|  |
| --- |
| Table of Contents |

Table of Contents 0

Commissioning Plan 1

I. Introduction 1

II. Commissioning Goals 4

III. Project Description 4

IV. Commissioning Scope 4

V. Systems to Be Commissioned 15

VI. Commissioning Team 17

VII. Commissioning Communications and Document Distribution 21

VIII. Pre-Design Phase Commissioning 28

IX. Design Phase Commissioning 28

X. Construction and Acceptance Phase Commissioning 30

XI. Warranty Phase Commissioning 34

XII. Team Member Roles and Responsibilities 35

XIII. Commissioning Schedule 67

XIV. Appendix A – Preliminary Log of Required Documentation 79

|  |
| --- |
| Commissioning Plan |

1. Introduction
2. The National Cemetery Administration (NCA) is committed to commissioning new facilities and systems required for the reliable, safe, and secure operation of the [project name] in [project location]. This process will verify that systems are complete and functioning properly upon project completion and that the facilities maintenance staff has appropriate system documentation and training.
3. Commissioning consists of systematically documenting that specified components and systems have been installed and started up properly and then functionally tested to verify that systems are complete and functioning properly upon project completion and that the NCA Facilities Management (FMD) staff has the appropriate system documentation and training. In addition, owner-personnel training will be verified and final project Operation & Maintenance (O&M) documents will be reviewed for completeness.
4. This document is intended to be a roadmap for the parties involved in the Commissioning process. The document will explain the systems to be commissioned, the process activities, the procedures to follow throughout the commissioning process, and the roles and responsibilities for each party involved. The commissioning activities will begin during the design phase of the project and proceed through the warranty period.
5. The team members for this project are committed to commissioning this facility and systems required for the reliable, safe, and secure operation of the Facility. This process is intended to verify that systems are properly installed, configured and operating in accordance with the requirements of the project and that operating personnel are adequately prepared to successfully operate the facility at project turnover.
6. For this project, the National Cemetery Administration establishes AE Design contracts for Design Phase and Construction Period Services.  The Department also establishes a construction contract with a Prime Contractor to provide construction services.  Both contracts are administered by a NCA Contracting Officer (CO) and his/her designated representative (COR).  During the Design Phase, this representative is the Project Manager; during the construction phase, it is the Resident Engineer.  On every project, the authority to modify any contract is strictly limited to the Contracting Officer and his/her designated representative.
7. In this structure, all communications on contractual issues are strictly limited to communications between the CO/COR and these two prime contractors (AE Team and Prime Contractor).  It is the practice of the NCA to require that communication between other parties to the contracts (AE Sub-consultants, Subcontractors and Vendors) be routed through these two prime contractors and the CO/COR.
8. Commissioning is a process that relies upon high levels of communications and collaboration between all parties to the construction process.  By its nature, the levels of communication and cooperation between the Commissioning Authority and all other parties to the construction process (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc) is essential to the success of the Commissioning effort.  In the absence of the relationships, cooperation and support created by this communication, the Commissioning Process will likely fail to achieve its ends.
9. With this fundamental conflict in mind, this Commissioning Plan has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and his/her Designated Representative.   Thus, all procedures outlined in this manual must be executed within the following limitations:

The Commissioning Agent may maintain a continuous open communication with the AE team, including sub-consultants, the Contractor and subcontractors and the Owner’s team to facilitate a collaborative commissioning process subject to the specific limitations outlined below.

All communications shall be copied to the Project Manager (Design Phase) and Resident Engineer (Construction Phase).

All Communications shall include specific reference to these contract limitations (e.g., “All issues identified in this Commissioning Issues Log are subject to Paragraph 2.5: Contractual Relationships in the NCA Commissioning Process Manual.”

All information from the Commissioning Agent to any party to the project must be transmitted with the following clear limitations:

No communications (verbal or written) will be deemed to constitute direction that modifies the terms of any contract between the National Cemetery Administration and any party to the construction project.

Commissioning Issues communicated in writing to the Contractor or AE Team and copied to the PM/RE are provided to all parties to the contract to expedite communication.  All issues must be understood as the professional opinion of the Commissioning Agent and suggestions for issue resolution only until expressly approved as direction by the Project Manager or Resident Engineer.

In the event that any Commissioning Issues and suggested resolutions are deemed to require either an official interpretation of the construction documents or are determined to require a modification of the contract documents, Contracting Officer or designated COR will issue an official directive to this effect.

All parties to the Commissioning Process shall be individually responsible for alerting the COTR of any issues that they deem to constitute a potential contract change prior to acting on these issues.

Authority for design and construction issues resolution rests solely with the Contracting Officer and his/her designated representative with appropriate technical guidance from the AE Team and/or Commissioning Agent.

1. Abbreviations
2. Operations and Maintenance (O&M)

Project Manager and/or Resident Engineer (PM/RE)

NCA Facilities Management Department Staff (FMD)

Design Professionals (D)

Construction Manager (CPM)

Installation Contractors (CONTR)

Testing, Adjusting & Balancing Contractor (TAB)

Commissioning Authority (CxA)

Request for Information (RFI)

Architect’s Supplemental Instructions (ASI)

Design Development Documents (DD)

Construction Documents (CD)

Commissioning (Cx)

Functional Performance Test (FPT)

Pre-Functional Checklist (PFC)

Corrective Action Notice (CAR)

Quality Control (QC)

1. Commissioning Goals
2. The Commissioning Authority has developed specific Commissioning Goals to emphasize the role commissioning will play in the design and construction processes:

* Meet or exceed NCA Project Requirements
* Optimize Systems Operations
* System operation and performance verification
* Performance Test results
* Pre-Functional checklists
* Equipment startup
* Documentation and Training for FMD Staff
* Operating instructions and documentation
* Operator equipment training
* Operator systems training
* Integrate Testing Schedules into Construction Schedule
* Coordination of trades
* Coordination of DDC vendor tasks
* Coordination of TAB vendor tasks
* Early identification and resolution of issues
* Clear and open communications

1. Project Description
2. [Provide a brief narrative description of the project, including overall project scope, goals, and systems.]
3. Commissioning Scope
4. [Commissioning Agent name] will provide commissioning services to support the [project name] project. Commissioning activities will include the tasks and deliverables outlined below.

Commissioning Scope

| Project Phase | Task | Description | Deliverable |
| --- | --- | --- | --- |
| Design | Review Owner’s Project Requirements | Review NCA Design Criteria and Owner’s Project Requirement document prior to submission to LEED Facilitator. | Review comment log. |
| Design | Review Basis of Design Document | Review the Basis of Design Document prior to submission to the LEED Facilitator | Review comment log. |
| Design | Review Schematic design | Review Schematic Design for familiarization, general conformance with Owner’s Project Requirements, Basis of Design and NCA Design Criteria. | Review comment log. |
| Design | Review Design Development design | Review Design Development design for familiarization, general conformance with Owner’s Project Requirements, Basis of Design and NCA Design Criteria. | Review comment log. |
| Design | Commissioning Specifications | Prepare Commissioning Specification “Section 01 91 13 – General Commissioning Requirements” to be included in project manual. | Commissioning Specification |
| Prepare Commissioning Specification for Division 03 – Burial Crypts, Division 07 – Thermal and Moisture Protection, Division 10 – Specialties, Division 11 – Equipment, Division 14 – Conveying Equipment, Division 21 – Fire Protection, Division 22 – Plumbing, Division 23 – HVAC, Division 26 – Electrical, Division 27 – Communications, Division 28 – Electronic Safety and Security, Division 32 – Lawn Irrigation, Division 33 – Utilities and to provide detailed commissioning, operations & maintenance and training requirements for individual technical specification sections. | Commissioning Specifications |
| Design | Design Phase Controls Meeting | Meet with Owner, Architect, Mechanical/Electrical Design Engineer, and Owner’s Controls Vendor to review Building Control Systems and Sequences of Operations. The focus of the meeting will be to obtain understanding of the interactions between systems and the control system in various operating modes. It is anticipated this meeting will be held in conjunction with a scheduled Owner/Architect design-phase meeting. | Meeting notes. |
| Design | Preliminary Commissioning Plan | Prepare Preliminary Commissioning Plan that describes the Commissioning Process, Commissioning Team with specific Roles and Responsibilities. The Commissioning Plan will include description of systems to be commissioned. | Preliminary Commissioning Plan |
| Design | Focused Design Document Review | Perform a focused review of a Design Document SD-1, SD-2, DD-1, DD-2, CD, and Final submissions. | Commissioning Design Review Log |
| Design | Focused Construction Document Review | Perform a focused review of the final Construction Document submission. This review will include a back check of commissioning comments provided during previous reviews. | Commissioning Design Review Log |
| Design | Design Phase Meetings | Participate in selected Design Phase Owner/Architect/ meetings. | Meeting Notes. |
| Design | Focused Design Review Meetings | Attend selected meetings with Owner and Design Team to review the design and specific commissioning design review comments. It is assumed this meeting will be scheduled in conjunction with scheduled Owner/Architect meetings. | Meeting Notes. |
| Design | LEED Commissioning-related Document Review | Assist LEED Facilitator with final review of commissioning-related design-phase LEED templates and required documentation. | Brief Narrative Reports |
| Design | Develop Measurement & Verification (M&V) Plan | Coordinate with the design team and the LEED energy modeling consultant to develop an M&V Plan for the project.  Coordinate with the design team to verify that appropriate instrumentation is included in the DDC or other systems to support the M&V Plan. | Draft M&V Plan  Marked up drawings showing required M&V instrumentations. |
| Construction | Final Commissioning Plan | Based on the final construction documents, update the Preliminary Commissioning Plan to identify specific systems to be commissioned. The Final Commissioning Plan will also include specific individual roles and responsibilities and Preliminary Pre-Functional Checklists and Functional Test Plans for systems to be commissioned. | Final Commissioning Plan. |
| Construction | Construction Commissioning Kick Off meeting | Conduct an initial commissioning meeting with all contractors and commissioning team members. The purpose of the meeting will be to establish the purpose and proposed process for commissioning this facility in the construction, acceptance and warranties phases of the project. Review the individual roles and responsibilities of each participating commissioning team member as specified in the Construction Documents. Meeting will be scheduled for each construction package with a commissioning scope. | Meeting Notes |
| Construction | Duration Schedule for Commissioning Activities | Based on Final Commissioning Plan, prepare a duration schedule to show the duration, predecessors and successors for commissioning activities. This duration schedule will be provided to the Construction Manager to include commissioning activities in the project construction schedule. This will allow commissioning activities to be smoothly integrated into the overall construction process. | Duration schedule with commissioning activities, predecessors, successors and key milestones. |
| Construction | Submittal and Shop Drawing Review | Based on final construction documents, prepare a list of selected submittals and shop drawings for review by the Commissioning Authority. | Submittal Request Checklist. |
| Construction |  | Review selected submittals and shop drawings to support the commissioning process. Review will be for the purpose of developing appropriate Pre-Functional Checklists and Functional Test Plans. Reviews will focus on the ability to commission the systems, maintainability and general conformance to owner’s requirements. Commissioning review of submittals and shop drawings does not replace the Design Team responsibility for approval. | Commissioning Submittal Review Log |
| Construction | Controls Meeting | After receipt of the Controls Submittal, participate in or conduct a meeting with the Owner’s representatives, Control Vendor, TAB contractor, Mechanical/Electrical Design team, mechanical sub-contractor and electrical sub-contractor to review the Controls Submittal and mechanical/electrical systems to be installed.  Focus will be on how the selected sequences of operation interact with the mechanical/electrical systems and how well they meet the owner’s requirements. | Meeting Notes  Marked up Controls Submittal and Sequence of Operations.  Commissioning Issues Log to track action items. |
| Construction | Pre-Functional Checklists | Prepare Pre-Functional Checklists for systems, components and/or equipment to be commissioned. These Pre-Functional Checklists will be used to document completion of system, component and/or equipment installation and to determine system readiness for functional testing.  Pre-Functional Checklists should be completed by the installing contractors to document the installation process. Completed Pre-Functional Checklists are to be submitted to the commissioning authority a minimum of seven days prior to testing.  Completed Systems Readiness Checklists will be spot checked by the commissioning authority to verify systems are ready for testing. | Draft Pre-Functional Checklists for owner and contractor review.  Final Pre-Functional Checklists for use by contractors and/or CxA. |
| Construction | Review Contractor Equipment Startup Checklists | Commissioning authority will review selected equipment startup reports prepared by installing contractor.  Commissioning authority will witness selected equipment startup procedures. Seven days prior notice is required to schedule commission authority witnessing the startup. | Contractor Equipment Startup Checklist (this checklist is part of the Submittal and Shop Drawing Review Checklist).  Commissioning Issues Log |
| Construction | Prepare Functional Test Plans | Based on final construction documents (including applicable changes), and approved submittals, prepare Functional Test Plans for systems to be commissioned. Draft Functional Test Plans will be issued for review by owner, installing contractors and DDC Vendor.  Final Functional Test Plans will be prepared incorporating review comments received from owner, contractors or DDC Vendor. | Draft Functional Test Plans for review by owner, installing contractors and DDC vendor.  Final Functional Test Plans for use in systems testing. |
| Construction | TAB Review | Review HVAC systems Test and Balance Plan prepared by the TAB vendor. Review will be to determine general conformance with owner’s requirements. | Commissioning Review Log |
| Review TAB Report prepared by TAB vendor following system air and water balancing. Review will be focused on TAB results that affect system performance and/or commissioning. Specific attention will be given to equipment installation and operational issues identified by the TAB vendor. | Commissioning Issues Log |
| Construction | Review O & M Manuals | Review Operations and Maintenance Manuals submitted by contractors for general conformance with specifications and owner’s requirements. | Commissioning Review Log |
| Construction | Prepare Systems Manuals | Prepare detailed systems manuals for commissioned systems. The manuals will provide operating staff the information needed to understand and optimally operate the commissioned systems. The manuals will describe system design, components, capacity and sequences of operations. Manuals will include descriptions of interactions with other systems and common systems failure modes and responses. | Systems Manuals – 1 hardcopy plus 2 electronic copies on CD/DVD |
| Construction | Review Training Plans | Review contractor and manufacturer training plans and agendas for general conformance with specifications and owner’s requirements. Observe selected training for quality of training and for general conformance with the training plan and agenda. | Commissioning Review Log |
| Construction | Warranty Review | Review contractor’s and manufacturer’s warranties for general conformance with specifications and owner’s requirements. | Commissioning Review Log |
| Construction | Systems Functional Testing | Direct functional testing for systems to be commissioned. Testing will be conducted as detailed on the specific Functional Test Plan for each system to be commissioned.  Functional testing will require support from the owner, mechanical contractor, electrical contractor, DDC Vendor, TAB Vendor, and specialty-systems installing contractors. Installing contractors must be available to respond to issues and problems identified during testing. | Executed Functional Test Plans.  Commissioning Issues Log |
| Construction | Construction Observation | Conduct Construction Observation visits to the construction site to observe construction activities. Specific attention will be given to installation of mechanical, electrical, and plumbing systems for general conformance with specifications and manufacturer’s installation requirements. Specific attention will also be given to installation of site utilities, site improvements and building envelope construction for general conformance with plans, specifications and manufacturer’s installation requirements. | Field Observation Reports  Commissioning Issues Log. |
| Construction | Verify M&V instrumentation | Verify proper installation and calibration of instrumentation necessary to support the M&V program | Commissioning Issues Log |
| Construction | Final Commissioning Report | Compile a comprehensive commissioning report documenting all commissioning activities, including but not limited to:   * Commissioning scope * Test methods and results * Outstanding commissioning issues * Issues log * Commissioning plan * Status reports * Submittal and O&M manual reviews * Training record * Pre-Functional Checklists * Design Review Comments   Scope includes one submission of a preliminary report for owner review. Scope includes one submission of the Final Commissioning Report that incorporates owners review comments. | Preliminary Commissioning Report – 1 hardcopy for owner review.  Final Commissioning Report – 1 hardcopy plus 2 electronic submissions on CD/DVD. |
| Construction | Owner Architect and Construction Manager Meetings (Construction Phase) | Attend selected Owner/Architect/Contractor Meetings. CxA will attend meetings to discuss commissioning issues, review the Commissioning Issues Log and to maintain awareness of general construction schedule and issues. | Meeting Notes (it is assumed the Construction Manager will provide the official minutes). |
| Construction | Commissioning Progress Meetings | Conduct Commissioning Progress Meetings to review system installation progress, system readiness, and preparation for functional systems testing. These meetings will also review status of unresolved commissioning issues and progress towards resolution of the issues. The Construction Manager, Construction Commissioning Manager, Construction Quality Control Manager, and commissioning representatives from the Mechanical/Electrical Design team, mechanical contractor, electrical contractor, DDC vendor, TAB vendor, and specialty systems installing contractors will attend these meetings. | Meeting minutes. |
| Construction | Status Reports | Provide periodic status reports detailing activities, significant unresolved issues, and upcoming commissioning activities. Prepare report outlining status of deliverables for the project. Status reports are submitted with invoices for professional services. | Monthly Narrative Status Report.  Monthly Percent Complete Report. |
| Construction | Master Issues Log | Maintain a Commissioning Issues Log to document commissioning issues identified during construction and functional testing. The Commissioning Issues Log will include recommended responsible party and recommendations for resolution of the issue. The Commissioning Issues Log will also be used to document progress toward resolution and the final resolution | Commissioning Issues Log |
| Construction | Review Change Orders, ASI, and RFI | Review change orders, architect’s supplemental instructions and requests for information (with design team response) for issues that affect commissioning. Review is for information only and does not constitute technical or contractual approval or disapproval. | Commissioning Requests for Information. |
| Construction | LEED Commissioning Document Review | Prepare LEED templates and required documentation relative to construction phase commissioning activities. Task to be performed electronically through the LEED On-Line web site and/or electronic communication with the LEED Facilitator. | Draft LEED Templates and Brief Narrative Reports |
| Warranty | Deferred and/or seasonal Testing | Direct testing that was deferred due to lack of system readiness or for seasonal requirements. Testing will be conducted in accordance with Functional Test Plans. Testing support will be required from the DDC Vendor and owner. We have assumed this testing will be performed during a two-day site visit approximately 10 months after substantial completion. | Executed Functional Test Plans.  Commissioning Issues Log |
| Warranty | Post-Occupancy Warranty Checkup | Return to the project approximately 10 months into the 12 month warranty period to review the building operation with the facility staff and discuss outstanding issues related to commissioning and outstanding warranty issues. Provide suggestions for improvements. Assist facility staff in developing reports, documents and requests for service to remedy outstanding problems. We have assumed this will be performed during a (TBD)-day site visit approximately 10 months after substantial completion | Field Observation Report |
| Warranty | Final Commissioning Report Amendment | Amend Final Commissioning Report to document the Warranty Phase commissioning activities. | Amendment to Final Commissioning Report. |

Design Phase Commissioning Services will be provided by the [location] office of [Commissioning Agent Name].

Construction Phase Commissioning Services will be provided at the Construction Site in [location].

The scope of Commissioning Services described above will meet the Fundamental Commissioning of Building Energy Systems requirements as outlined in the LEED® Energy & Atmosphere (EA) Pre-Requisite 1. The scope of services will also meet the Enhanced Commissioning requirements outlined in LEED® EA Credit 3.

The scope of Commissioning Services also includes developing and implementing a Measurement and Verification Plan to meet the requirements of LEED®- Energy and Atmosphere (EA) Credit 5.

1. Systems to Be Commissioned
2. The systems and equipment to be commissioned are outlined in the table below. A more detailed list of specific systems and equipment is provided in Appendix B.

Systems To Be Commissioned

| System | Pre-Functional Checklists | Equipment Startup | Functional Testing | Sample Size | Remarks |
| --- | --- | --- | --- | --- | --- |
| **Div 3 – Pre-Cast Burial Crypts** | | | | | |
| Burial Crypts | No | No | No | TBD | Cx consists of sampling of required specification tests and test reports |
| **Div 11 - Equipment** | | | | | |
| Global Positioning System (GPS) | Yes | No | Yes | TBD | [list applicable bid packages or other remarks] |
| Geographical Information System | Yes | No | Yes | TBD | [list applicable bid packages or other remarks] |
| **Div 21 - Fire Protection** | | | | | |
| Fire Protection Systems | Yes | Yes | Yes | TBD | [list applicable bid packages or other remarks] |
| **Div 22 - Plumbing** | | | | | |
| Domestic Hot Water Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| **Div 23 - HVAC** | | | | | |
| Air Handling Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Dehumidification Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Heating Hot Water Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Chilled Water Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Exhaust Fans | Yes | Yes | Yes | TBD | [list applicable bid packages or other remarks] |
| Direct Digital Control System | Yes | Yes | Yes | TBD | [list applicable bid packages or other remarks] |
| Computer Room HVAC Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| **Div 26 - Electrical** | | | | | |
| Utility service entrance Switchgear | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Standby Generator Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Generator Paralleling Switchgear | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Generator Power Distribution Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Utility Power Unit Substations | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Generator Power Unit Substations | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Automatic Transfer Switches | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Normal Power Distribution Systems | Yes | Yes | Yes | TBD | [list applicable bid packages or other remarks] |
| Life Safety Power Distribution Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Critical Power Distribution Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Essential Equipment Power Distribution Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| Lighting Controls | Yes | Yes | Yes | TBD | [list applicable bid packages or other remarks] |
| UPS Systems | Yes | Yes | Yes | 100% | [list applicable bid packages or other remarks] |
| **Div 27 - Communications** | | | | | |
| **Div 28 – Electronic Safety and Security** | | | | | |
| Fire Detection and Alarm Systems | Yes | Yes | Yes | TBD | [list applicable bid packages or other remarks] |

1. Commissioning Team
2. The Commissioning Team shall consist of representatives from the following parties involved in the design and construction of this facility. The time at which individual members join the team and the level of their participation during the different phases of the project will vary from member to member.

Commissioning Team

| Item | Team Member | Description | Contact Information |
| --- | --- | --- | --- |
| PM | Project Manager | Program Management Representative responsible for contractual and technical aspects of the project. | Name  Organization  Address  City, State Zip  Phone:  Email: |
| RE | Resident Engineer | On-site technical representative of the Contracting Officer. | Name  Organization  Address  City, State Zip  Phone:  Email: |
| NCA | NCA Representative | Representative of the National Cemetery Administration | Name  Organization  Address  City, State Zip  Phone:  Email: |
| A | Architectural Design Professional | Architect’s Construction Administration Representative | Name  Organization  Address  City, State Zip  Phone:  Email: |
| MEP | Mechanical, Electrical and Plumbing Design Professional | MEP Construction Administration Representative | Name  Organization  Address  City, State Zip  Phone:  Email: |
| CxA | Commissioning Agent | Project Manager for Commissioning Agent | Name  Organization  Address  City, State Zip  Phone:  Email: |
| CxTL | Commissioning Agent Technical Lead | Primary point of contact for Commissioning technical issues | Name  Organization  Address  City, State Zip  Phone:  Email: |
| CPM | Construction Project Manager | Contractor’s Project Manager responsible for construction and coordination of sub-contractors | Name  Organization  Address  City, State Zip  Phone:  Email: |
| CQC | Quality Control Manager | Contractor’s Quality Control Manager responsible for managing the construction quality program | Name  Organization  Address  City, State Zip  Phone:  Email: |
| FP | Fire Protection Contractor | Commissioning Representative for the Sub-contractor responsible for installation of fire protection systems | Name  Organization  Address  City, State Zip  Phone:  Email: |
| PLMG | Plumbing Contractor | Commissioning Representative for the Sub-contractor responsible for installation of plumbing systems | Name  Organization  Address  City, State Zip  Phone:  Email: |
| HVAC | Mechanical Contractor | Commissioning Representative for the Sub-contractor responsible for installation of HVAC systems | Name  Organization  Address  City, State Zip  Phone:  Email: |
| EC | Electrical Contractor | Commissioning Representative for the Sub-contractor responsible for installation of MV and LV electrical systems | Name  Organization  Address  City, State Zip  Phone:  Email: |
| SC | Specialty Systems Contractor | Commissioning Representative for the Sub-Contractor(s) responsible for installation of specialty and/or low voltage systems | Name  Organization  Address  City, State Zip  Phone:  Email: |
| DDC | DDC Vendor | Commissioning Representative for the DDC vendor responsible for providing the control system(s) | Name  Organization  Address  City, State Zip  Phone:  Email: |
| TAB | Testing and Balancing Vendor | Commissioning Representative for the TAB vendor responsible for certified air- and water-testing and balancing. | Name  Organization  Address  City, State Zip  Phone:  Email: |

Roles and Responsibilities for the Commissioning Team members are described elsewhere in this Commissioning Plan.

1. Commissioning Communications and Document Distribution
2. The following table outlines the submittal and distribution requirements for various documents used in the commissioning process.

Communication Distribution Matrix

| Document | Prepared by: | Submitted to: | Copies to: | Comments |
| --- | --- | --- | --- | --- |
| Owner’s Project Requirements | PM | * Design Team | * QA * CxA * CPM |  |
| OPR Comment Log | CxA | * PM | * QA * Design Team * CPM |  |
| Basis of Design Document (Design Narrative) | Design Team | * PM | * QA * CxA * CPM |  |
| Schematic Design Documents | Design Team | * PM | * QA * CxA * CPM | Design team submits direct to PM |
| Schematic Design Review Comment Log | CxA | * PM | * QA * Design Team * CPM | PM Review comments submitted separately to Design Team |
| Design Development documents | Design Team | * PM | * QA * CxA * CPM |  |
| DD Review Comment Log | CxA | * PM | * QA * Design Team * CPM | PM Review comments submitted separately to Design Team |
| General Commissioning Requirements Specification Section (01 91 00) | CxA | * PM | * QA * Design Team |  |
| Commissioning Specifications Coordination Matrix | CxA | * PM | * QA * Design Team |  |
| Design Phase Controls Meeting | Minutes by Design Team  Notes by CxA | * PM | * QA * CxA * CPM |  |
| Preliminary Commissioning Plan | CxA | * PM | * QA * CPM * Design Team * DDC * TAB |  |
| Progress CD Drawings and Specs | Design Team | * PM | * QA * CxA * DDC |  |
| Progress Set Review Comments Log | CxA | * PM | * QA * Design Team |  |
| Final Construction Documents | Design Team | * PM | * QA * CxA * CPM | Design team submits directly to NCA as separate submission |
| Final CD Review Comment Log | CxA | * PM | * QA * Design Team * CPM | PM Review comments submitted separately to Design Team |
| Design Phase Meeting Minutes | Design Team | * PM | * QA * CxA * CPM |  |
| Focused Design Review Meeting Minutes | Minutes by Design Team  Notes by CxA | * PM | * QA * CxA * CPM |  |
| Final Commissioning Plan | CxA | * RE | * QA * Design Team * CPM * DDC * TAB |  |
| Construction Kickoff Meeting Minutes | CPM | * RE | * QA * CxA * Design Team |  |
| Duration Schedule for Commissioning Activities | CxA | * RE | * QA * CPM | Initial submission included in Final Commissioning Plan  Updates provided as necessary |
| Submittals and Shop Drawings | CPM | * RE | * Design Team * CxA * QA | Submittals and Shop Drawings are submitted to the Design Team as separate submission |
| Submittal and Shop Drawing Comment Log | CxA | * RE | * CPM * Design Team * QA | Design team comments and/or approval provided separately to CPM and PM |
| Construction Phase Controls Meeting Minutes | CPM  Notes by CxA | * RE | * QA * CxA * Design Team * DDC |  |
| Preliminary Pre-Functional Checklists | CxA | * RE | * QA * CPM * DDC |  |
| System Pre-Functional Checklist Comments | CPM  PM  DDC | * RE | * CxA * QA |  |
| Final Pre-Functional Checklists | CxA | * RE | * CPM * QA |  |
| Executed Pre-Functional Checklists | CPM | * RE | * CxA * QA |  |
| Contractor Startup Reports | CPM | * RE | * CxA * QA * Design Team * DDC |  |
| Contractor Startup Report Comment Log | CxA | * RE | * QA * CPM * Design Team * DDC |  |
| Preliminary Functional Test Procedures | CxA | * RE | * QA * CPM * DDC |  |
| Preliminary Functional Test Procedure Comments | PM  CPM  DDC | * RE | * CxA * QA * DDC |  |
| Final Functional Test Procedures | CxA | * RE | * QA * CPM * DDC |  |
| Executed Functional Test Procedures | CxA | * RE | * QA * CPM * DDC |  |
| TAB Plan | TAB | * RE | * QA * CxA * Design Team |  |
| TAB Plan Review Comment Log | CxA | * RE | * QA * TAB * Design Team |  |
| TAB Daily Worksheets | TAB | * RE | * CxA * MEP |  |
| TAB Final Report | TAB | * RE | * QA * Design Team * CxA |  |
| TAB Final Report Comment Log | CxA | * RE | * QA * TAB * Design Team |  |
| O&M Manuals | CPM | * RE | * QA * NCA * CxA * Design Team |  |
| O&M Manual Comment Log | CxA | * RE | * CPM * QA * NCA * Design Team |  |
| Systems Manuals | CxA | * RE | * QA * NCA * CPM * Design Team |  |
| System Manual Review Comments | QA  FMD  CPM  Design Team | * RE | * QA * NCA * CxA * CPM * Design Team |  |
| Training Plans | CPM | * RE | * QA * NCA * CxA * Design Team |  |
| Training Plan Comment Log | CxA | * RE | * QA * NCA * CPM * Design Team |  |
| Warranty and other Closeout Documents | CPM | * RE | * QA * CxA * Design Team |  |
| Warranty and Closeout Comment Log | CxA | * RE | * QA * CPM * Design Team |  |
| System Functional Testing Field Reports | CxA | * RE | * QA * CPM * DDC |  |
| Construction Observations Field Reports | CxA | * RE | * QA * CPM * DDC |  |
| Preliminary Commissioning Report | CxA | * QA | * PM * CPM * DDC * TAB |  |
| Commissioning Report Review Comments | QA | * CxA | * PM * CPM * DDC * TAB |  |
| Final Commissioning Report | CxA | * QA | * PM * CPM * DDC * TAB |  |
| Construction O/A/C Meeting minutes | CPM | * RE | * QA * CxA * Design Team * DDC |  |
| Commissioning Status Reports | CxA | * QA | * PM |  |
| Master Issues Log | CxA | * RE | * QA * CPM * DDC |  |
| Change Orders, ASI, RFI | Design Team  CPM | * RE | * QA * CxA * CPM * Design Team |  |
| Deferred / Seasonal Testing Field Report | CxA | * RE | * QA * CPM * DDC |  |
| Deferred / Seasonal Executed Functional Test Procedures | CxA | * RE | * QA * CPM * DDC |  |
| Warranty Checkup Field Report | CxA | * RE | * QA * CPM * DDC |  |
| Master Issues Log | CxA | * RE | * QA * CPM * DDC |  |
| Commissioning Report Amendment | CxA | * QA | * PM |  |

1. Pre-Design Phase Commissioning
2. Design Intent Document: During the Pre-Design Phase, PM will solicit and award contracts for the Design Team, Construction Manager and Commissioning Authority. Once these contracts are executed, the Design Team will begin developing the project design. The CPM will assist the Design Team by providing advice on construction issues and periodic cost estimates. The Design Team will prepare a Design Narrative to document the NCA project requirements. The mechanical, electrical, plumbing, controls and other technical sections will provide a reference for all design and commissioning requirements. This document will be updated as needed during the design process to document changes in the NCA project requirements.
3. Design Narrative: The Design Team will also prepare a Design Narrative that provides documentation on the design assumptions, design parameters, design calculations, and decisions made during design to implement the Design Intent Document. The Design Narrative is also submitted to the PM for review.
4. The goal of the commissioning tasks in the Pre-Design Phase of the project include the following:
5. The CxA, PM, CPM and NCA representatives will review and provide written comments on the Design Intent Document.
6. The CxA, PM, CPM and NCA representatives will review and provide written comments on the Design Narrative.
7. Design Phase Commissioning
8. Schematic Design Phase: The goals of the commissioning tasks in the Schematic Design Phase of the project include the following:
9. The CxA, PM, and NCA representatives will review and provide written comments on the Schematic Design documents submitted by the Design Team. The focus of the CxA review will be on adherence to the Design Narrative. The review comments will be geared towards aligning the design and design narrative with the Design Intent Document and/or updating the Design Narrative with decisions approved by NCA during the Schematic Design Phase.

Design Development Phase: The goals of the commissioning tasks in the Design Development Phase of the project include the following:

1. The CxA, PM, and NCA representatives will review and provide written comments on the Design Development documents submitted by the Design Team. The focus of the CxA review will be on adherence to the Design Narrative as updated after the Schematic Design Phase. The review comments will be geared towards aligning the design and design narrative with the Design Narrative and/or updating the Design Narrative with decisions approved by NCA during the Design Development Phase.
2. The CxA will prepare the Preliminary Commissioning Plan to provide an initial framework for commissioning activities that will follow. This Preliminary Commissioning Plan will be aligned with the project scope and schedule. It will be reviewed by the PM, NCA, CPM and other interested parties.
3. The CxA will also prepare preliminary commissioning specifications to be included in the project manual. The preliminary specifications will include Section 01 91 00 – GENERAL COMMISSIONING REQUIREMENTS as well as language to be included in other Division 7, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 32 and Division 33 specification sections. The Design Team will review the preliminary commissioning specifications and provide written comments to the CxA. The CxA will revise the Preliminary Commissioning Specification and re-submit to the Design Team.
4. A review conference is held with the Design Team, PM, NCA, CxA and CPM to coordinate review comments and responses.
5. The CxA, CPM, Design Team, PM, and NCA will hold a meeting to review mechanical, electrical and plumbing system selections and to develop the preliminary control system Sequences of Operations for the project. Based on the results of this meeting, the Design Team will use these concepts as the basis for designing the final control system specifications and Sequences of Operations to be included in the construction documents. The Design Team will notify and coordinate and changes with the other parties involved in the control system.
6. The CxA will update the Commissioning Plan to incorporate any changes resulting from the Design Development submission and review comments.
7. The CxA will also prepare the Commissioning Specifications Coordination Matrix. This document is based on the outline specifications provided by the Design Team. It provides recommended wording to be included in the technical specifications sections to identify commissioning, O&M manual and training requirements for the CPM and the installing contractors.
8. The Design Narrative will be updated by the CxA to incorporate decisions approved during the Design Development phase.

Construction Document Phase: The goals of the commissioning tasks in the Construction Document Phase of the project include the following:

1. The Design Team will prepare final construction documents that will be used to construct the facility. A progress set of drawings and specifications will be issued for review at approximately the 50% CD stage. The CxA, PM, CPM, and NCA will review the progress set to verify that the design is proceeding in accordance with the Design Narrative.
2. The CxA will prepare a final, detailed list of systems and equipment to be commissioned.
3. The CxA will prepare preliminary Pre-Functional Checklists and Systems Functional Performance Test procedures for each type of system to be commissioned. These will be published in the Preliminary Commissioning Plan to be included as an informational appendix to Specification Section 01 91 00 – GENERAL COMMISSIONING REQUIREMENTS that will be issued for bid.
4. A review conference will be conducted to coordinate review comments and provide direction for adjustments in the design prior to issuing the final construction documents.
5. The CxA will update the Design Narrative to reflect changes approved during the review conference.
6. The Design Team will issue final Construction Documents, including drawings, and specifications. These will be reviewed by the CxA, PM andNCA. The CPM will also review the final construction documents and prepare the final estimates of construction costs.
7. Construction and Acceptance Phase Commissioning
8. The CxA will prepare the Construction Commissioning Plan that incorporates any changes due to the Final Construction Documents or Design Narrative. This Commissioning Plan outlines the commissioning activities during the Construction and Acceptance Phase of the project.
9. A Commissioning Kickoff Meeting will be held at the start of construction to describe the commissioning process for the Construction Team which includes the CPM, installing sub-contractors (Mechanical, Electrical, Plumbing, Controls Electrical, DDC, TAB, and others). Preliminary Pre-Functional Checklists and Functional Test Plans will be included to describe the level of involvement required of all parties.
10. The CxA will provide preliminary Commissioning Milestones, predecessors, successors, and durations to the CPM. The CPM will be able to use these data to integrate commissioning activities into the project construction schedule. The CxA will align commissioning activities with the construction schedule for each construction phase.
11. The CxA will attend periodic Owner/Architect/Contractor (O/A/C) meetings to discuss commissioning activities, field reports, issues log and responses to commissioning issues noted during construction.
12. Regular Commissioning Progress meetings will be held for each construction phase. These meetings are a forum to review progress and to discuss issues affecting installation, coordination, startup, and testing of the systems to be commissioned. Meeting attendees should include the Commissioning Agent, RE, CPM, mechanical, electrical, plumbing, controls and TAB subcontractors. Design team members, especially the MEP designers are also encouraged to attend.
13. It is anticipated these meetings will be held quarterly during the early stage of construction. Once the building has come out of the ground and the exterior shell is being constructed, the meetings will be held on a monthly basis. As the mechanical, electrical and plumbing systems are being installed, it is likely the commissioning meetings will be held bi-weekly.
14. The Commissioning Agent will witness selected equipment startups for mechanical, electrical and plumbing components. The purpose will be to observe any issues that may arise that would affect equipment or system operations.
15. The Commissioning Agent will conduct periodic Field Observations to review construction progress, overall quality of workmanship, and to review maintenance access to equipment. The CxA will issue a Field Observation Report following each visit. The report will describe any specific observations that are found. The specific observations will be tracked on the Commissioning Master Issues Log.
16. The RE, CPM, installing sub-contractors and the Design Team (as necessary) should review the Field Reports to determine the most appropriate resolution for the issue. The CxA will assist in determining the resolution as requested. The status of issue resolution will be a primary topic of discussion at the Commissioning Progress meetings and O/A/C meetings.
17. The CxA will review selected submittals and shop drawings relative to the systems to be commissioned. The review will be to determine if sufficient information is provided to describe system installation, operation and the information necessary to commission the equipment and systems.
18. The CxA will review the Operations & Maintenance data submitted by the installing contractor and the CPM. The Commissioning Specification provides specific requirements for O&M Manuals that are more detailed for those systems to be commissioned. The O&M Manuals will be review to determine compliance with these additional requirements.
19. The Cx A will prepare systems narratives and other information to be added to the O&M data provided by the installing contractors and the CPM to become the Systems Operations and Maintenance Manual (SOMM). The SOMM will provide operations and maintenance staff with an overview of the system design parameters, intended operating conditions and sequences. It will also provide data necessary to maintain and troubleshoot the equipment and systems.
20. The installing contractors and the CPM will prepare equipment training plans intended to provide basic equipment operating and maintenance procedures. The installing contractors and the CPM will prepare training plans that will outline the training to be provided and the intended outcome of the training. The CxA will review the training plans to determine that the training will meet the requirements of the specifications and the FMD staff.
21. The Commissioning Agent will prepare Pre-Functional Checklists that the installing sub-contractors will complete to document equipment and systems are complete and ready for testing.
22. The Commissioning Agent will also prepare detailed System Functional Performance Test plans that will provide detailed step-by-step procedures that will be used to verify system operations under all operating conditions. These test procedures will be issued to the RE, CPM, installing Contractors, DDC, TAB and NCA for review and comment. The reviews should focus on the ability to implement the steps, especially the control systems adjustments, necessary to perform the test. The reviewers should also note any procedures that would damage the equipment or system.
23. The installing sub-contractors are encouraged to use the System Functional Test Plans as a tool for pre-testing the equipment and systems prior to the “official” functional testing. This will allow early detection and resolution of problems.
24. The CxA will assist the CPM in scheduling equipment training. The CxA will review training plans prepared by the CPM and the installing sub-contractors.
25. The CxA will conduct enhanced systems training for NCA staff. This training will focus on the system operation, design criteria, and troubleshooting of systems level issues. It is anticipated that the enhanced systems training will be conducted prior to functional testing to facilitate participation of the FMD staff in the testing activities.
26. It is the expectation that System Functional Testing will demonstrate that the systems perform in accordance with design criteria, construction documents and NCA requirements. Functional testing pre-requisites are that the system components and equipment are completely installed, all required power connections are complete, all required control connections and control functions are operational, and that required air and hydronic testing and balancing has been completed. When required by construction specifications, third-party testing must also be complete and required test reports have been submitted to the RE and CxA for review.
27. Functional testing of each system to be commissioned will be conducted by the CxA. The CxA will witness and document the testing; the installing sub-contractors, DDC contractor, and TAB contractor will conduct the testing by operating the equipment, adjusting the control system and performing measurements in accordance with the System Functional Test Plan. The NCA staff is encouraged to assist in the testing as an additional training opportunity.
28. Issues and/or failures detected during the Functional Performance Testing will be documented on the test plan, on Field Observation reports and on the Master Issues Log. Installing sub-contractors, DDC contractor, and/or TAB contractor will be responsible for correcting each issue as directed by the RE, and reporting the corrective action to the RE and CxA. The CxA will document the corrective action on the Master Issues Log. The need for re-testing will be determined by the RE in consultation with the CxA.
29. Upon completion of all commissioning activities, including resolution of all issues on the Commissioning Master Issues Log, the CxA will prepare and issue the Final Commissioning Report. This report will include the final version of the Commissioning Plan, copies of all Commissioning Meeting Minutes, Commissioning Field Observation Reports, Pre-Functional Checklists, Functional Performance Test results, and the Commissioning Master Issues Log. The report will also include blank copies of the Functional Test Plans for use by NCA for future re-commissioning activities.
30. Warranty Phase Commissioning
31. The CxA will review operational data from the NCA DDC System to monitor system operations. Significant deviations from defined criteria will be noted and referred to NCA for further investigation.
32. Conduct any deferred or seasonal functional testing that was not completed during the Construction and Acceptance Phase. Issues identified during the deferred or seasonal testing will be documented on the Commissioning Issues Log. The CPM will be notified of the issue and will be responsible for resolution. The CPM will document the resolution and the CxA and FMD will verify the resolution. The RE in consultation from the CxA, will determine the need for re-testing.
33. Conduct a 10-month warranty review to identify any potential warranty issues prior to expiration of the warranty. The warranty review will include interviews with FMD staff and an on-site inspection of systems and equipment condition and operations.
34. Warranty issues identified during the review will be documented on the Commissioning Issues Log. Written notice of potential warranty issues will be provided to the RE. Upon direction by the RE, the CPM will schedule appropriate sub-contractors to correct the issues within the balance of the warranty period. The CPM will provide written documentation that each warranty issue has been resolved. The CxA and NCA will spot-check selected issues to verify resolution.
35. The CxA will prepare an amendment to the Final Commissioning Report to document the deferred or seasonal testing, any re-testing, and the results of the warranty review.
36. Team Member Roles and Responsibilities
37. The following is an outline of team member responsibilities in the Design, Construction and Acceptance, and Warranty phases of the commissioning process. These responsibilities are meant to be limited to those tasks related to the commissioning process and are not intended to be representative of each team member’s contractual responsibilities for other aspects of this project.
38. In the table that follows, the tasks identified for the “CxA” include the Commissioning Project Manager, Commissioning Technical Lead, or other Commissioning Specialists and sub-consultants as directed by the CxA.
39. In the table that follows, the tasks identified for the “Design Team” include the Architect, MEP Engineer, Civil Engineer or other design consultants as directed by the RE and Architect.
40. In the table that follows, the tasks identified for “Contractor” include the Construction Project Manager, as well as the commissioning representatives for the installing sub-contractors, as directed by the RE and the Construction Project Manager.
41. In the table that follows, the tasks identified for “DDC” include the owner’s DDC Vendor as directed by the RE and CPM.
42. In the table that follows, the tasks identified for “TAB” include the owner’s TAB Vendor as directed by the RE or CPM.

Commissioning Team Roles and Responsibilities

| Project Phase | Cx Task | Description | Team Member | Responsibility |
| --- | --- | --- | --- | --- |
| Design | Review Owner’s Project Requirements | Review NCA Design Criteria and Owner’s Project Requirement document prior to submission to LEED Facilitator. | PM | * Prepare and issue Owner’s Project Requirements based on specific requirements, Ed Specs and District Design Criteria. |
| CxA | * Review and comment on Owner’s Project Requirements. Submit comments to the PM and QA. |
| Design Team | * Review for understanding project requirements. |
| CPM | * None. |
| DDC | * None |
| TAB | * None |
| Design | Review Design Narrative | Review the Design Narrative Document | PM | * Receive and distribute Basis of Design documents to CPM, CxA, and other NCA agencies as necessary. |
| CxA | * Review Design Narrative document. * Provide comment log to PM and Design Team. |
| Design Team | * Prepare Phase 1 (Schematic Design) and Design Narrative to describe design approach. |
| CPM | * None. |
| DDC | * None |
| TAB | * None |
| Design | Review Schematic design | Review Schematic Design for familiarization, general conformance with Owner’s Project Requirements, Basis of Design and NCA Design Criteria. | PM | * Receive and distribute Schematic Design package to Peer Reviewer, CxA, and other NCA agencies as necessary. |
| CxA | * Review Schematic Design * Provide comment log to PM and QA. |
| Design Team | * Prepare Schematic Design. * Provide responses to CxA review comments. * Incorporate changes into design as directed by PM. |
| CPM | * None. |
| DDC | * None |
| TAB | * None |
| Design | Design Development design | Review Design Development design for familiarization, general conformance with Owner’s Project Requirements, Design Narrative, and NCA Design Criteria. | PM | * Receive and distribute Design Development package to Peer Reviewer, CxA, DDC and other NCA agencies as necessary. |
| CxA | * Review Design Development drawings and specs. * Update Design Narrative * Provide comment log to PM and QA. |
| Design Team | * Prepare Design Development drawings and specs. * Provide responses to CxA review comments. * Incorporate changes into design as directed by PM. |
| CPM | * None. |
| DDC | * None. |
| TAB | * None |
| Design | Commissioning Specifications | Prepare Commissioning Specification “Section 01 91 00 – General Commissioning Requirements” to be included in project manual.  Prepare Commissioning Specification for Division 21 – Fire Protection, Division 22 – Plumbing, Division 23 – HVAC, Division 26 – Electrical, Division 27 – Communications, and Division 28 – Electronic Safety and Security to provide detailed commissioning, operations & maintenance and training requirements for individual technical specification sections. | PM | * Review, comment and approve Cx specifications as part of project manual review. |
| CxA | * Prepare Cx Specification Section 01 91 13. * Prepare systems commissioning specifications. |
| Design Team | * Incorporate commissioning specifications into Project Manual. |
| CPM | * None. |
| DDC | * None. |
| TAB | * None. |
| Design | Design Phase Controls Meeting | Meet with Owner, Architect, and Mechanical/Electrical Design Engineer to review Building Control Systems and Sequences of Operations. The focus of the meeting will be to obtain understanding of the interactions between systems and the control system in various operating modes. | PM | * Schedule, facilitate and attend meeting. |
| CxA | * Attend meeting to discuss control sequences and strategies. |
| Design Team | * Attend meeting to discuss control sequences and strategies. |
| CPM | * None |
| DDC | * None. |
| TAB | * None |
| Design | Preliminary Commissioning Plan | Prepare Preliminary Commissioning Plan that describes the Commissioning Process, Commissioning Team with specific Roles and Responsibilities. The Commissioning Plan will include description of systems to be commissioned. | PM | * Review Cx Plan * Provide comments to CxA. |
| CxA | * Prepare Cx Plan * Submit to PM and QA |
| Design Team | * Review Cx Plan relative to Design Team roles and responsibilities. |
| CPM | * None. |
| DDC | * None. |
| TAB | * None. |
| Design | Focused Construction Document Review (Progress Set) | Perform a focused review of a Construction Document progress submission (recommend review prior to the 50% CD stage). | PM | * Receive and distribute Progress Set drawings and specs to QA, CxA, DDC and other NCA agencies as necessary. |
| CxA | * Review Progress Set drawings and specs. * Update Design Narrative * Provide comment log to PM and QA. |
| Design Team | * Prepare Progress Set drawings and specs. * Provide responses to CxA review comments. * Incorporate changes into design as directed by PM. |
| CPM | * None |
| DDC | * None. |
| TAB | * None |
| Design | Focused Construction Document Review | Perform a focused review of the final Construction Document submission. This review will include a back check of commissioning comments provided during previous reviews. | PM | * Receive and distribute Construction Documents package to QA, CxA, DDC and other NCA agencies as necessary. |
| CxA | * Review Construction Document drawings and specs. * Update Design Narrative * Provide comment log to PM and QA. |
| Design Team | * Prepare Construction Documents drawings and specs. * Provide responses to CxA review comments. |
| CPM | * None. |
| DDC | * None |
| TAB | * None. |
| Design | Design Phase Meetings | Participate in Design Phase meetings. | PM | * Schedule, facilitate and attend meetings |
| CxA | * Attend approximately selected meetings to discuss Commissioning Issues. |
| Design Team | * Conduct meetings * Provide meeting minutes to PM, CxA and others as directed by PM. |
| CPM | * None |
| DDC | * None. |
| TAB | * None. |
| Design | Focused Design Review Meetings | Attend Design Review meetings to review the design and specific commissioning design review comments. | PM | * Schedule, facilitate and attend meetings. |
| CxA | * Attend meetings to discuss commissioning review comments. |
| Design Team | * Attend meetings to discuss design and to respond to commissioning and DDC comments. |
| CPM | * None. |
| DDC | * None. |
| TAB | * None. |
| Construction | Final Commissioning Plan | Based on the final construction documents, update the Preliminary Commissioning Plan to identify specific systems to be commissioned. The Final Commissioning Plan will also include specific individual roles and responsibilities and preliminary Pre-Functional Checklists and Functional Test Plans for systems to be commissioned. | PM | * Review and approve Commissioning Plan. * Provide comments to CxA and QA. |
| CxA | * Prepare Final Commissioning Plan. * Prepare preliminary Pre-Functional Checklists * Prepare Preliminary Systems Functional Performance Test procedures. * Issue to PM and QA. * Incorporate comments into Cx Plan revisions as necessary. |
| Design Team | * Review Cx Plan relative to Design Team roles and responsibilities. * Provide comments to PM and CxA. |
| CPM | * Review Cx Plan relative to CPM and installing sub-contractor’s roles and responsibilities. * Provide comments to PM and CxA. |
| DDC | * Review Cx Plan relative to DDC roles and responsibilities. * Provide comments to QA and CxA. |
| TAB | * Review Cx Plan relative to TAB roles and responsibilities. * Provide comments to QA and CxA. |
| Construction | Construction Commissioning Kick Off meeting | Conduct an initial commissioning meeting with all contractors and commissioning team members. The purpose of the meeting will be to establish the purpose and proposed process for commissioning this facility in the construction, acceptance and warranties phases of the project. Review the individual roles and responsibilities of each participating commissioning team member as specified in the Construction Documents. | RE | * Schedule, facilitate and attend meeting. |
| CxA | * Conduct meeting. * Prepare, present and discuss commissioning tasks, roles and responsibilities. * Prepare meeting agenda and minutes. |
| Design Team | * Attend meeting. |
| CPM | * Attend meeting. |
| DDC | * Attend meeting |
| TAB | * Attend meeting. |
| Construction | Duration Schedule for Commissioning Activities | Based on Final Commissioning Plan, prepare a duration schedule to show the duration, predecessors and successors for commissioning activities. This duration schedule will be provided to the Construction Manager to include commissioning activities in the project construction schedule. This will allow commissioning activities to be smoothly integrated into the overall construction process. | RE | * Review commissioning schedule data. * Coordinate with CPM to incorporate commissioning activities into project schedule. |
| CxA | * Prepare and issue commissioning activities schedule, including durations and predecessors. * Review project schedule prepared by CPM. |
| Design Team | * None. |
| CPM | * Incorporate commissioning activities into Master Construction Schedule. |
| DDC | * Review project schedule prepared by CPM. |
| TAB | * Review project schedule prepared by CPM. |
| Construction | Submittal and Shop Drawing Review List | Based on final construction documents, prepare a list of selected submittals and shop drawings for review by the Commissioning Authority. | RE | * None. |
| CxA | * Prepare list of submittals and shop drawings to be provided to the CxA. |
| Design Team | * None. |
| CPM | * None. |
| DDC | * None. |
| TAB | * None. |
| Construction | Submittal and Shop Drawing Review | Review selected submittals and shop drawings to support the commissioning process. Review will be for the purpose of developing appropriate Pre-Functional Checklists and Functional Test Plans. Reviews will focus on the ability to commission the systems, maintainability and general conformance to owner’s requirements. Commissioning review of submittals and shop drawings does not replace the Design Team responsibility for approval. | RE | * Receive and distribute submittals and shop drawings. * Distribute selected submittals and shop drawings to CxA. * Review and approve submittals |
| CxA | * Review selected submittals and shop drawings. * Prepare issue comment log |
| Design Team | * Review submittals and shop drawings. * Provide comments and recommendations to RE. |
| CPM | * Prepare and issue submittals and shop drawings. * Incorporate RE comments into revised submittals and shop drawings. |
| DDC | * Prepare and issue DDC submittals and shop drawings. * Incorporate RE comments into revised submittals and shop drawings. |
| TAB | * None. |
| Construction | Controls Meeting | After receipt of the Controls Submittal, participate in or conduct a meeting with the Owner’s representatives, Owner’s Control Vendor, Owner’s TAB contractor, Mechanical/Electrical Design team, mechanical sub-contractor and electrical sub-contractor to review the Controls Submittal and mechanical/electrical systems to be installed.  Focus will be on how the selected sequences of operation interact with the mechanical/electrical systems and how well they meet the owner’s requirements. | RE | * Schedule, facilitate and attend meeting. |
| CxA | * Conduct Meeting * Prepare meeting agenda and minutes. |
| Design Team | * Attend meeting |
| CPM | * Coordinate and schedule Mechanical, Electrical and Controls Electrical sub-contractors to attend meeting. * Attend meeting. |
| DDC | * Attend meeting |
| TAB | * None. |
| Construction | Pre-Functional Checklists | Prepare Pre-Functional Checklists for systems, components and/or equipment to be commissioned. These Pre-Functional Checklists will be used to document completion of system, component and/or equipment installation and to determine system readiness for functional testing.  Pre-Functional Checklists should be completed by the installing contractors to document the installation process. Completed Pre-Functional Checklists are to be submitted to the commissioning authority a minimum of seven days prior to testing.  Completed Pre-Functional Checklists will be spot checked by the commissioning authority to verify systems are ready for testing. | RE | * Review checklists * Provide comments to CxA |
| CxA | * Prepare preliminary checklists. * Issue to RE and CPM for review * Incorporate changes into final checklists as necessary. |
| Design Team | * None. |
| CPM | * Provide copies of sub-contractor QC installation checklists to CxA for review. * Review checklists prepared by CxA * Provide comments to CxA |
| DDC | * Review checklists prepared by CxA * Provide comments to CxA |
| TAB | * Review checklists prepared by CxA * Provide comments to CxA |
| Construction | Review Contractor Equipment Startup Reports | Commissioning authority will review selected equipment startup reports prepared by installing contractor.  Commissioning Agent will witness selected equipment startup procedures. Seven days prior notice is required to schedule commission authority witnessing the startup. | RE | * Receive and distribute Contractor Startup Reports |
| CxA | * Witness selected contractor equipment startups. * Review selected Contractor Startup Reports. * Provide comment log to RE and QA. |
| Design Team | * Review Contractor Startup Reports. |
| CPM | * Complete Contractor Startup Reports * Issue to RE and CxA. |
| DDC | * Review selected Contractor Startup Reports. |
| TAB | * Review selected Contractor Startup Reports. |
| Construction | Prepare Functional Test Procedures | Based on final construction documents (including applicable changes), and approved submittals, prepare Functional Test Procedures for systems to be commissioned. Draft Functional Test Procedures will be issued for review by owner, installing contractors and DDC Vendor.  Final Functional Test Procedures will be prepared incorporating review comments received from owner, contractors or DDC Vendor. | RE | * Review preliminary Functional Test Procedures. * Provide comments to CxA |
| CxA | * Prepare preliminary Functional Test Procedures. * Issue to RE, CPM and DDC. * Incorporate comments into final Functional Test Procedures as necessary. |
| Design Team | * None. |
| CPM | * Distribute preliminary Functional Test Procedures to MC, EC and other installing sub-contractors. * Review preliminary Functional Test Procedures * Provide comments to CxA |
| DDC | * Review preliminary Functional Test Procedures * Provide comments to CxA |
| TAB | * Review preliminary Functional Test Procedures * Provide comments to CxA |
| Construction | TAB Plan Review | Review HVAC systems Test and Balance Plan prepared by the TAB vendor. Review will be to determine general conformance with owner’s requirements. | RE | * Distribute TAB Plan to CxA, QA, CPM and Design Team. |
| CxA | * Review TAB Plan * Provide comment log to PM and QA |
| Design Team | * Review and approve TAB Plan. |
| CPM | * Review TAB Plan * Provide comments to PM |
| DDC | * Review TAB Plan * Provide comments to QA, CxA and PM |
| TAB | * Prepare preliminary TAB Plan * Issue to PM and QA. * Incorporate comments into Final TAB Plan as necessary. |
| Construction | TAB Report Review | Review TAB Report prepared by TAB vendor following system air and water balancing. Review will be focused on TAB results that affect system performance and/or commissioning. Specific attention will be given to equipment installation and operational issues identified by the TAB vendor. | RE | * Distribute TAB report to Design Team, and CxA. * Approve TAB Report in consultation with Design Team and CxA. |
| CxA | * Review TAB report. * Provide comments to RE and Design Team. |
| Design Team | * Review and provide recommendations to RE. |
| CPM | * Review and submit TAB Report. |
| DDC | * None |
| TAB | * Provide preliminary TAB data (daily worksheets) to CxA for preliminary review. * Prepare TAB Report * Issue TAB report to RE. |
| Construction | Review O & M Manuals | Review Operations and Maintenance Manuals submitted by contractors. Manuals will be reviewed for clarity, organization, usability and general conformance with specifications and owner’s requirements. | RE | * Distribute O&M Manuals to CxA and Design Team. * Review and approve O&M Manuals. |
| CxA | * Review O&M Manuals. * Provide comment log to RE and QA. |
| Design Team | * Review O&M Manuals. |
| CPM | * Prepare and issue O&M Manuals to PM. |
| DDC | * Prepare and issue DDC O&M Manuals to PM. |
| TAB | * None. |
| Construction | Prepare Systems Manuals for commissioned systems | Prepare detailed systems manuals for commissioned systems. The manuals will provide operating staff the information needed to understand and optimally operate the commissioned systems. The manuals will describe system design, components, capacity and sequences of operations. Manuals will include descriptions of interactions with other systems and common systems failure modes and responses. | RE | * Review and approve Systems Manuals. * Distribute Systems Manuals to FMD. |
| CxA | * Using O&M Manuals, Basis of Design, and Construction Documents, prepare Systems Manual. |
| Design Team | * None. |
| CPM | * None. |
| DDC | * None. |
| TAB | * None. |
| Construction | Review Training Plans | Review contractor and manufacturer training plans and agendas for general conformance with specifications and owner’s requirements. Observe selected training for quality of training and for general conformance with the training plan and agenda. | RE | * Schedule and facilitate training sessions. * FMD staff attends training sessions. |
| CxA | * Review Training Plans. * Provide comment log * Witness selected training sessions. |
| Design Team | * None. |
| CPM | * In conjunction with installing sub-contractors and/or manufacturers’ representatives, conduct training sessions. |
| DDC | * Conduct DDC training sessions. |
| TAB | * None. |
| Construction | Warranty Review | Review contractor’s and manufacturer’s warranties for general conformance with specifications and owner’s requirements. | RE | * Distribute warranty documents to FMD and CxA * Review and approve warranty documents |
| CxA | * Review warranty documents. * Provide comment log |
| Design Team | * Review warranty documents and provide comments. |
| CPM | * Prepare and issue warranty documents * Incorporate comments into final warranty documents. |
| DDC | * Prepare and issue warranty documents for DDC. * Incorporate comments into final warranty documents. |
| TAB | * None |
| Construction | Systems Functional Testing | Witness and document functional testing for systems to be commissioned. Testing will be conducted as detailed on the specific Functional Test Plan for each system to be commissioned.  Functional testing will require support from the CPM, MC, EC, DDC and TAB Vendor. Installing contractors should be available to respond to issues and problems identified during testing. | RE | * Schedule, facilitate and witness systems functional testing. * FMD staff should assist in functional testing as additional systems training opportunity. |
| CxA | * Witness systems functional testing using previously prepared Functional Test Procedures. * Document systems testing on Functional Test Procedures. * Issue Field Reports to document deficiencies. * Update Master Commissioning Issues Log to document and track deficiencies. |
| Design Team | * Review test documentation |
| CPM | * CPM, MC and EC to conduct functional testing by operating systems in accordance with functional test procedures. * Make corrections, repairs or adjustments to systems during testing as directed by the RE. * Correct outstanding deficiencies after testing as directed by the RE. * Report corrective actions to RE and CxA upon completion. |
| DDC | * Conduct functional testing by operating DDC in accordance with CxA directions and functional test procedures. * Assist in troubleshooting and corrective action as necessary |
| TAB | * Assist functional testing as directed by the RE and functional test procedures. * Verify selected DDC data by spot measurements of air and/or water balancing data. |
| Construction | Systems Functional Retesting | Retest systems with deficiencies as recommended by the CxA and directed by the PM  (Note: Retesting is not included in the scope of commissioning services and is provided as an additional service. The costs associated with retesting may be recovered from the Construction Manager in accordance with appropriate contract provisions.) | RE | * Approve retesting as recommended by CxA. * Schedule and coordinate retesting. |
| CxA | * Make recommendations for necessary retesting. * Coordinate with RE to schedule retesting after deficiencies are corrected. |
| Design Team | * None |
| CPM | * Make necessary system repairs, adjustments and/or corrections prior to retesting. * Coordinate retesting as directed and approved by the RE. * Conduct systems retesting by operating systems as directed by RE and functional test procedures. |
| DDC | * Assist in systems retesting by operating DDC as directed by RE and functional test procedures. |
| TAB | * None. |
| Construction | Construction Observation | Conduct visits to the construction site to observe construction activities. Specific attention will be given to installation of mechanical, electrical, and plumbing systems for general conformance with specifications and manufacturer’s installation requirements. Specific attention will also be given to installation of site utilities, site improvements and building envelope construction for general conformance with plans, specifications and manufacturer’s installation requirements. | RE | * None. |
| CxA | * Conduct Construction Observation visits to observe construction progress, systems/equipment installation and general quality of construction. * Prepare Field Report to document general and specific observations and issues. * Update Master Issues Log to document and track specific issues reported on Field Report. * Monitor and verify corrective actions. * Update Master Issues Log to document corrective action progress and completion. |
| Design Team | * Review Master Issues Log |
| CPM | * Review Field Reports * Review Master Issues Log * Provide corrective actions as directed by the RE to resolve outstanding issues. |
| DDC | * Review Field Reports relative to DDC issues. * Review Master Issues Log relative to DDC issues. * Report progress of corrective actions relative to DDC issues. |
| TAB | * Review Field Reports relative to issues affecting TAB. * Review Master Issues Log relative to issues affecting TAB. * Report corrective actions relative to issues affecting TAB. |
| Construction | Final Commissioning Report | Compile a comprehensive commissioning report documenting all commissioning activities, including but not limited to:   * Commissioning scope * Test methods and results * Outstanding commissioning issues * Issues log * Commissioning plan * Status reports * Submittal and O&M manual reviews * Training record * Pre-Functional Checklists * Design Review Comments   . | RE | * Review preliminary Commissioning Report. * Provide comments to CxA. * Review and approve Final Commissioning Report |
| CxA | * Prepare preliminary Commissioning Report. * Incorporate RE comments into final report. * Issue Final Commissioning Report. |
| Design Team | * Review Final Commissioning Report |
| CPM | * Review Final Commissioning report * Report on progress and completion of corrective actions. |
| DDC | * Review Final Commissioning Report. * Report on progress and completion of corrective actions relative to DDC. |
| TAB | * Review Final Commissioning Report. * Report on progress and completion of corrective actions relative to TAB. |
| Construction | Owner Architect and Construction Manager Meetings (Construction Phase) | Attend selected Owner/Architect/Contractor Meetings to discuss commissioning issues, review the Commissioning Issues Log, and to maintain awareness of general construction schedule and issues. | RE | * Schedule, facilitate and attend meetings. |
| CxA | * Attend selected meetings to review commissioning issues. |
| Design Team | * Attend meetings. |
| CPM | * Conduct meetings. * Prepare and issue Meeting Minutes. |
| DDC | * Attend selected meetings to review DDC issues. |
| TAB | * Attend selected meetings to review TAB issues. |
| Construction | Status Reports | Provide monthly status reports detailing activities, significant unresolved issues, and upcoming commissioning activities. Prepare report outlining status of deliverables for the project. Status reports are submitted with invoices for professional services. | RE | * Review and approve status reports. |
| CxA | * Prepare Status Reports to summarize commissioning activities, significant unresolved issues and provide a two-month look-ahead of commissioning activities. |
| Design Team | * None. |
| CPM | * None. |
| DDC | * None. |
| TAB | * None. |
| Construction | Master Issues Log | Maintain a Commissioning Issues Log to document commissioning issues identified during construction and functional testing. The Commissioning Issues Log will include recommended responsible party and recommendations for resolution of the issue. The Commissioning Issues Log will also be used to document progress toward resolution and the final resolution | RE | * Review Master Issues Log * Coordinate and direct corrective actions to resolve commissioning issues. |
| CxA | * Provide monthly updates to Master Commissioning Log. * Provide updated Master Commissioning Log after each Construction Visit to document specific issues observed during the visit. * Update Master Issues Log to document progress on corrective actions. * Update Master Issues Log to document completion of corrective actions. |
| Design Team | * None. |
| CPM | * Review Master Issues Log. * Provide status of corrective actions. * Provide notification of corrective action completion. |
| DDC | * Review Master Issues Log. * Provide documentation of punch list or other issues noted by DDC vendor. * Provide status of corrective actions relative to DDC issues. * Provide notification of corrective action completion relative to DDC issues. |
| TAB | * Review Master Issues Log. * Provide documentation of punch list or other issues noted by TAB vendor. * Provide status of corrective actions relative to TAB issues. * Provide notification of corrective action completion relative to TAB issues. |
| Construction | Review Change Orders, ASI, and RFI | Review change orders, architect’s supplemental instructions and requests for information (with design team response) for issues that affect commissioning. Review is for information only and does not constitute technical or contractual approval or disapproval. | RE | * Issue change orders, ASI and/or RFI. * Provide copies of change orders, ASI and RFI to CxA |
| CxA | * Review change orders, ASI, and RFI for changes that affect system/equipment design or installation. * Incorporate changes into revised Functional Test Procedures or Pre-Functional Checklists. |
| Design Team | * Respond to RFIs. * Prepare change orders and/or ASI. * Update construction documents as necessary. |
| CPM | * Issue RFI. * Request change orders and ASI as needed. |
| DDC | * Monitor system changes for impact on DDC installation and/or sequences of operations. * Update DDC programming or sequences of operations to implement approved changes. |
| TAB | * Monitor system changes for impact on TAB. * Update TAB Plan as necessary to implement approved changes. |
| Warranty | Monitor Systems Operation | Monitor system operation using trend data from DDC. | RE | * Coordinate corrective actions with CPM as necessary |
| CxA | * Periodically monitor systems operation using DDC trend data. * Prepare and issue brief narrative reports documenting issues noted during systems monitoring. * Update Master Commissioning Log with issues noted during systems monitoring. |
| Design Team | * None. |
| CPM | * Provide corrective actions as directed by RE. |
| DDC | * Provide corrective actions as directed by RE. |
| TAB | * None. |
| Warranty | Deferred and/or seasonal Testing | Direct testing that was deferred due to lack of system readiness or for seasonal requirements. Testing will be conducted in accordance with Functional Test Plans. Testing support will be required from the DDC Vendor and FMD. | NCA RE | * Schedule, facilitate and witness deferred/seasonal testing. * FMD staff should assist in deferred/seasonal as additional systems training opportunity. |
| CxA | * Witness deferred/seasonal testing using previously prepared Functional Test Procedures. * Document deferred/seasonal testing on Functional Test Procedures. * Issue Field Reports to document deficiencies. * Update Master Commissioning Issues Log to document and track deficiencies. |
| Design Team | * None. |
| CPM | * CPM, MC and EC will conduct seasonal/deferred testing by operating systems in accordance with RE directions and functional test procedures. * Make corrections, repairs or adjustments to systems during testing as directed by the RE. * Correct outstanding deficiencies after testing as directed by the RE. * Report corrective actions to RE and CxA upon completion. |
| DDC | * Conduct deferred/seasonal testing by operating DDC in accordance with CxA directions and functional test procedures. * Assist in troubleshooting and corrective action as necessary |
| TAB | * Assist deferred/seasonal testing as directed by the CxA and functional test procedures. * Verify selected DDC data by spot measurements of air and/or water balancing data. |
| Warranty | Post-Occupancy Warranty Checkup | Return to the project approximately 10 months into the 12 month warranty period to review the building operation with the facility staff and discuss outstanding issues related to commissioning and outstanding warranty issues. Provide suggestions for improvements. Assist facility staff in developing reports, documents and requests for service to remedy outstanding problems. | RE | * Schedule and facilitate Warranty Checkup Visit. * Direct CPM and/or DDC to provide corrective action for Warranty claims. |
| CxA | * Conduct Warranty Checkup Visit. * Interview facility users and/or FMD staff to identify specific operational concerns. * Review FMD Work Order logs for potential warranty claim issues. * Verify corrective action on outstanding unresolved issues shown on Master Issues Log. * Document other deficiencies noted during Warranty Checkup Visit. * Prepare report of potential Warranty Claims noted during Warranty Checkup Visit. |
| Design Team | * None. |
| CPM | * Implement corrective actions on Warranty Claims as directed by RE. |
| DDC | * Implement corrective actions on Warranty Claims as directed by RE. |
| TAB | * None. |
| Warranty | Final Commissioning Report Amendment | Amend Final Commissioning Report to document the Warranty Phase commissioning activities. | RE | * Review and approve Commissioning Report Amendment. |
| CxA | * Prepare Final Report Amendment to document Warranty phase commissioning activities. |
| Design Team | * None |
| CPM | * None. |
| DDC | * None. |
| TAB | * None. |

1. Commissioning Schedule
2. The following is a general outline of the Commissioning Schedule for the commissioning tasks that will be performed on the project site or at the CxA Offices:

Commissioning Schedule

| Project Phase | Task | Duration | Schedule | Predecessors |
| --- | --- | --- | --- | --- |
| Design | Review Owner’s Project Requirements | 3 weeks | Comments submitted concurrent with design review comments | Receive Owner’s Project Requirement document |
| Design | Review Design Narrative | 3 weeks | Comments submitted concurrent with design review comments | Receive Design Narrative |
| Design | Review SD 1 design | 3 weeks | Comment log issued 3 weeks after receipt of SD 1 design.  Attend SD-1 Design Review meeting | Receive SD 1 documents including Design Narrative |
| Design | Review SD 2 | 3 weeks | Comment log issued 3 weeks after receipt of SD 2 design  Attend SD-2 Design Review Meeting | Receive SD 2 drawings and specifications |
| Design | Commissioning Specifications | 3 weeks | Specifications issued concurrent with Phase 2 comment log | Receive Phase 2 drawings and specifications |
| Design | Review DD1 | 3 weeks | Comment log issued 3 weeks after receipt of DD-1 design  Attend DD-1 Design Review meeting | Receive DD-1 drawings and specifications |
| Design | Design Phase Controls Meeting | 1 day | Schedule after Cx DD-1 Design Review | DD-1 Cx comment log issued |
| Design | Preliminary Commissioning Plan | 3 weeks | Preliminary Cx Plan issued concurrent with DD-1 comment log | Receive DD-1 drawings and specifications |
| Design | Review DD2 | 3 weeks | Comment log issued 3 weeks after receipt of DD-2 design  Attend DD-2 Design Review Meeting | Receive DD-2 drawings and specifications |
| Design | Update Design Narrative | 3 weeks | Updated Design Narrative issued 3 weeks after DD-2 Design Review Meeting | DD-2 Design Review meeting.  Receive DD-2 Design review comments from peer reviewer. |
| Design | Focused DC-1 Review (Progress Set) | 3 weeks | Comment log with back check update issued 3 weeks after receipt of progress set.  Attend CD-1 Design Review meeting | Receive CD-1 drawings and specifications |
| Design | Update Design Narrative | 3 weeks | Updated Design Narrative issued 3 weeks after CD-1 Design Review Meeting | CD-1 Design Review meeting.  Receive CD-1 Design review comments from peer reviewer. |
| Design | Focused Final Construction Document Review | 3 weeks | Comment log issued 3 weeks after receipt of final CDs | Receive Final Construction Document drawings and specifications |
| Design | Update Design Narrative | 3 weeks | Updated Design Narrative issued 3 weeks after Final CD Design Review Meeting | Final CD Design Review meeting.  Receive Final CD Design review comments from peer reviewer. |
| Design | Design Phase Meetings | 1 day each | Scheduled by PM and Design Team | None |
| Construction | Preliminary Commissioning Plan | 3 weeks | Concurrent with Final CD Design review | Receive Final CD drawings and specifications. |
| Construction | Construction Commissioning Kick Off meeting | 1 day | Scheduled by RE and CPM | Contracting Officer’s and RE Initial Construction Meeting |
| Construction | Final Commissioning Team | 3 weeks | Issue 3 weeks after Construction Commissioning Kickoff Meeting | Commissioning Kickoff Meeting |
| Construction | Duration Schedule for Commissioning Activities | None | Issued as part of Final Commissioning Plan | Preliminary construction schedule |
| Construction | Submittal and Shop Drawing Request List | None | Issued as part of Final Commissioning Plan | Final Construction Document plans and specifications |
| Construction | Submittal and Shop Drawing Review | 2 weeks | Comment log issued 2 week after receipt of shop drawings and submittals | Receipt of submittal or shop drawings.  Comment log will be updated after receipt of each requested submittal |
| Construction | Controls Meeting | 1 day | Scheduled by RE and CPM  Meeting notes issued 1 week after meeting. | Receive major HVAC equipment submittals.  Receive DDC submittal with sequences of operations. |
| Construction | Pre-Functional Checklists | TBD | Preliminary checklists issued approximately 4 months prior to substantial completion  Final checklists issued approximately 3 months prior to substantial completion | Receive equipment submittals  Receive installing contractor’s QC checklists |
| Construction | Witness selected Contractor Equipment Startup | 1 day | Scheduled by CPM | 1 week written notice of scheduled startup |
| Construction | Review Contractor Equipment Startup Checklists | 1 week | Comment log issued 1 week after receipt of completed checklist | Receive Startup Checklist completed by installing sub-contractor. |
| Construction | Prepare Functional Test Procedures | TBD | Preliminary Functional Test Procedures issues approximately 4 months prior to substantial completion.  Final Functional Test Procedures issues approximately 3 months prior to substantial completion | Receive all requested equipment submittals and shop drawings.  Receive DDC submittal and final sequences of operations. |
| Construction | TAB Plan Review | 2 weeks | Comment log issued 2 weeks after receiving TAB Plan | Receive TAB Plan |
| Construction | TAB Report Review | 2 weeks | Comment log issued 2 weeks after receiving TAB Report | Receive TAB Report |
| Construction | Review O & M Manuals | 3 weeks | Comment log issued 3 weeks after receiving O&M Manuals | Receive O&M Manuals |
| Construction | Prepare Systems Manuals | 8 weeks | Systems Manuals issued 8 weeks after receiving O&M Manuals | Receive O&M Manuals |
| Construction | Review Training Plans | 3 weeks | Comment log issued 3 weeks after receiving Training Plans | Receive Training Plans |
| Construction | Warranty Review | 3 weeks | Comment log issued 3 weeks after receiving Warranty documents | Receive Warranty documents |
| Construction | Systems Functional Testing | TBD | Functional testing to begin coordinated with construction schedule and systems completion | See separate table. |
| Construction | Systems Functional Retesting | TBD | TBD | Corrective actions complete |
| Construction | Construction Observation | 1 day | Construction observations scheduled concurrent with progress meetings – approximately 1 visit per month.  More frequent visits may be scheduled during the 3 months preceding substantial completion  Cx Specialist will provide a verbal out-brief of significant issues to the CPM prior to leaving the construction site.  Field Report will be issued 1 week following visit. | None |
| Construction | Final Commissioning Report | 6 weeks | Preliminary Commissioning Report issued approximately 6 weeks after completing Functional Testing | Functional Testing completed. |
| Construction | Owner Architect and Construction Manager Meetings (Construction Phase) | 1 day | Scheduled by PM and CPM. CxA will attend approximately 1 meeting per month. More frequent attendance many be warranted during the 3 months prior to substantial completion. | None |
| Construction | Status Reports | 1 day | Status Reports will be issued monthly in conjunction with invoices for professional services | None |
| Construction | Master Issues Log | 1 day | Master Issues Log will be updated and issued following each progress meeting and/or Construction Observation visit | Construction Observation visit and/or progress meeting. |
| Construction | Review Change Orders, ASI, and RFI | TBD | Ongoing throughout construction | Receive Change Order, ASI or RFI |
| Warranty | Deferred and/or seasonal Testing | TBD | Seasonal testing scheduled approximately 6 months after completing Functional Testing  Deferred testing schedule to be determined | Seasonal changeover (i.e. summer-to-winter or winter-to-summer)  Completion of system installation or corrective action completed |
| Warranty | Post-Occupancy Warranty Checkup | TBD | Scheduled approximately 10 months after substantial completion | Initial Functional Testing is complete.  Seasonal/deferred testing is complete.  Receive FMD work order log for HVAC equipment. |
| Warranty | Final Commissioning Report Amendment | 2 weeks | Final Commissioning Report Amendment issued approximately 2 weeks following Warranty Checkup | Warrant Checkup visit complete |

The following is a general outline of the Commissioning Schedule for the Functional Testing activities that will be performed at the construction site. This information is provided to assist the General Contractor in incorporating the commissioning activities into the overall construction schedule:

| Functional Testing Activities | | | | |
| --- | --- | --- | --- | --- |
| System | Test Duration | Schedule | Predecessors | Notes |
| ***Mechanical Systems*** | | | | |
| Ductwork Installation | 1 day | 1 week prior notice by CPM | Ductwork complete | * Witness selected duct pressure testing |
| Facility Water Distribution | 1 day | 1 week prior notice by CPM | Piping complete | * Witness selected pipe pressure testing |
| Plumbing Piping | 1 day | 1 week prior notice by CPM | Piping complete | * Witness selected pipe pressure testing |
| Plumbing Equipment | 1 day | Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational | * Functional testing of domestic hot water heating systems |
| Refrigeration Piping | 1 day | 1 week prior notice by CPM | Equipment installation in-process | * Witness selected vacuum testing |
| Hydronic Pumps | 4 hours per system | Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational * TAB water balance | * Functional testing of pump systems |
| Air-Cooled Refrigerant Condensers | 2-4 hours per system | Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational | * Functional testing of a representative sample of condenser systems |
| Air-Cooled Chilled Water Systems | 1 day per system | 1 week prior notice of startup by CPM  Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational * TAB water balance | * Witness equipment startup * Functional testing of all chillers |
| Variable Frequency Motor Controls | Included in other testing | 1 week prior notice of startup by CPM | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational | * Witness selected equipment startup. * Functional testing in conjunction with testing the motor and system controlled |
| Decentralized HVAC Equipment | 2 – 4 hours per system | 1 week prior notice of startup by CPM  Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational | * Witness selected equipment startup. * Functional testing of a representative sample of systems |
| Electrical Resistance Duct Heaters | Included in other testing | TBD | * Pre-Functional Checklist * TAB air balance | * Functional testing of duct heaters in conjunction with air handler or other system testing |
| Air Handling Units | 1 day per AHU | 1 week prior notice of startup by CPM  Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * DDC Controls Operational * TAB air & water balance | * Witness selected equipment startup. * Functional testing of all air-handling units |
| HVAC Power Ventilators | 1 – 2 hours per system | 1 week prior notice of startup by CPM | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational * TAB air balance | * Witness selected equipment startup. * Functional testing of a representative sampling of equipment in conjunction with testing air handling units or other systems |
| Ductwork | 1 day | 1 week prior notice by CPM | * Ductwork complete | * Witness selected duct pressure testing |
| DDC System | 1 day for head-end testing | 1 week prior notice of startup by CPM  Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational * TAB air & water balance | * Review DDC sequences of operation. * Witness selected equipment startup. * Functional testing of DDC in conjunction with air handler units, chillers, and other systems controlled. * Review of DDC graphics and other human-interface equipment. * Review of trend data to support functional testing and verify proper operation of systems controlled |
| Variable Air Volume Units | 1 – 2 hours per AHU system | Functional Testing TBD | * Pre-Functional Checklist * Equipment startup * Controls & DDC Interface Operational * TAB air balance | * Functional testing of a representative sampling |
| Tests Plumbing Piping Systems | 1 day | 1 week prior notice by CPM | * Piping system complete | * Witness selected plumbing piping tests |
| Tests HVAC Piping Systems | 1 day | 1 week prior notice by CPM | * Piping system complete | * Witness selected HVAC piping tests |
| ***Electrical Systems*** | | | | |
| Electrical Utility Services | 1 day | 1 week prior notice of startup by CPM |  | * Pre-startup testing. * Witness startup of service equipment |
| Switchboards | 1 day | 1 week prior notice of startup by CPM |  | * Pre-startup testing. * Witness startup of switchboards |
| Grounding & Bonding Electrical Systems | 1 day | 1 week prior notice of 3rd party testing by CPM |  | * Witness 3rd party ground resistance testing |
| Panelboards | 1 – 2 hours per panel | 1 week prior notice of startup by CPM |  | * Pre-startup testing * Witness startup of selected panelboards. |
| Enclosed Switches & Circuit Breakers | 1 – 2 hours per switch or breaker | 1 week prior notice of startup by CPM |  | * Pre-startup testing * Witness startup of selected equipment |
| Motor Controls | Included in other testing | TBD |  | * Functional testing in conjunction with system testing of equipment controlled |
| Transfer Switches | Included in other testing | TBD |  | * Functional testing in conjunction with generator testing |
| Interior Lighting | 2 – 4 hours | TBD |  | * Functional testing of daylighting and occupancy sensors |
| Exterior Lighting | 1 – 2 hours | TBD |  | * Functional testing of DDC-controlled contactors in conjunction with DDC testing |
| Emergency Lighting | Included in other testing | TBD |  | * Functional testing in conjunction with loss of utility power testing. |
| Diesel Engine Driven Generator Assembly | 10 – 12 hours | 1 week prior notice of startup by CPM |  | * Witness load bank testing * Functional testing for compliance with NFPA 110 |
| Lightning Protection for Structures | 1 – 2 hours | TBD |  | * Review of UL Master Label |
| Fire Alarm & Smoke Detection Systems | 2 days | TBD |  | * Functional testing of features not tested by local-authority (i.e. battery draw-down tests) |
| Intrusion Detection | 2 – 4 hours | TBD |  | * Functional testing of a representative sample of devices |
| Video Surveillance System | 2 – 4 hours | TBD |  | * Functional testing of a representative sample of devices |
| ***Integrated Systems Testing*** | | | | |
| Loss of Utility Power Test | 1 day | TBD | All functional systems testing complete with no significant deficiencies | * Tests response by all systems to loss of utility power * Tests response by all systems to restoration of utility power |

1. Appendix A – Preliminary Log of Required Documentation

The following log provides a preliminary summary of all the Pre Functional Checklists, Functional Performance Tests and Integrated Systems tests that will be required to complete the Commissioning process. The log is preliminary and will be updated based on the components and systems installed by the contractor on the project. It will also be updated to reflect any clarifications or changes in the construction documents that may be reflected by ASIs, ESI, Addendum or other amendments to the construction documents.