

Montgomery County Public Schools Facilities Guide  
DIVISION 15 – MECHANICAL

**SECTION 15400 – COMMISSIONING**

**PART 1 – GENERAL**

- 1.1 **OBJECTIVES:** The objective of commissioning is to provide documented confirmation that each facility fulfills the functional and performance requirements of Montgomery County Public Schools. To reach this goal, it is necessary for the commissioning process to establish and document the following:
- A. Owner's Project Requirements (OPR), which are a criteria for system function, performance, and maintainability (design intent);
  - B. Compliance with OPR throughout design, construction, start-up, and the initial period of operation.
- 1.2 **GENERAL SCOPE:**
- A. The CxA will serve as an objective advocate of the owner, oversee and coordinate the commissioning process, and present final recommendations to the owner regarding the performance of the commissioned building systems.
  - B. The primary tasks of the CxA during the overall Design Stage is to review the design to ensure it meets OPR and develop detailed commissioning specifications.
  - C. During construction, the CxA coordinates the execution of a testing plan, which includes observing and documenting all systems' performance to ensure that the systems are functioning in accordance with the OPR and the contract documents.
  - D. The CxA is not responsible for design or general construction scheduling, cost estimating, or construction management, but may assist with problem-solving or resolving nonconformance issues or deficiencies.
- 1.3 **LEED REQUIREMENTS:**
- A. The CxA shall be involved throughout the project from design development through the warranty phase.
  - B. The CxA will provide commissioning services required by LEED for Schools - 2007 (or current version).
  - C. The CxA works in conjunction with the project design team through the design process, prepares a commissioning plan, and a Final Commissioning Record to meet the requirements of the LEED Energy & Atmosphere commissioning credits.
- 1.4 **DESIGN STAGE:** The CxA shall perform the following duties during the design stage of the project:
- A. Assemble initial commissioning team, hold a scoping meeting and identify responsibilities.
  - B. Review the Preliminary Commissioning Plan developed by MCPS during the Planning Phase and fill in additional detail including team member responsibilities & directory, communication structure, specific systems & equipment to be commissioned and commissioning process schedule.
  - C. Schedule and lead commissioning meetings as needed with the Commissioning Team
  - D. Coordinate the commissioning work during design.
  - E. Review Owner's Project Requirements & Basis of Design documentation for clarity and completeness.

- F. Perform focused reviews of the design, drawings and specifications at each stage of development (Pre-DD, 35%, 65%, & 99% review meetings).
  - G. Assist and review the development and updating of the Owner's Project Requirements and Basis of Design by design team members after each design review submission.
  - H. Update the Commissioning Plan in preparation for Construction Stage.
  - I. Develop full commissioning specifications for all commissioned equipment. Coordinate this with the architect and engineers and integrate the commissioning specifications into the overall project specification package, normally Sections 01910 and 15995; with Section 16995 open if required.
    - 1. The commissioning specification will include general commissioning requirements common to all systems and assemblies and a detailed description of the responsibilities of all parties, details of the commissioning process; reporting and documentation requirements, including formats; alerts to coordination issues, deficiency resolution; construction checklist and start-up requirements; the functional testing process; specific functional test requirements, including testing conditions and acceptance criteria for each piece of equipment being commissioned.
    - 2. The specifications will clearly indicate who is witnessing and documenting start-up of each commissioned system. The specifications will be clear as to who is writing, directing, conducting and documenting functional tests and regulatory-required tests. This may vary between systems, especially between electrical and mechanical. Provide language to enhance current project specifications to ensure comprehensive controls submittals, full control contractor accountability for documented point-to-point checkout and commissioning participation, comprehensive test, adjusting and balancing, full contractor documentation of start-up and superior training and O&M manual documentation.
  - J. Coordinate a controls integration meeting where the electrical engineers, mechanical engineers, MCPS representatives, and the CxA discuss integration issues between equipment, systems and disciplines to ensure that integration issues and responsibilities are clearly described in the specifications.
  - K. Review the recommendations from the constructability review for commissioning and O&M issues.
  - L. Write step-by-step functional test procedures and documentation formats for all commissioned equipment and assemblies. Test procedures will include manual functional testing, energy management control system trending and may include stand-alone data-logger monitoring.
- 1.5 CONSTRUCTION STAGE: The CxA shall perform the following duties during the construction stage of the project:
- A. Coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
  - B. Plan and conduct commissioning meetings as needed and distribute minutes. Once project has successfully been bid and awarded conduct a commissioning kick-off meeting to provide an overview of the commissioning process, establish lines of communications, and review timelines and schedules.

- C. Coordinate the commissioning work with the design team, MCPS Mechanical Division, and construction manager, to ensure that commissioning activities are being incorporated into the master schedule.
- D. Revise, as necessary, the construction phase commissioning plan developed during design, including scope and schedule.
- E. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures. Before start-up, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
- F. Review submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the design team and Construction Manager reviews.
- G. Write and distribute construction checklists for commissioned equipment.
- H. Develop an enhanced start-up and initial systems checkout plan with contractor input for selected equipment.
- I. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process.
- J. Witness HVAC piping pressure test and flushing, sufficient to be confident that proper procedures were followed. Include testing documentation in the Commissioning Record.
- K. Witness any ductwork testing and cleaning sufficient to be confident that proper procedures were followed. Include documentation in the Commissioning Record.
- L. Document construction checklist completion by reviewing completed construction checklists and by selected site observation.
- M. Document systems start-up by reviewing start-up reports and by selected site observation.
- N. Approve air and water systems balancing by spot testing and by reviewing completed reports and by selected site observation.
- O. Coordinate functional testing for all commissioned systems and assemblies. Witness and document manual functional performance tests performed by the Construction Contractor for all commissioned systems and assemblies, except:
  - 1. Some smaller equipment may be tested and documented by the Construction Contractor at the Commissioning Agent's discretion,
  - 2. Electrical equipment testing and regulated testing may be directed and documented by the Construction Contractor with only spot witnessing and report review by the Commissioning Agent.
- P. The functional testing shall include operating the system and components through each of the written sequences of operation, and other significant modes and sequences, including start-up, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure, security alarm when impacted and interlocks with other systems or equipment. Sensors and actuators shall be calibrated during construction check listing by the installing contractors, and spot-checked by the commissioning authority during functional testing. Analyze functional performance trend logs and monitoring data to verify performance. Coordinate retesting as necessary until satisfactory performance is achieved.

- Q. Functional testing shall be done using conventional manual methods, control system trend logs, and readouts or standalone dataloggers, to provide a high level of confidence in proper system function, as deemed appropriate by the Commissioning Agent and MCPS.
- R. After manual testing and initial trouble shooting is complete, monitor system operation and performance for selected data points for up to two weeks by requesting trend logs from the Construction Contractor from the building automation system. For needed system points not able to be trended by the building automation system, furnish and install temporary portable data loggers that will monitor up to 20 points. Analyze monitored data to verify operation and performance and issue a written report. This time frame and monitoring points may be modified to accurately commission the building.
- S. Verify the following specific EMS operations and/or programming functions
  1. Building has been zoned according to design and includes associated equipment
  2. Operational schedules are set; prove modifications can be performed
  3. Overrides are functional for Zones (via touch-screen), Individual Equipment, and Outdoor Air Dampers
  4. Warm-up/cool-down and night set-back routines are accurately programmed and functional
  5. Alarms are proven for incoming power failures (EMS & Security) and critical mechanical operations.
- T. Review and verify the delivery and accuracy of the following EMS items:
  1. Control As-Built documents are complete (electronic and paper form)
  2. EMS program and database installed on CD/DVD and MCPS Energy Management laptop
  3. Graphics are complete and floor plans are color coded per zone
  4. Software manuals are delivered and EMS training is performed for MCPS Energy Management and Building Services personnel
- U. Maintain a master issues log and a separate record of functional testing. Report all issues through the Construction Manager and MCPS Mechanical Division as they occur. Provide through the Construction Manager written progress reports and test results with recommended actions.
- V. Review the O&M manuals for commissioned equipment.
- W. Compile a Commissioning Record, which shall include:
  1. A brief summary report that includes a list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification methods.
  2. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each noncompliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented.
  3. Also included in the Commissioning Record shall be the commissioning plan, Owner's Project Requirements, Basis of Design, commissioning specifications, design review, submittal review, issues log, construction checklists, CxA site

visit and Commissioning Team meeting minutes, O&M review, test procedures and test data reports.

4. Submit 3 bound text copies of the Commissioning Records with 3 CD copies including all information listed above.

**PART 2 – PRODUCTS:** None.

**PART 3 – EXECUTION:** Per above.

**END OF SECTION**