P.4 Design and Construction Commissioning

Supporting Information

Design and Construction Commissioning Process Summary

Design and Construction Commissioning refers to the commissioning process that shall begin in schematic design and conclude after the correction period or after completion of a full year of operation, which ever is last. The Design and Construction Commissioning process is the means to verify and document that the systems of a facility operate in accordance with their design intent and that the operations staff fully understands the system operational procedures. This includes documenting system operational goals and design parameters, planning for verification and testing in the design and specifications, confirming the successful completion of the verification process, documenting the system

Key components of the Design and Construction Commissioning Process include:

- Establish Planning Baseline, Programming Baseline, and before the end of schematic design phase, establish the Design Baseline.
- Before the end of the Schematic Design phase, engage a Commissioning Team and establish the role of Commissioning Leader. ****
- Before the end of the Schematic Design phase, review the design intent and basis of design documentation, incorporating this into a Design and Construction Commissioning Plan that includes the required Commissioning Scope defined in the MSBG Guidelines.
- Update the Commissioning Plan in each phase with increasing detail, and noting the characteristics upon which design and demonstration of performance will be based as they
- At least once during each of Design Development and Construction Documents phases, evaluate progress of work towards the Commissioning Plan, documenting the progress and recommendations into a Commissioning Report before the end of each phase so that
- Submit a list of I/O data points as part of outcome documentation before the end of
- Incorporate commissioning criteria and scope into the Construction Documents.
- Review contractor submittals for commissioned equipment and other design elements during the Construction Administration phase.
- Verify installation, functional performance, training, and operation and maintenance documentation during construction and correction period.
- After construction, complete an initial Commissioning Report comparing work completed to the Commissioning Plan and identifying outstanding items or seasonally-deferred items
- At 10 months into the correction period, review building operation with Operations and maintenance staff, and create a plan for resolution of outstanding commissioning-related
- After the 10 month correction period review, or after seasonally deferred commissioning work, whichever is longer, complete a Commissioning Report, confirming that the tasks for the Design and Construction Commissioning Plan are complete and design intent has

Commissioning Roles

Commissioning Leader: The person who coordinates efforts of commissioning team and assembles commissioning design reviews and final Commissioning Report. For Design and Construction Commissioning, the commissioning leader shall have a distinct role from the design team, but may be employed within the same firms providing design services. In Operations Commissioning, the Facility Operations Manager could play the role of the

Commissioning Team: Assists in planning, reviewing and coordination of commission process with all disciplines involved in the building project. The team will complement skills

- Commissioning Leader
- Representative of owner's facilities operations team, preferably Facility Operations
- Current Guideline Leader for the phase
- Commissioning Consultants as needed to cover other commissioning expertise
- For Design and Construction Commissioning, the team shall also include:
  - Architect and Engineers of multiple disciplines as needed to cover the expertise to plan and execute commissioning of selected systems.
  - Contractor, and appropriate subcontractors

[illegible] facility performance during ongoing occupancy and manages or performs ongoing operational practices, maintenance and corrective actions. The FOM is responsible for understanding Operations and Maintenance manuals, and monitors and reports on ongoing performance of the facility. This person is available for participation throughout the design process for continuity into final operation. The FOM or their representative shall be part of the Design and Construction Commissioning Team. After occupancy, the Facility Operations Manager leads the work team responsible for facility maintenance, and corrective measures. The FOM may also be Guideline Leader during the occupancy phase, confirming compliance

Commissioning Reporting

Commissioning Plan: The Commissioning Plan identifies systems with specific performance criteria, establishes documentation, and identifies specific test and verification procedures for installed equipment to confirm operation according to commissioning plan. The Design and Construction Commissioning Plan is a living document that grows in detail over time, as systems are specified and design parameters become refined. After the correction period, the Operations Commissioning Plan defines systems to be monitored, regularly scheduled actions to be taken, and procedures for responding to problems and

Design and Construction Commissioning Plan: The Design and Construction Commissioning Plan shall include directly, or by reference, provision for all items required in the Commissioning Guideline for activities through the Correction Period or successful

Systems to be commissioned include:

- Mechanical HVAC Comfort, Energy, and Renewable Energy Systems, Testing Adjusting and Balancing: And other elements related to performance of Guidelines: E.1, E.2, E.3, E.4,
- Electrical Systems, including Lighting and Daylighting Controls: And other elements related to performance of Guidelines: S.7, E.1, E.2, E.3, I.8, I.9
- Indoor Air Quality Elements and Systems: And other elements related to performance of
- Plumbing Systems: Flow Rate
- Envelope Integrity: Test Building Envelope for Water Infiltration

Recommended additional scope of Commissioning:

- Plumbing Systems : In addition to required flow rate commissioning above as needed to support operational achievement of guidelines: S.11, S.12, S.13
- Interior materials (specification, installation): As needed to support operational
- Envelope integrity: In addition to required water infiltration commissioning above as needed to support operational achievement of guidelines: I.6, I.7, M.1, M.2
- IEQ: Vibrations/acoustics/noise: In addition to occupant surveys above, perform physical measurements as needed to support operational achievement of guidelines: I.11, I.12

The Design and Construction Commissioning Plan includes by reference the following documents that may be packaged separately but shall be coordinated with all other parts of

- Construction Air Quality Management Plan
- Correction Period Air Quality Management Plan
- Construction Waste Management Plan
- Correction Period User Comfort and Satisfaction Assessment

Construction Air Quality Management Plan: The Construction Air Quality Management Plan is part of the Design and Construction Commissioning Plan and shall cover practices to prevent introduction of air quality problems as a result of the construction process.

Meet construction air quality requirements of SMACNA IAQ Guideline for Occupied Buildings

Protect stored on-site or installed absorptive materials from moisture damage, and replace all filtration media immediately prior to occupancy.

Complete minimum two-week building "flush-out" prior to occupancy (One month is

Required Elements for IAQ protection during construction. (From CHPS section 01350, 1.6)

- Construction Ventilation and Preconditioning:
  - Temporary Construction Ventilation: Maintain sufficient temporary ventilation of areas where materials are being used that emit VOCs. Maintain ventilation continuously during installation, and until emissions dissipate after installation. If continuous ventilation is not possible via building's HVAC system(s) then ventilation shall be supplied via open
    - Period after installation shall be sufficient to dissipate odors and elevated concentrations of VOCs. Where no specific period is stated in these Specifications, a
    - Ventilate areas directly to outside; ventilation to other enclosed areas is not
  - Dust producing activities (e.g. drywall installation and finishing): Turn ventilation system off and protect openings in supply and return HVAC system from dust

Preconditioning: Prior to installation, allow products which have odors and significant VOC emissions to off-gas in dry, well-ventilated space for 14 calendar days to allow for reasonable dissipation of odors and emissions prior to delivery to Project site.
Condition products without containers and packaging to maximize off-gassing of VOCs
Condition products in ventilated warehouse or other building. Comply with substitution requirements for consideration of other locations.
Protection:
Moisture Stains: Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials: immediately remove from site and properly dispose. Take special care to prevent accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent
Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.
Replace moldy materials with new, undamaged materials.
Ducts: Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside ducts.
Environmental Issues:
On-Site Application: Where odorous and/or high VOC emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not
Complete interior finish material installation no less than fourteen (14) days prior to Substantial Completion to allow for building flush out.

Correction Period Air Quality Management Plan: Indoor Air Quality Testing: Evaluate building air quality three months, six months, and ten months after occupancy with testing that verifies ventilation system is better than or within design guidelines.** Measure key factor that determines ventilation rate for building (major pollutant or CO2) in building occupied zones. Pollutant concentrations measured should be within guideline range and CO2 levels should be at or below 450 ppm over outdoor levels. If pollutant concentrations exceed action level or CO2 levels are above 450 ppm over outdoor levels, excess
Construction Waste Management Plan: The Construction Waste Management Plan is part of the Design and Construction Commissioning Plan and shall cover practices to minimize waste of the construction

Correction Period User Comfort and Satisfaction Assessment: User Comfort and Satisfaction Assessment as one indicator of overall IEQ performance: Assess User Comfort and Satisfaction via occupant surveys, three months and ten months after occupancy. Areas
Air Quality (I.4, I.5 and integrated effect of I.6)
Thermal Comfort (I.7)
Access to Daylight, Quality of lighting, View space and window access (I.8,I.9,I.10)
Vibrations, Acoustics and Noise (I.11, I.12)
Personal Control of IEQ conditions and impacts (I.13)
Opportunities and encouragement for healthful physical activity (I.14.)

Commissioning Report: The Commissioning Report is an evaluation of work at a particular point in time in comparison with a particular version of the Commissioning Plan. Early Commissioning Reports during design phases may be simple design reviews to determine if steps needed to lead to an operating performance level are being taken. Construction Documents shall include Commissioning Plan, verification procedures, responsibilities, and reporting requirements. An end-of-correction-period Commissioning Report is the final deliverable of the Design and Construction Commissioning Process.

Commissioning Baselines

Baseline: Baselines demark a reference case for comparison and are used to determine performance improvements for compliance with guidelines throughout this document.

Planning Baseline: During Agency Planning determine the characteristics of the Planning Baseline scenario. The Planning Baseline is the initial space program document, construction type, and cost assumptions based on typical industry data and first understanding of facility needs and operating parameters. The Planning Baseline is needed to measure the environmental and economic advantages of Planning for Conservation approaches such as building less and/or reusing existing buildings studied in Predesign Programming and

Programming Baseline: During the Predesign Programming phase, the predesign team evaluates initial general assumptions of program needs and further develops program document to reflect Agency needs in concert with lifecycle performance goals. At the end of Predesign, determine characteristics of the Programming Baseline based on Planning for Conservation approaches chosen and other changes made during Predesign Programming and Site Selection phases. The Programming Baseline is needed to measure environmental and economic advantages of alternate construction for various building

Design Baseline: During schematic design after a basic building concept and outline of construction types for each building system is chosen, determine characteristics of the Design Baseline scenario. The Design Baseline defines project parameters that will be used as the baseline for all guidelines to be measured against. For example, additional savings gained through improved material properties shall be measured against the Design
Measurement and Verification Baseline(s): Measurement and Verification Baseline(s) are used to calculate savings as part of the Measurement and Verification Process. They should be coordinated with other baselines but may have other requirements per IPMVP reference standard. See details of
* It is recommended to engage the Commissioning Leader and Team as early as possible,
** Contaminant Testing: (Recommended) Measured values of pollutants and CO2
*** Consider (recommended, not required), monitoring three months, six months, and ten months after occupancy of other pollutants on I.4 guideline list which are not pollutants that determine the ventilation rate. Concentrations should be in guideline range and below action