|  |
| --- |
| Deca Logo 2.PNG |
| **COMMISSIONING PLAN** |
|  |
|  |
|  |
| **DATE HERE** |

|  |
| --- |
|  |

TABLE OF CONTENTS

Definitions 3

Abbreviations 4

1.1 Commissioning Objectives 5

1.2 Commissioning Overview 5

1.3 Systems to be Commissioned 6

1.4 Commissioning Team Members Responsibilities 7

1.5 Commissioning Schedule 9

1.6 Construction Phase Commissioning Activities 9

DEFINITIONS

* + - * 1. Commissioning Authority (CxA): An independent party, not otherwise associated with the A/E team members or the Contractor. The CxA leads, plans, schedules, and coordinates the commissioning team to implement the Commissioning process.
				2. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
				3. Commissioning Process: A quality-focused process for enhancing the delivery of a project. The process focuses upon verify and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the project requirements.
				4. Commissioning Team: The individuals who through coordinated actions are responsible for implementing the commissioning process.
				5. Deferred Functional Tests: FPT's that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.
				6. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).
				7. Functional Performance Test (FPT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The CxA develops the functional test procedures in a sequential written form, coordinates, oversees, and documents the actual testing, which is usually performed by the installing contractor or vendor. FPT's are performed after prefunctional checklists, startup, TAB, controls are complete.
				8. Issues log: A formal and ongoing record of problems or concerns and their resolution that have been raised by members of the Commissioning Team during the course of the commissioning Process.
				9. Phased Commissioning: Commissioning that is completed in phases due to the size of the structure or other scheduling issues, in order to minimize the total construction time.
				10. Prefunctional Checklist (PFC): A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the GC and Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operations (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.).
				11. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.
				12. Seasonal Performance Tests: FPT that are deferred until the system(s) will experience conditions closer to their design conditions.
				13. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists.
				14. Trending: Monitoring control point data using the building control system.

ABBREVIATIONS:

The following are common abbreviations used in the Specifications:

A/E – Architect and Design Engineers of Record

CxA – Commissioning Authority

CC – Controls Contractor

EC – Electrical Contractor

FPT – Functional Performance Test

GATR – Government Authorized Technical Representative

GC – General Contractor

MC – Mechanical Contractor

PFC – Pre-functional Checklist

RMCS – Refrigerant Monitoring Control System

TAB – Test and Balance

## COMMISSIONING PLAN

(Edited from DeCA June 2022 Design Criteria)

1. **Commissioning Objectives**

The objective of commissioning is to provide documented confirmation that a facility fulfills the functional and performance requirements of the Government. To reach this goal, it is necessary for the commissioning process to establish and document the Government’s criteria for system function, performance, and maintainability, as well as, to verify and document compliance with these criteria throughout design, construction, start-up, and the initial period of operation. In addition, the commissioning process ensures that Operation and Maintenance (O&M) Manuals are complete, thorough, and accurate, and that Government representatives are adequately trained in operation and maintenance of the building systems in order to ensure the systems continue to operate as intended.

The Commissioning Authority (CxA) will be involved in the project from the initial design phase through the warranty phase. The primary role during the design phase is to review the detailed commissioning specifications developed by the design team and review the design documents to ensure they include all the components required to meet the Government’s commissioning objectives. During the construction phase, the CxA will monitor the execution of the commissioning plan. The CxA will observe and document the installation and performance of all systems to ensure they are functioning in accordance with the Government’s objectives and the Contract Documents. During the warranty phase the CxA will observe the required opposite season or deferred testing and deficiency corrections and review the final testing documentation for the Commissioning Record and O&M Manuals.

1. **Commissioning Overview**
	1. Commissioning Process: The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
		1. Commissioning during construction begins with a meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members during a regularly scheduled monthly/biweekly Contractors' meeting. This is a onetime kick off type meeting. This meeting will occur prior to the completion of the first Prefunctional Checklist.
		2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future commissioning related activities, and resolve problems.
		3. Equipment documentation, including: Shop Drawings, installation instructions, detailed start up procedures are submitted to the CxA during the normal submittals process.
		4. The CxA will develop project specific prefunctional checklists and will issue these checklists to the installing contractors to execute. The prefunctional checklists may be paper, electronic, or web based format.
		5. The CxA will verify the information being entered on the PFC checklists during normal job site visits.
		6. Prior to commencement of functional testing, the Commissioning Team shall perform a systems activation inspection to ensure the systems are ready to be functionally tested.
		7. The installing contractors will ensure all Pre-functional Checklists are completed. The Contractor shall identify any missing checklists and provide as necessary.
		8. The CxA will verify all Pre-functional Checklists, TAB and startup are complete for systems to be Functionally Tested.
		9. The CxA will prepare the Functional Testing protocols for execution with the assistance from the installing contractors.
		10. The CxA will coordinate with the Contractor to schedule the Functional Testing after the Pre-Functional Checklists, TAB, and equipment startup are complete.
		11. Items of non-compliance in material, installation or setup are noted for the Contractor to correct. Non-complying systems will then be retested and functional performance verified by the GC and the CxA.
		12. The CxA will execute all Functional Performance Testing for the commissioned systems with the assistance from the appropriate installing contractors.
		13. All functional performance tests are completed before Substantial Completion Date.
		14. The CxA will review the O&M documentation for completeness and use in the Government Training sessions.
		15. The GC and CxA will witness training session(s) to verify that acceptable training was provided.
		16. The CxA with the assistance of the commissioning team will compile all the commissioning information into a final commissioning report.
	2. Commissioning Authority Limitation of Authority:
		1. The CxA is not authorized to modify, add or revoke the requirements of the Contract Documents.
		2. The CxA is not responsible for design concepts, design criteria or ensuring drawings and specifications comply with codes.
		3. The CxA is not responsible for verifying designers’ calculations or drawing layouts in detail.
		4. The CxA is not responsible for construction or construction means and methods.
		5. The CxA is not responsible for providing testing equipment to contractors.
2. **Systems to be Commissioned**
	1. The following systems and assemblies will be commissioned:
		1. Division 08 Openings
		2. Division 11 Equipment
		3. Division 21 Fire Suppression
		4. Division 22 Plumbing
		5. Division 23 HVAC
		6. Division 26 Electrical
		7. Division 27 Communication Systems
		8. Division 28 Electronic Safety and Security Systems
		9. Division 32 Exterior Improvements
		10. Division 33 Utilities
	2. Prefunctional and Functional checklists:
		1. Table 1.2 is a list of the prefunctional and functional checklists required, as a minimum, to commission the above systems. Table 1.2 may be modified depending upon shop drawing approvals and final commissioning plan development.
3. **Commissioning Team Members Responsibilities**
	1. Team Members contact information is listed in Table 1.1. It includes the name of the contact, company, address, and communication information. The contractor will amend as needed, as team members change or are added. This table will be provided to the Government in the Commissioning Manual.
	2. Government Authorized Technical Representative (GATR):
		1. Attend initial commissioning meeting and additional meetings as necessary.
		2. Provide firm direction to the commissioning team to address issues and concerns identified during the commissioning process.
		3. Provide written responses to all commissioning related review comments issued by the CxA.
		4. Review commissioning progress reports, Issue logs, and submittals throughout the project
		5. Participate in the resolution of deficiencies identified during commissioning process.
		6. Assist the GC in coordinating the training of Governments personnel.
	3. Commissioning Authority (CxA):
		1. Organize and lead the commissioning team.
		2. Coordinate the commissioning activities with the Installing Contractors and Government; help integrate commissioning activities into the Master Project Schedule.
		3. Plan and conduct commissioning team meetings as needed.
		4. Provide project-specific Prefunctional Checklist and Functional Performance Test procedures.
		5. Reviews all completed Pre-Functional Checklists and verify a minimum of 10% in the field prior to Functional Performance Testing.
		6. Prepare and maintain the commissioning issues log.
		7. Review TAB procedures and reports. Sample actual readings to verify repeatability.
		8. Execute all Functional Performance Testing of commissioned systems with the assistance from the appropriate installing contractors.
		9. Review control point trending to verify stable system operation.
		10. Verify the contractor has provided adequate training to the Government’s personnel for the commissioned systems.
		11. Develops and submit a final commissioning report at the end of project construction.
	4. Architect/Engineer of Record:
		1. Provide copies of all project documents including plans, specifications, addenda, RFI Responses, ASI, PR’s, etc.
		2. Provide any design narrative and sequences documentation requested by the CxA. The designers shall assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
		3. Participate in the resolution of deficiencies identified during commissioning process.
	5. Installing Contractor:
		1. Include commissioning requirements and activities in each purchase order or subcontract as appropriate.
		2. Facilitate the coordination of the commissioning and incorporate commissioning activities into the Master Project Schedule.
		3. Ensure that all installing contractors execute their commissioning responsibilities according the contract documents and as indicated on the master project schedule.
		4. Provide copies of all submittals including all changes to the CxA as requested.
		5. Provide RFI documents related to the commissioned systems to the CxA as needed.
		6. Attend and participate in commissioning team coordination meetings.
		7. Complete Prefunctional Checklists as work is completed and provide to the CxA for review and verification.
		8. Document all equipment and system startup activities. Provide documentation to the CxA for review and incorporation into the commissioning report.
		9. Cooperate with the CxA for timely resolution of issues recorded in the issues log.
		10. Notify the CxA when systems are ready for startup and functional testing including
		11. Completing and submitting system readiness checks.
		12. Provide assistance during the functional testing process including providing sufficient access to all equipment and components.
		13. Collect, compile, and submittal the Operations and Maintenance Manuals for approval prior to scheduling the government training sessions.
		14. Prepare a written training plan as indicated in the project specifications.
4. **Commissioning Schedule**
	1. Figure 1.1 contains a summary schedule of the commissioning activities.
		1. The CxA will plan and conduct site visits and commissioning meetings on a regular basis.
		2. Visits will be by Government Commissioning Representatives with the appropriate technical expertise. On some occasions, more than one Government Commissioning Representative will be on site.
5. **Construction Phase Commissioning Activities**
	1. COMMISSIONING COORDINATION/KICK-OFF MEETING
		1. Commissioning during the Construction Phase starts with a coordination/Kick-off meeting conducted by the Commissioning Authority wherein the commissioning process, activities, and each team member responsibilities are reviewed with the commissioning team members. Commissioning meetings will be conducted throughout construction to plan, coordinate, and schedule activities and address commissioning related issues.
	2. SCHEDULING
		1. The CxA will work with GC to plan and schedule the commissioning activities. The CxA will review the Construction Schedule and verify that commissioning activities are properly scheduled. The GC will integrate all commissioning activities and milestones into the master schedule.
	3. SUBMITTAL REVIEW
		1. The CxA will review Cx related submittals for quality and compliance with the Project Requirements. The CxA will indicate on the approved submittal schedule which submittals are considered to be Cx related. The Contractor will forward all necessary copies of the submittal package to the GATR. The GATR will be responsible for disseminating the submittals to all project team members including the CxA. The GATR will send one complete copy of the submittal package directly to the CxA, preferably in electronic format. The CxA will review the submittal package concurrently with the GATR performing their review. Any review comments generated by the CxA will be issued directly to the GATR. The GATR will then issue a comprehensive set of review comments as part of the stamped submittal package returned to the Contractor.
		2. Data for Commissioning: The CxA will provide a list of submittal data needed for the Commissioning Process to the GC. The GC will provide the requested information to the CxA as it becomes available. Typically submittal data required includes: detailed manufacturer installation instructions, start-up, operating, and troubleshooting procedures, fan and pump curves, and performance data. This information is required for development of the Pre-Functional checklists.
	4. PREFUNCTIONAL CHECKLISTS
		1. General: Pre-Functional checklists ensure that the equipment and systems are properly installed and operational before functional testing begins. Prefunctional checklists are static type inspections and procedures to prepare the equipment for initial operation.
		2. Pre-Functional Checklist: The Commissioning Agent will develop specific prefunctional checklists for each piece of equipment included in the commissioning process. The CxA will issue the prefunctional checklist to the installing contractors.
		3. Execution of Pre-Functional Checklists: The installing contractors will fill out the pre-functional checklists. The checklist format will be [Paper hard copies, electronic, a cloud based commissioning field tool]. Checklists should be completed as the equipment installation progresses. [Online access to the PFC forms will be provided by the CxA. The installing contractors will complete the forms on their own personal tablet device or one will be provided for them] The GC will manage the process and ensure all PFC forms have been completed & signed by the installing contractors. The CxA will verify 10 percent of the pre-function checklists as the checklists are being completed. Inaccurate or incomplete prefunctional checklist shall be returned to the Contractor for corrections and resubmission. The GC will provide all completed prefunctional checklist to the CXA for inclusion in the final commissioning report. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off.
		4. Deficiencies: The installing contractor shall list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the GC and the CxA within 2 days of test completion. The GC and CxA will review and monitor outstanding deficiencies. The installing contractors shall correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Government.
	5. EQUIPMENT START UP MEETING
		1. General: This coordination meeting should occur well before start-up actually takes place to initiate preparations for both starting the equipment and maintaining it after start-up. The meeting should include key commissioning team members such as the followings: Installing contractors, equipment start up vendor representatives. The meeting should focus on discussing activities that must happen before equipment startup such as: electrical power availability, flushing and cleaning piping systems, indoor air quality maintenance, etc. The meeting should close by developing and submitting a start-up plan for executing equipment start up for each piece of equipment included in the Commissioning process.
		2. The startup plan must include these procedures:

The plan should cover detailed start up procedures from equipment manufacturers and provide checkout procedures using standard filed checkout sheets. The documentation should include checklists and procedures with specific boxes or lines for recording and documenting inspections of each piece of equipment.

Maintenance procedures: include maintenance procedures to follow while the systems are operated prior to turnover to the Government. These procedures should include at least the following:

* Protection of the equipment from exposure to construction
* Cleaning of the equipment – identify the parties responsible
* Monitoring of system during operation – clearly identify responsible parties
* Schedule for servicing such as cleaning strainers and/or replacing filters
* A plan for addressing activated alarms such as high static or freeze stats that protect the equipment from damage. – Procedure of notification and correction.
	+ 1. Startup plan submission. The startup plan will be submitted to the CXA and Government representative for review and approval prior to starting any equipment.
		2. Once the startup plan has been approved the installing contractors executes equipment start up according to the start up plan and provides the sign and dated copies of all completed start up documents to the CxA for inclusion in the final commissioning report. All start up procedures must be satisfactorily executed before functional testing begins and before the equipment is operated, even temporarily.
	1. COMMISSIONING ISSUES LOG
		1. The Commissioning Agent will prepare and maintain a Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues. The CxA will verify the corrected issue and provide the commissioning team with updated issues log on a routine basis.
		2. Creating a Commissioning Issues Log Entry:
* Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
* Assign a descriptive title for the issue.
* Identify date of the issue.
* Identify test number of test being performed at the time of the observation, if applicable, for cross reference.
* Identify system, subsystem, and equipment to which the issue applies.
* Identify location of system, subsystem, and equipment.
* Include information that may be helpful in diagnosing or evaluating the issue.
* Note recommended corrective action.
* Identify commissioning team member responsible for corrective action.
* Identify expected date of correction.
* Identify person that identified the issue.
	+ 1. Documenting Issue Resolution:
* Log date correction is completed or the issue is resolved.
* Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
* Identify changes to the Contract Documents that may require action.
* State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
* Identify person(s) who corrected or resolved the issue.
* Identify person(s) verifying the issue resolution.
	1. TAB REVIEW AND VERFICATION OF REPORT ACCURACY
		1. General: The TAB contractor will provide the CxA with a preliminary TAB report for review. The CxA will review the TAB report to verify or assure the following:
* TAB results for all equipment and systems covered in the specifications are included in the TAB report
* Actual flow rates were adjusted to the design values plus or minus specified tolerances.
* The report discusses any TAB activities that failed to produce the required results.
* The report and process followed adheres to the TAB firms national organizations standard and project specifications.
	+ 1. Verification of Report Accuracy: The CxA and TAB contractor will verify the accuracy of the TAB report readings by randomly sampling the readings noted in the report in the field using the TAB contractors calibrated instruments.
		2. The CxA will note any deviations greater than the tolerance specified in the TAB specifications (+/- 10%, for example)
		3. Deviations noted should be corrected and documented by the TAB contractor.
		4. If the total number of sampled readings that deviate beyond specified tolerances exceeds 10 percent, Additional sampling will be required.
	1. PHASED COMMISSIONING
		1. When startup and initial checkout are required to be executed in phases, this phasing will be planned and scheduled in a coordination meeting of the CxA, mechanical, plumbing, TAB, and controls contractor, and the GC. The GC shall modify the construction schedule as needed, to reflect phased commissioning.
	2. FUNCTIONAL TESTING
		1. The CxA directs comprehensive equipment and system testing and documents all testing performance. This testing is conducted using functional performance test procedures developed by the CxA.
		2. The objective of functional testing is to demonstrate that each system is operating according to the Contract Documents. Functional testing facilitates bringing the systems to full dynamic operation. During the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
		3. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and alarm conditions as power failure, freeze conditions, low oil pressure, no flow, equipment failure, etc. shall also be tested.
		4. Functional Performance testing will not be scheduled until all prefunctional checklists are completed and return to the CxA, the Certificate of Readiness has been provided to the CxA, TAB is complete and all control programming and check out is complete.
		5. Documentation: The CxA will execute the functional testing with support from the appropriate installing contractors and document the results of all functional performance tests using the specific procedural forms developed for that purpose.
		6. Non-Conformance: Systems or equipment for which 100 percent sample size are tested fail if one or more of the test procedures results in discovery of a deficiency and the deficiency cannot be resolved within 15 minutes during the test. Re-test to the extent necessary to confirm that the deficiencies have been corrected without negatively impacting the performance of the rest of the system. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted on the commissioning issues log and functional test form. All deficiencies or non-conformance issues identified during the functional testing shall be corrected and retested at no additional cost to the Government.
		7. Aborted Tests and Re-Testing: Abort functional performance test if any deficiency prevents successful completion of the test or if any required commissioning team member is not present for the test. Functional performance test may be aborted if the CxA determines the system is not sufficiently complete or ready for testing. The Contractor will reimburse the Government for all cost associated with the effort lost due to re-testing due to test failures and aborted tests. These costs must include salary, travel costs, and per diem for Government commissioning team members. Re-test only after all deficiencies identified during the original test have been corrected.
	3. CONTROL POINT TRENDING
		1. General: Following successful completion of functional performance testing the RCMS the installing contractor shall configure key control points to collect data at 15 minute time intervals over a 36 hour minimum period of time. The control point trends shall be used to confirm stable system control and operation.
		2. The system shall be in full automatic mode during the entire trending period. Restart the trending if the equipment, systems or setpoints are overridden to manual mode at any time during the trend test period.
		3. All alarm points shall be included in the trending.
		4. The control RCMS installing contractor shall provide the trend data to the CxA at the end of the trending period for the CxA to review. Additional trending may be needed after the initial review.
	4. OPERATIONS AND MAINTENANCE MANUALS
		1. The commissioning process requires detailed O&M documentation to be provided.
		2. The Contractor shall submit manuals to the GATR and CxA prior to scheduling training of the Governments personnel. The GATR and CxA shall review the O&M manuals and documentation; with redline as-builts, for systems that were commissioned to verify compliance with the specifications. The GATR and CxA will communicate any deficiencies in the manuals to the contractors. Upon a successful review the GATR will recommend approval and acceptance of these sections of the O&M manuals. The GATR will also review each equipment warranty and verify that all requirements to keep the warranty valid are clearly stated. The approved manuals will be provided to the Governments personnel prior to the training session so they can become familiar with the information the training session will cover.
		3. The contractor shall compile O&M manuals for every piece of equipment and system being commissioned with the following format:
* Quantity: 6 (Unless more are required by the technical specifications).
* Format: 8-1/2 x 11 3-ring loose-leaf binders, 3-inch maximum, and electronic format that is compatible with Government’s system. Each binder shall be clearly labeled on the spine. Use as many binders as required. Do not overload binders. Dividers with permanently marked tabs of card stock shall separate each section and sub section. Tab labels shall not be handwritten. A separate manual or chapter shall be provided for each applicable system.
* There shall be a title page and table of contents in the front of each binder for each binder’s contents. In each binder, there shall be a main tab for each specification section. Behind the section number tab there shall be the equipment ID tag sub-tab for each piece of major equipment (or group, if small or numerous). Behind each equipment name, tab shall be the following sections, in the given order, divided by a double weight colored sheet labeled with the title of the section.
	+ Contractor. The first page behind the equipment tab shall contain the name, address and telephone number of the manufacturer and installing contractor and the 24-hour number for emergency service for all equipment in this section, identified by equipment.
	+ Submittal and Product Data. This section shall include all approved submittal data, cut sheets, data base sheets and appropriate shop drawings. If submittal was not required for approval, descriptive product data shall be included.
	+ Operation and Maintenance Instructions. These shall be the written manufacturer’s data with the model and features of this installation clearly marked and edited to omit reference to products or data not applicable to this installation. This section shall include data on the following:
		- Model number, serial number and nameplate data for each piece of equipment and any subcomponent.
		- Installation, startup and break-in instructions.
		- All starting, normal shutdown, emergency shutdown, manual operation and normal and emergency operating procedures and data, including any special limitations.
		- Step-by-step procedure for system startup, including a pre-start checklist. Refer to controls and indicators by nomenclature consistent with that used on panels and in control diagrams.
		- Sequence of operation, with detailed instruction in proper sequence, for each mode of operation (i.e., day-night; staging of equipment.
		- Emergency operation: If some functions of the equipment can be operated while other functions are disabled, give instructions for operations under these conditions. Include here only those alternate methods of operations (from normal) which the operator can follow when there is a partial failure or malfunctioning of components, or other unusual condition.
		- Shutdown procedure: Include instructions for stopping and securing the equipment after operation. If a particular sequence is required, give step-by-step instructions in that order.
		- O&M and installation instructions that were shipped with the unit.
		- Preventative and corrective maintenance, with service procedures and schedules.
		- Safety Precautions: This subsection shall comprise a listing of safety precautions and instructions to be followed before, during and after making repairs, adjustments or routine maintenance.
		- Manufacturers' brochures (including controls): Manufacturers' descriptive literature covering devices and equipment used in the system, together with illustrations, exploded views and renewal parts lists. Manufacturers’ standard brochures and parts list shall be corrected so that information applying to the actual installed equipment is clearly defined.
		- Warranty and guarantee, which clearly lists conditions to be maintained to keep warranty in effect and conditions that, would affect the validity of the warranty.
		- Any service contracts issued.
		- Control Diagrams/Drawings. Include the as-built control diagrams/drawings for the piece of equipment and its components, including full points list, full print out of all schedules and set points after testing and acceptance of the system, and copies of all checkout tests and calibrations performed by the contractor (not commissioning tests).
		- Specifications. This section is comprised of the component or system specification section copied and inserted complete with all addenda.
	1. TRAINING OF GOVERNMENT PERSONNEL
		1. A training plan must be developed which identifies all training required by specification sections associated with commissioned systems. The General Contractor will submit the training plan to the CxA for review and approval prior to scheduling the training sessions. The General Contractor will be responsible for coordination and implementation of the training sessions after the training plan is approved.
		2. The written training plan will include the following at a minimum:
* Schedule and location of the training sessions
* List of training instructors
* Equipment included in the training
* General purpose of systems
* Training objectives
* Use of O&M manuals
* Startup, normal operation, shutdown, troubleshooting, interactions with other systems
* Contact information and procedure for warranty issues
* Special maintenance requirements
* Suggested spare part to stock
	+ 1. Training session shall include hands-on training that includes startup, operation in all modes possible, including manual, shut-down, alarms, power failure, and any emergency procedures, and preventative maintenance for all equipment.
		2. The RCMS installing contractor shall provide a separate training session that provides an overview of the intent of the system as well as the particular operation requirement. Operator interface, scheduling, alarms, trending and troubleshooting are included in the training session.
		3. After all training is complete; the contractor is to provide an attendance list and proper documentation of the training that occurred to the CxA for the final commissioning report.
	1. COMMISSIONING REPORT
		1. The CxA will compile all the documentation from the commissioning process into a final commissioning report.
		2. Final Commissioning Report Details: The Final Commissioning Report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report shall contain:
* Commissioning Plan
* Submittal Review Comments
* Completed Pre-Functional Checklists
* Site Observation Reports
* TAB verification comments
* Functional Test Reports
* Control Point Trend Data
* Final Commissioning Issues Log
* Training Plan, training procedure, and documentation used to support training.
* Commissioning Meeting Notes
* All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.
	1. DEFERRED TESTING
		1. Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the CxA.

**Table 1.1 - Team Members Information**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Contact** | **Phone** | **Fax** | **Mobile** | **e-mail** | **Address** | **City/State,/Zip** | **Trade / Role** |
|  |  |  |  |  |  |  |  | Government Representative |
|  |  |  |  |  |  |  |  | Project Manager |
|  |  |  |  |  |  |  |  | Architect/Engineer Principal |
|  |  |  |  |  |  |  |  | Mechanical Engineer |
|  |  |  |  |  |  |  |  | Electrical Engineer |
|  |  |  |  |  |  |  |  | Commissioning Authority |
|  |  |  |  |  |  |  |  | General Contractor |
|  |  |  |  |  |  |  |  | HVAC Contractor |
|  |  |  |  |  |  |  |  | Plumbing Contractor |
|  |  |  |  |  |  |  |  | Electrical Contractor |
|  |  |  |  |  |  |  |  | Refrigerant Monitoring Control System Contractor |
|  |  |  |  |  |  |  |  | Others: |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

**Table 1.2 - System Components to be Commissioned**

| **System/Component** | **Pre-functional****Testing** | **Functional** **Testing** |
| --- | --- | --- |
| **Number** | **Modified****Y / N** | **Number** | **Modified****Y / N** |
| **Building Automation System** |  |  |  |  |
|  |  |  |  |  |
| **Division 8 – Openings** |
| Overhead Coiling Doors | None | NA | FT-083323 |  |
| Sectional Overhead Doors | None | NA | FT-083613 |  |
| Automatic Entrance Doors | None | NA | FT-084229 |  |
| Windows | None | NA | FT-085000 |  |
| Door Hardware | None | NA | FT-087100 |  |
| Key Control Cabinet | PC-087913 |  | None |  |
|  |  |  |  |  |
| **Division 11 – Equipment** |
| Refrigerated Display Cases | PC-110000-1 | \* | None | NA |
| Equipment, Generic | PC-110000-2 | \* | None | NA |
| Loading Dock Equipment | PC-111300 | \* | None | NA |
| Queuing System | PC-111400 | \* | None | NA |
| Pedestrian Control Equipment | None | NA | FT-111400 |  |
| Safes | PC-111616 | \* | None | NA |
| Bakery Equipment | PC-114000.13 | \* | None | NA |
| Deli Equipment | PC-114000.16 | \* | None | NA |
| Grocery Equipment | PC-114000.19 | \* | None | NA |
| Meat Department Equipment | PC-114000.23 | \* | None | NA |
| Produce Department Equipment | PC-114000.26 | \* | None | NA |
| Seafood Department Equipment | PC-114000.29 | \* | None | NA |
| Baler | PC-118236 | \* | None | NA |
|  |  |  |  |  |
| \* Use generic form PC-11000, customize as required by commissioning work scope. |
|  |
| **Division 13 – Special Construction** |
| Cold Storage Rooms | PC-132126 |  | None | NA |
|  |
| **Division 21 – Fire Suppression** |
| Fire Suppression | PC-211300 |  | FT-211300 |  |
|  |  |  |  |  |
| **Division 22 – Plumbing** |
| Sanitary Waste and Vent Piping | PC-220000-1 |  | None | NA |
| Storm Drainage Piping | PC-220000-2 |  | None | NA |
| Fuel Piping | PC-220000-3 |  | None | NA |
| Domestic Water Piping | PC-220000-4 |  | None | NA |
| Domestic Water Heaters | PC-220000-5 |  | FT-220000-3 |  |
| Domestic Water Filtration | PC-223200 |  | None | NA |
| Pumps (Plumbing) | None | NA | FT-220000-1 |  |
| Plumbing Fixtures | None | NA | FT-220000-2 |  |
|  |  |  |  |  |
| **Division 23 – Heating, Ventilating, and Air Conditioning (HVAC)** |
| Testing, Adjusting, and Balancing | PC-230593-1 |  | FT-230593-1 |  |
| Calibration and Leak-By Test Procedure | PC-230593-2 |  | FT-230593-2 |  |
| Control Devices for HVAC | PC-230913 |  | FT-230913 |  |
| Refrigeration Monitoring Systems | PC-230916 |  | FT-230916 |  |
| Hydronic Piping | PC-232113 |  | None | NA |
| Pumps (HVAC) | PC-232223 |  | FT-232223 |  |
| Ducts | PC-233113 |  | None | NA |
| Fans | PC-233423-1 |  | FT-233423-1 |  |
| Air Curtains | PC-233423-2 |  | FT-233423-2 |  |
| Makeup Air Units | PC-233423-3 |  | FT-233423-3 |  |
| Diffusers Registers and Grilles | PC-233713 |  | None |  |
| Kitchen/Exhaust Makeup Air Unit | PC-233813 |  | FT-233813 |  |
| Heat Pumps | PC-236213 |  | FT-236213 |  |
| Packaged Water Chillers | PC-236400 |  | FT-236400 |  |
| Split System Air Conditioners | PC-238126-1 |  | None | NA |
| Split System Heat Pumps | PC-238126-2 |  | None | NA |
| Fan Coil Units | None | NA | FT-238216 |  |
| Air Handling Units | PC-238416-1 |  | FT-238416-1 |  |
| Dehumidifier | PC-238416-2 |  | FT-238416-2 |  |
| Refrigeration Compressors | PC-239000-1 |  | FT-239000 |  |
| Air Cooled Condenser | PC-239000-2 |  | None | NA |
|  |  |  |  |  |
| **Division 26 – Electrical**  |
| Medium Voltage Cables | PC-260513 |  | None | NA |
| Grounding and Bonding | PC-260526 |  | FT-260526 |   |
| Transformers (Dry) | PC-261219-1 |  | None | NA |
| Transformers (Liquid) | PC-261219-2 |  | None | NA |
| Electric Metering | PC-261600 |  | None  | NA |
| Switchboards  | PC-262300 |  | FT-262300 |  |
| Panelboards | PC-262416 |  | FT-262416 |  |
| Motor Control Centers | PC-262419 |  | FT-262419 |  |
| Safety Switches | PC-262816 |  | None | NA |
| Generator Assemblies | PC-263214 |  | FT-263214 |  |
| Battery Equipment | PC-263343 |  | None | NA |
| Cathodic Protection | PC-264213 |  | None | NA |
| Emergency Lighting | PC-265100-1 |  | FT-265100 |  |
| Interior Lighting | PC-265100-2 |  | FT-265100 |  |
| Exterior Lighting | PC-265600 |  | FT-265600 |  |
|  |  |  |  |  |
| **Division 27 – Communications** |
| Voice and Data Communications Cabling | PC-271000-1 |  | None | NA |
| Consoles | PC\_271116 |  | None | NA |
| Data Communication Systems | PC-272000 |  | FT-272000 | NA |
| Voice Communication Systems | PC-273000 |  | FT-273000 |  |
| Public Address and Music Systems | PC-275116 |  | FT-275116 |  |
| Processing Area Signaling Systems | PC-278000 |  | None | NA |
|  |  |  |  |  |
| **Division 28 – Electronic Safety and Security** |
| Intrusion Detection | PC-281600 |  | FT-281600 |  |
| Video Surveillance | PC-282300 |  | FT-282300 |  |
| Fire Detection and Alarm | PC-283100 |  | FT-283100 |  |
|  |  |  |  |  |
| **Division 32 – Exterior Improvements** |
| Irrigation Systems | PC-328400 |  | FT-328400 |  |
|  |  |  |  |  |
| **Division 33 – Utilities** |
| Water Distribution | PC-331100-1 |  | None | NA |
| Water Metering | PC-331100-2 |  | None | NA |
| Sanitary Sewerage | PC-333000 |  | None | NA |
| Storm Drainage | PC-334000 |  | None | NA |
| Gas Metering | PC-335100 |  | None | NA |
|  |  |  |  |  |

**Figure 1.1 – Commissioning Schedule**

