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CERTIFIED COMMISSIONING MANAGER

CCM TRAINING PROGRAM

ONLINE PROFESSIONAL COURSES LED BY THE WORLD'S TOP SPECIALISTS

ONLINE TRAINING BY KRISHNAJI PAWAR

LEED AP(BD+C),GSAS CGP,GCP,ISO 14001

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MODULE

09 - C

Commissioning Test Procedures, Testing, and Reporting

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CERTIFIED COMMISSIONING MANAGER - CCM TRAINING OVERVIEW

Members of the Cx Team are accountable for attending Construction Phase meetings and completing action items by their due dates. Effective commissioning and a successful project for the owner are dependent on the full cooperation of all meeting participants.

Learning Objectives

- Introduction and Construction Phase Overview
- Construction Phase CxA Objectives
- Construction Phase CxA Team
- Pre-construction Commissioning Conference
- Conference & Kickoff Meeting
- Site Observation
- Commissioning Test Procedures
- Performing Tests
- Commissioning Tests and Certification of Readiness
- Operational Sustainability & Reporting
- Progress Reports
- Final Report

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INTRODUCTION

- The construction phase is the third of the four phases we've identified for the building systems commissioning process.
- This phase comes immediately after the design phase and comes before the occupancy and operations phases.
- The third phase of the commissioning process outlined in the 2005 BEYOND SMART CITIES Commissioning Guidelines was the construction phase.
- The Commissioning Plan (Cx Plan), which was updated by the Commissioning Provider (CxP) during the Design Phase, is implemented during the Construction Phase.
- Consistent interaction between the CxP and the construction team, as well as frequent communication between the CxP and the design team, are essential to the construction phase's success.
- The CxP leads both the larger Commissioning Team (Cx Team) and the smaller Commissioning Provider Group (CxP Group) to ensure commissioning activities are completed correctly and on schedule
- Verifying building system compliance with the OPR or CFR is one of the most important priorities for the CxP during the construction phase.



COMMISSIONING TEST PROCEDURES

- Extensive, extremely detailed commissioning test procedures (CxTPs) must be developed and implemented, which is one of the primary reasons the prime contractor is required to hire a testing contractor.
- Consequently, the specifications must include fully-developed models of all CxTPs required for the current commissioning program.
- The specifications stipulate that the testing contractor must adapt the model CxTPs to the project's specifics and submit them to the CxA for review and approval.

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COMMISSIONING TEST PROCEDURES+

- A clause in the specification can account for this contingency by requiring the prime contractor to include a lump-sum dollar amount in the bid, which would be returned to the owner to pay for the final development of CxTPs by the CxA if the testing contractor is unable to make the necessary modifications.
- The training program for the owner's operations staff must be meticulously coordinated, with close coordination between the commissioning authority and the testing contractor.

PERFORMING TESTS

- Ultimately, actual testing will commence.Beginning the process is the contractor conducting commissioning tests on all specified equipment and systems.
- Commissioning test demonstrations of a sample of the components, equipment, and systems demonstrate the validity of the submitted commissioning test data.
- The sequence of commissioning tests is crucial.
- Some argue that testing should begin with system functional performance tests.
- In the case of larger, more complex systems, it becomes exceedingly difficult to determine which of the many components — one or more — was responsible for the functional failure.
- Only by beginning with testing the functional performance of components, then subsystems, and concluding with testing the functional performance of systems can the functionality of every system component be guaranteed.





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PERFORMING TESTS +

- As static tests become intersystem functional performance tests, testing procedures become more complex and time-consuming.
- As components become systems, more people must conduct and observe tests.
- Diagnostics and repairs are usually easy when component testing uncovers failures.
- However, component failures during system testing present a difficult diagnostic problem with many solutions.
- Starting system testing makes it harder to ensure that all components have been fully exercised through their full range of intended service, increasing the likelihood of undetected flaws in a functional system.

COMMISSIONING TESTS AND CERTIFICATION OF READINESS

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COMMISSIONING TESTS AND CERTIFICATION OF READINESS+

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- Before beginning any testing procedure, it is essential to understand the distinction between commissioning tests and demonstrations of commissioning tests.
- CxA and owner's witnesses were assembled, and acceptance testing was planned.
- At the conclusion of the first trying day, the failure rate for all tests administered surpassed 40 percent.
- When questioned at the end of the day, the contractor admitted that there had been no preliminary testing.
- In fact, as problems were identified, he intended to resolve them, complete the test, and then move on to the next test.
- The C.A. and witnesses were expected to remain on the sidelines while problems were resolved.



COMMISSIONING TESTS AND CERTIFICATION OF READINESS+

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- In essence, the The contractor attempted to substitute his own quality control program with commissioning test demonstrations.
- Due to the numerous test failures, acceptance testing was discontinued.
- The prime contractor informed that no additional acceptance testing would be conducted until a new Certificate of Readiness letter was received.
- It Before another Certification of Readiness letter could be sent, it took the subcontractor six weeks to complete all of the preliminary tests and resolve the inter-component wiring discrepancies and other failures.
- The failure rate for acceptance testing at that time was less than one percent.
- prior to the contractor submitting the Letter of Certification of Readiness.



01. Static Tests

02. Startup Procedures

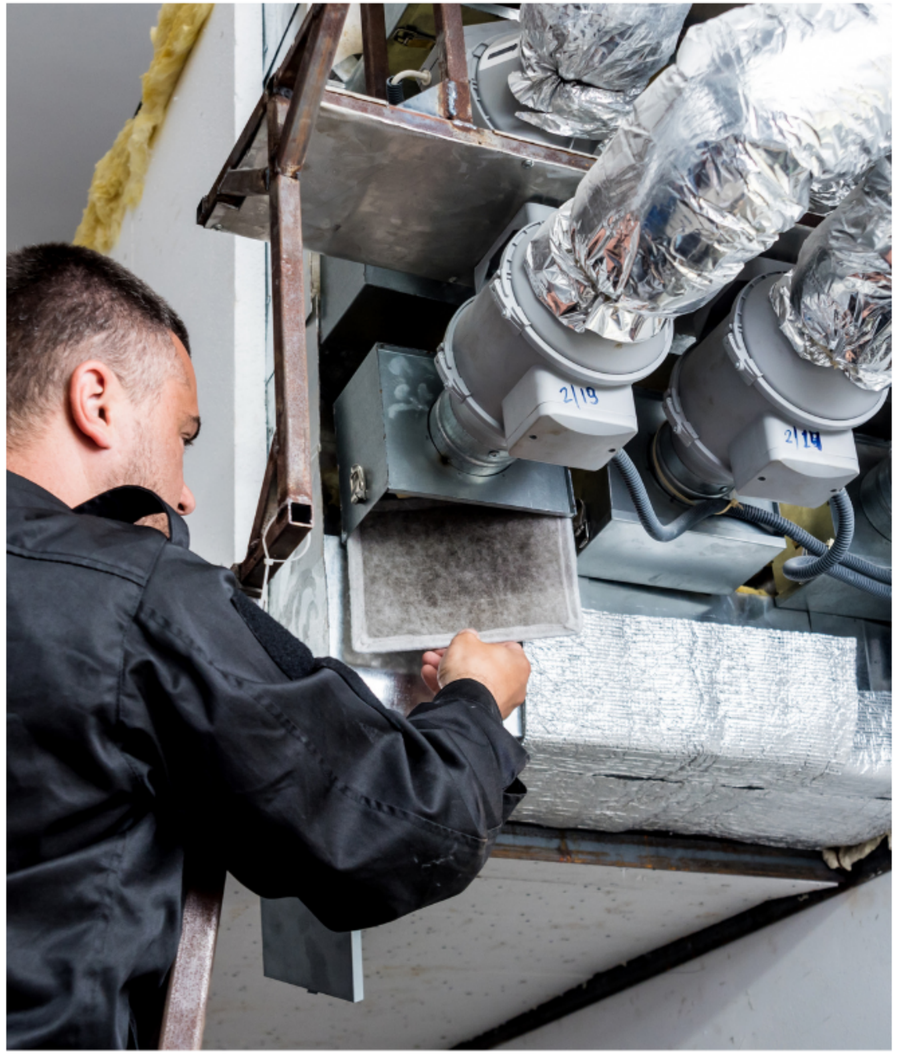
03. Component and Subsystem Tests

04. System Commissioning Tests

05. Deficiency Tracking and Resolution

06. Operational Sustainability

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STATIC TESTS

- Pre-commissioning static tests included pipe, duct, and insulation integrity tests.
- Successful commissioning requires managing and conducting static tests as the initial step in a project.
- Before continuing commissioning tests, distribution systems must hold water, air, or electrons without mixing them.
- Static tests should be performed according to written procedures, witnessed, recorded, and approved like other commissioning tests.

STARTUP PROCEDURES

- Like static tests, equipment and system startup predates the industry's understanding of modern commissioning, but it should now be managed as part of it.
- Minimum startup procedures must follow manufacturer's instructions.
- In addition to manufacturer requirements, the DP or CxA may include lubrication analysis or vibration signature recording during startup.
- This exception to the contractor's requirement to record satisfactory performance before commissioning test demonstrations requires the CxA to be present when equipment and systems start up.

- Commissioning all subsystems and components is essential before system functional performance testing.
- Component and subsystem commissioning is crucial before system functional performance testing.
- Interior smoke-control zone dampers can also affect smoke-control system performance during fires for the same reasons.
- In the specifications, it is best to state that when the facility is finished and occupancy is about to begin, the contractor must demonstrate access to, operation of, reset, and restoration of every fire damper.
- Specifying this requirement in the specification and during the preconstruction commissioning conference ensures that all fire dampers are accessible and functional.

COMPONENT AND SUBSYSTEM TESTS



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SYSTEM COMMISSIONING TESTS

- System commissioning testing is a crucial process that begins after component and subsystem commissioning testing is complete and demonstrated.
- It involves identifying the modes of operation for each variable functionality area, which can be over ten.
- This process is complex, and specifications must be carefully written to set test conditions and record data for evaluation.
- System functional performance tests (FPTs) often require multiple observations and data readings.

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SYSTEM COMMISSIONING TESTS

- If the integrity and dependability of the DDC system are not determined, witnesses must manually record test data on-site alongside DDC data to compare actual readings with machine-recorded readings.
- System PTs can take time and involve many participants, and if many trades are still building, stable test conditions may be impossible.
- This may require system FPTs outside of business hours, and the testing contractor must consider these factors when scheduling tests.
- Overall, system commissioning testing is essential for ensuring the smooth operation of building automation systems.



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DEFICIENCY TRACKING AND RESOLUTION

- Despite the commissioning team's best efforts to ensure the job is done correctly the first time, it is not uncommon to discover unforeseen flaws.
- A deficiency tracking and resolution procedure must be implemented from the outset in order to ensure the timely resolution of all deficiencies and ensure that all deficiencies are resolved.
- It is simple to create spreadsheets with headings and cell inputs that provide weekly updates on the status of each identified deficiency.
- This is a task that should not be delegated; the commissioning authority should maintain and update this file on their own computer.
- One of the chief responsibilities of the CxA is to oversee the process of deficiency tracking.



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OPERATIONAL SUSTAINABILITY

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- When the facility is turned over to the owner's operations staff, the final objective of the commissioning process is to ensure operational sustainability.
- The commissioning authority will be aware of how close the operations staff is to being able to reliably maintain the achieved operational conditions.
- The owner's contract with the CxA should stipulate that the CxA remain available and on-call for six to twelve months, as needed to respond to the facility's operational nuances.
- All parties will benefit from the continued informal involvement of the CA during the final quarter of the warranty period, when any outstanding warranty issues must be resolved.



REPORTING

- One cannot overstate the significance and value of a disciplined reporting program.
- Many participants in the project are required to be aware of the project's status, while others may be curious.
- Good communication is a courtesy in some ways.
- Reporting is an important obligation of the commissioning authority.
- Reports are the primary means of communication with the various parties involved in the commissioning program.
- The CxA must have a strong commitment and discipline for producing a variety of timely reports.



Reports are the principal communication link to a variety of parties associated with the commissioning program.



The CxA must have a deep commitment to and discipline for producing a range of reports in a timely manner.

PROGRESS REPORTS

- The CA should be responsible for submitting a report on the preconstruction commissioning conference.
- When testing begins, weekly commissioning meetings are necessary to keep the CxA abreast of the project's progress and specifics.
- In either case, including the construction commissioning conference, immediate progress reports must be generated after each meeting.
- These are progress reports that emphasize issues, actions, and outcomes.
- Action designees are typically "too busy" to attend the following scheduled meeting.



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PROGRESS REPORTS+

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- The CxA must take all necessary measures to prevent poor performance.
- During the preconstruction phases, the distribution of progress reports was discussed with the owner and design professionals, and it is one of the topics or concerns that must be resolved with the contractors during the reconstruction conference and the preconstruction commissioning conference.
- In order to instill confidence in the process and ensure that all parties are routinely informed as promised, strict adherence to the agreed-upon distribution method is essential.



FINAL REPORT

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- Final report is more formal and comprehensive.
- We will illustrate a final report later.
- The commissioning authority should prepare and submit the final report to the owner.
- The testing contractor submits a final report to the owner with all the detailed information and other materials gathered during commissioning. Per contract specifications, the owner owns the report after contract completion.
- The CxA's report is a lengthy executive summary, unlike the testing contractor's.
- The CxA views issues differently than the TC.



The CxA's final report should cover the commissioning program's activities, the owner's benefits, the significant issues discovered and resolved, a projection of the owner's consequences if commissioning had not occurred, and a cost-benefit analysis to verify the operational and economic benefits of commissioning.



Finally, building commissioning is the owner's quality assurance program, so the owner should catalog the quality results for sharing.



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