronically transmit the Cx Plan to the AEC Facilities Information Center for archiving, retain a copy for the CxA's record.

If the report is a Provisional Final Report, issue a Final Report when Cx is finished, following the same procedure above.

Operation and Maintenance Manuals

During construction, assure that the contractors and the CM or GC assemble the O&M manuals as construction progresses.

- At the first (or a very early) commissioning meeting, thoroughly explain the O&M manual requirements to the contractors. Review the requirements of Specification 017823 and establish how the O&M sections provided by various contractors will be collated into one uniform manual. Instruct the CM or GC to take ownership of this coordination.
- Notify contractors that a draft copy of their O&M manual will be required in the near future, and agree upon a reasonable date for submittal of it. This draft copy should consist of the labeled binders with a complete table of contents and the appropriate binder tabs.
- Review the draft O&M manual when received. Verify the binders and table of contents are in compliance with Specification 017823, and the table of contents covers all the equipment for which O&M information must be submitted. Pay special attention to easily missed systems provided by minor subcontractors, such as automatic over-head doors. Identify required changes in arrangement and missed equipment which must be added. Note where additional table of contents entries may need to be added later as construction progresses. Remind contractors that O&M materials shall include installation manuals, and these materials should be collected throughout construction, starting with the submittal process. Remind contractors that manufacturers' sales literature and similar promotional materials are not to be included.
- Throughout construction, remind contractors and the CM or GC to gather operation and maintenance documentation and enter this data into the binders. Periodically instruct contractors to bring the binders to the next commissioning meeting for interim review.
- Remind contractors that four Owner-reviewed and approved O&M manuals must be submitted at least two weeks prior to Owner training. Remind them that completed O&M manuals are a prerequisite for Substantial Completion and final payment.

Review and approve the O&M manuals, and transmit the final O&M manuals to U-M AEC Facilities Information Services (FIC).

- Instruct contractors to submit one copy of the O&M manual for approval as soon as completed. Review the manual for completeness and conformance to Specification 017823. Verify the contents are marked so they are project specific.
- Depending upon the number of comments, mark the manual "Approved", "Approved as Noted" or "Rejected - Revise and Resubmit". Repeat this review process as necessary until the manual can be used to make the additional manual copies.
- When the four approved copies of the O&M manuals are received from the CM or GC, prepare a transmittal memo and transmit all four copies to FIC. FIC will distribute the O&M manuals according to their procedures.
- If the O&M manuals are not complete at the time of transmittal, state in the transmittal that the manuals are not complete. When the CM or GC provides four copies of all of the missing pages required to complete the manuals, prepare a transmittal memo and transmit the four copies of the pages as above. State in the transmittal memo that each O&M manual holder shall insert the pages into his or her copy. Collect and transmit all of the missing pages only once. Multiple partial transmittals of additional pages are not acceptable.
- Test and Balance (TAB) reports shall be kept separate from but should be handled the same as O&M manuals. When the four approved copies of the TAB report are received from the CM or GC, prepare a transmittal memo and transmit all four copies to FIC.

Owner Training

Manage and conduct Owner training sessions.

Develop, with the assistance of the contractors, a training plan consisting of overview training (to be conducted by the CxA and the contractors) and any equipment or system specific training which has been specified in the contract document technical sections (e.g. boiler training). Refer to U-M Master specification MS 019100 for training plan and training requirements.

Execute training in compliance with the requirements outlined in MS 019100.

- Develop a logical plan generally organized on a system-by-system basis.
- Assure all equipment of system training required by the technical specifications has been identified, and include it in the plan in a manner that makes the training most effective.
- Assure the training includes OPR and BOD requirements pertinent to the Cx process. For example, identify spaces with special temperature and humidity requirements, what those requirements are, and fundamentally how those requirements are achieved.
- Identify critical sensors, transmitters, and other components whose continued calibration or proper operation are essential for maintaining required performance levels, safety and energy efficiency.

Identify the appropriate parties to be invited to each training session. These shall include:

- U-M Plant. Appropriate plant personnel will be identified and informed of the training by the U-M Plant Training Coordinator once the Coordinator is notified of the training.
- The building facilities manager.
- Users of user equipment supplied by the project. Contact the building facilities manager and the user representatives that assisted in the functional testing of the user equipment (refer to U-M DG 4.3.3) to determine the persons to invite.
- Parties as identified by the U-M Project Manager (contact the U-M Project Manager)
- Other parties that have expressed a desire to attend training and are appropriate to attend.

Invite the appropriate parties.

- U-M Plant: U-M Plant Training Coordinators (send email notification to Tom Sullivan <tomsul@umich.edu> and Christine Nedrow <cnedrow@umich.edu>)
- Other parties per the above.
- Include date, time, duration, and brief agenda. List the systems, equipment, and building areas served, and if personal protective equipment is required.
- Do not schedule training sessions that extend past 3:00PM. Avoid scheduling training sessions on Mondays and Fridays.
- Arrange for classroom space when classroom training is specified (work with the U-M Project Manager to identify a location)

Execute the training sessions.

- Execute the training plan including over-view training and specification required technical training sessions. Describe the design intent of each system and the OPR and BOD requirements applicable to each session.
- Review the contents of the O&M Manual as they relate to the training session.
- Take attendance at all training sessions. Attendees shall print and sign their name on the attendance sheet.
- E-mail a copy of the attendance list to the U-M Plant Training Coordinators after training is complete.
- Insert copies of the attendance lists into the Commissioning Plan.

SAMPLE INTERIM CX REPORT

COMMISSIONING REPORT: < INSERT PROJECT NAME>

DATE:
REPORT NUMBER:
BUILDING NAME:
U-M PROJECT NUMBER:
TYPE OF REPORT: ☐ **INTERIM** ☐ **PROVISIONAL FINAL** ☐ **FINAL**

FROM: , Cx Authority **PHONE:** **CELL:**

CX TEAM DISTRIBUTION:

Name	Company	Name	Company	Name	Company

This report documents the status of systems being commissioned and tracks the resolution of issues discovered by the Cx team during the Cx process.

EXECUTIVE SUMMARY

Functional Tests Performed Since Last Report:

Major Issues Discovered:

New/Ongoing Impediments to Commissioning:

Overall Cx Progress:

The following pages provide a detailed list of issues discovered as a result of the Cx process.

ISSUES DISCOVERED

System Tab numbers listed below correspond to the tab numbers in the Cx Plan.

System Tab: **System:**

Activities & Dates:				
Comments & Dates:				
Tab.Issue #	**Issue Description**	**Date Opened**	**Date Closed**	**Action By**

System Tab: **System:**

Activities & Dates:				
Comments & Dates:				
Tab.Issue #	**Issue Description**	**Date Opened**	**Date Closed**	**Action By**

SAMPLE FINAL CX REPORT

COMMISSIONING REPORT: < INSERT PROJECT NAME>

DATE:
REPORT NUMBER:
BUILDING NAME:
U-M PROJECT NUMBER:
TYPE OF REPORT: ☐ **INTERIM** ☐ **PROVISIONAL FINAL** ☐ **FINAL**

FROM: , Cx Authority **PHONE:** **CELL:**

CX TEAM DISTRIBUTION:

Name	Company	Name	Company	Name	Company

This report documents the status of systems being commissioned and tracks the resolution of issues discovered by the Cx team during the Cx process.

EXECUTIVE SUMMARY

Functional Tests Performed Since Last Report:

Major Issues Discovered:

Cx Activities Still Outstanding:

Open Issues Directly Related to the Scope of the Project:

Issues Beyond the Scope of the Project:

Cx Recommendations/Lessons Learned:

The following pages provide a detailed list of issues discovered as a result of the Cx process.

ISSUES DISCOVERED

System Tab numbers listed below correspond to the tab numbers in the Cx Plan.

System Tab: **System:**

Activities & Dates:				
Comments & Dates:				
Tab.Issue #	**Issue Description**	**Date Opened**	**Date Closed**	**Action By**

System Tab: **System:**

Activities & Dates:				
Comments & Dates:				
Tab.Issue #	**Issue Description**	**Date Opened**	**Date Closed**	**Action By**