

# 1 General

## **.1 General Commissioning Requirements.**

- .a Office Buildings, Detention Facilities, Courthouses, Fire Stations, Libraries, Public Health Buildings, Complex Renovations and other facilities as determined by Wake County shall be commissioned.
- .b Commissioning shall include design phase review, construction phase services, post occupancy verification observations, and final submission of final commissioning report.

## **.2 Systems to be Commissioned.**

- .a HVAC: Air handlers, boilers, gas furnaces, chillers, fan coil units, ductwork, dampers, grilles, fans, piping, valves, refrigeration systems, hydronic accessories, chemical treatment, pumps, terminal equipment, building automation system (BMS) including interfaces with other systems.
- .b Plumbing: Domestic Water Heating, water, gas, and fuel oil piping, valves, sump pumps, and hydronic accessories.
- .c Electrical: VFD and Lighting Controls including interface with BMS, power distribution system, grounding system, low voltage, and fire alarm systems.
- .d Security systems.
- .e Fire protection systems.
- .f Building Envelope: Exterior Walls, roofing, and glazing.
- .g Solar PV Systems
- .h Additional Systems and enhanced commissioning: As required where a LEED Building or similar certifications are pursued.

# 2 Commissioning Team

## **.1 Designers Responsibility.**

- .a Assist CxA in the development of the Owner Project Requirements (OPR) and Basis of Design (BOD) documents.
- .b Coordinate with CxA schematic design, design development, and construction document phase project reviews.
- .c Monitor the project progress from initial design phase to completion of the commissioning process.
- .d Support the CxA in all phases of construction activity.
- .e Manage the project, including assigning and detailing roles and responsibilities.
- .f Assure all consultants are available to support the CxA, attend appropriate CxA meetings, and other duties as required during the design, and construction process.
- .g Coordinate shop drawing submittal responses and comments with the CxA.
- .h Attend and record minutes of all construction related meetings.
- .i Review the final commissioning report.

## **.2 Contractors Responsibility.**

- .a Assign representatives from the HVAC, Electrical, and Plumbing subcontractors to participate and perform commissioning team activities.
  - 1. Coordinate and assist with CxA (Commissioning Authority) to identify schedule requirements for all commission activities.

2. Participate in commissioning meetings.
3. Invite appropriate parties to the Commissioning Meetings.
4. Provide one copy of each system and equipment submittal to the CxA.
5. Certify all work is complete and systems are operating according to the contract documents.
6. Evaluate performance deficiencies.
7. Provide technicians who are familiar with the construction and operation of installed systems.
8. Schedule start-ups.
9. Develop and coordinate an overall training plan.
10. Provide qualified instructors to perform training sessions for owner's operation.
11. Provide personnel to assist or perform seasonal or deferred testing.
12. Provide prompt written responses to all identified issues.
13. Organize and provide O & M Manuals.

### **.3 Commissioning Firms (CXA) Responsibility.**

#### **.a Organize and lead the commissioning team.**

1. Develop Owner Project Requirements (OPR) and review Basis of Decision (BOD).
2. Develop commissioning specification.
3. Conduct commissioning related design reviews at each phase of design.
4. Attend design review meetings.
5. Prepare a construction phase commissioning plan.
6. Review and comment on submittals from the contractor and return all comments to the designer prior to the submittals being returned to the contractor.
7. Convene commissioning team meetings.
8. Conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities.
9. Observe construction and report progress and deficiencies.
10. Checks to verify all equipment delivered for installation matches the approved submittal.
11. Observes and documents all service and access clearances are maintained for all equipment and valves installed.
12. Prepare project specific construction checklist for each piece of equipment and component.
13. Field-verify proper installation of commissioned systems.
14. Direct, witness, and document functional performance.
15. Compile test results and baseline data.
16. Review project record documents.
17. Review and comment on operation and maintenance documentation for compliance with Contract Documents.
18. Review operation and maintenance training program.
19. Prepare commissioning reports.
20. Conduct a post occupancy review of building 10 months after substantial completion.
21. Perform LEED enhanced commissioning as required on a project-by-project basis.
22. Perform building envelop leak, air infiltration, and thermography testing.
23. Verify all BMS system graphics for completeness and point-to-point checks for proper operation.

#### **.b Assemble and submit final commissioning documentation.**

1. Owners Project Requirements (OPR).
2. Basis of Design (BOD).
3. Commissioning plan.
4. Construction checklist.
5. Functional performance test procedures.

6. Certificate of Readiness. (See supplemental form.)
7. Systems and equipment functional test reports.
8. Corrective action documents.
9. Issues Log.
10. Final Commissioning Report

## 3 Execution

### **.1 Basic Commissioning Processes:**

- .a Commissioning during construction begins with a scoping meeting conducted by the CxA.
- .b Additional meetings as required throughout construction with all necessary parties attending to plan, scope, coordinate, and schedule future activities and resolve problems.
- .c CxA maintains and distributes a Masters Issues Log to track all deficiencies through resolution.
- .d Equipment documentation is submitted to the CxA during normal submittal distribution.
- .e The CxA coordinates with the contractor in developing startup plans and startup documentation formats.
- .f The Contractor and subcontractors execute and document startup and initial checkout. The CxA documents that the startups were completed according to the approved plans.
- .g Functional test procedures are executed by the Contractor under the direction of and documented by the CxA.
- .h Items of non-compliance in material, installation, or set up are corrected at the Contractor's expense and the system retested.
- .i The CxA reviews the O & M documentation for completeness.
- .j The CxA reviews, pre-approves and coordinates the training provided by the Contractor and verifies that it was completed.
- .k CxA shall convene a training preparation conference to include the Owner's operation and maintenance personnel, Contractor, and subcontractors.
- .l Deferred and seasonal training is conducted by the Contractor, as specified or required under the direction of the CxA. The CxA coordinates the scheduling with the Contractor.
- .m The CxA performs post-occupancy evaluations after approximately two months and ten months of occupancy to identify any issues and deficiencies. Deficiencies shall be addressed by the Contractor prior to expiration of any warranties.
- .n The CxA performs a control sequence review with the Engineer and the controls contractor.
- .o Commissioning is complete when controls graphics are completely integrated into the BMS as approved by the owner.

### **.2 Testing**

- .a **Functional Performance Tests** of systems and intersystem performance.
  1. HVAC system testing shall include the entire HVAC installation and integration of controls of the Building Management System.
  2. Plumbing system testing shall include central equipment for water heating through distribution systems to each fixture.
  3. Electrical System testing shall include evaluation of proper control for interior and exterior lighting via switches, occupancy sensors, daylight sensors, photocell, master lighting control systems, and integration into the Building Management System.
  4. Security system testing shall include proper operation of the security system and integration with notification and building management system.
  5. Fire protection systems shall include observation of system testing and fire pumps.
- .b **Building Envelope Testing.**
  1. Water penetration testing on all roof surfaces.
  2. Water spray testing on of glazing.

3. Whole building pressurization and Air infiltration testing on 10% of or rooms in the building.
  4. Infrared thermography of completed building to identify thermal performance issues.
- .c **Integrated System Testing** to include interactions and communication between various systems.
  - .d **Deferred Testing** where tests cannot be completed because of a deficiency outside the scope of the system.
  - .e Seasonal Testing will be provided to verify performance of the HVAC systems with the cooling, heating, and colder seasons during the warranty phase of the project.
  - .f **“Testing and Balancing”** required in Divisions 23, 24, 25 and 26 shall be coordinated for verification with the CxA.