# Scope of Work (SOW) Template for Commissioning Projects

# *Purpose and Goal of this Template*

*This Scope of Work (SOW) template provides information that can be used to describe relevant Commissioning services for a school construction project. It provides information and instructions for service requirements as well as deliverables descriptions. This document may be used in conjunction with a Request for Proposals (RFP) document to solicit bids for Commissioning services or on its own to describe SOW requirements for bidders.*

*The goal of this template is to provide examples of the areas of work that may be considered for energy efficiency and emissions reduction projects commissioning services. It is the intention of this document to provide a framework upon which a complete scope of work can be based and more fully developed by a public education administrator (the Agency) or their representatives and tailored to a specific project.*

*Included are sections that may be required in the RFP and some sections that are optional, depending on how this document is intended to be used (i.e., if it is being used alongside the RFP template, or not). These optional sections are clearly identified by the (Optional) designation.*

*Instructions for Use of this document.*

*The Agency can use this structure as a basis for the final SOW document and should add sections as appropriate. For sections appearing in the RFP, which this document accompanies, these can be modified accordingly or deleted.*

***Notes in italics between lines*** *(often under section headings) provide instructions to the Agency on the use of the template and should be deleted from the final version of the document before being issued to potential bidders.*

***Plain text (unitalicized)*** *is included in each section of this document. This contains suggested language / example content intended as indicative for what may be included in each section and is organized by building energy system type. The Agency should modify and / or delete example content for each section as appropriate, according to the specific characteristics of their project.*

***Italic text*** [***in parentheses and highlighted yellow***] *relates to site specific information or requirements that should be updated by the Agency. The parentheses and yellow highlighting should be removed before publication.*

*Finally, text that is included as* ***EXAMPLE BEGINS******→*** [*‘Example Content’*] ***← EXAMPLE ENDS*** *is there to assist with completing sections, to indicate the type of content and level of detail recommended for Agencies to include in that section. These should be deleted once the Agency has completed the document.*

***NOTE:*** *Once the SOW is completed to the satisfaction of the Agency, the Purpose and Goals and Instructions for Use sections shall be deleted from the document. Once appropriate detail from the Appendices has been moved to the main body of the document, the Appendices should also be deleted.*

# *Template*

*The Commissioning services SOW includes the following sections with a table of contents at the beginning:*

**Table of Contents**

[1. Introduction and Project Goals 4](#_Toc188023756)

[2. Systems to be Commissioned 5](#_Toc188023758)

[3. Commissioning Plan and Schedule 7](#_Toc188023759)

[4. Basis of Design 11](#_Toc188023760)

[5. Design Review 12](#_Toc188023761)

[6. Pre-Construction 13](#_Toc188023762)

[7. Construction Phase Verification 13](#_Toc188023763)

[8. Submittals Review 15](#_Toc188023764)

[9. Training 15](#_Toc188023765)

[10. System Performance Test 16](#_Toc188023766)

[11. Commissioning Report 17](#_Toc188023767)

[12. Systems Manual 18](#_Toc188023768)

[13. Operation and Warranty Review 19](#_Toc188023769)

[14. Handover and Closeout 19](#_Toc188023770)

[15. Project Deliverables 20](#_Toc188023771)

[16. Reference Standards Requirements (examples) 21](#_Toc188023772)

[17. Appendix: Facility Profile 22](#_Toc188023773)

# Disclaimer

This template is intended as a resource only and should be modified for your specific needs. It is the responsibility of the Agency to ensure that all procurements follow applicable local, state, and federal requirements and agency-specific policies and procedures. All documents comprising the Commissioning services agreement must be thoroughly reviewed by the Agency’s contracting and legal staff and should be modified to address each Agency’s unique acquisition process, and project-specific characteristics and needs.

This template is intended as a resource only and should be modified for your specific needs. It is the responsibility of the Agency to ensure that all procurements follow applicable local, state, and federal requirements and agency-specific policies and procedures. The use of the Design Build (DB) contracting model should be understood by the Agency and decision-makers early in the process. All documents comprising the Design Build agreement must be thoroughly reviewed by the Agency’s contracting and legal staff and should be modified to address each Agency’s unique acquisition process, and project-specific characteristics.

# Introduction and Project Goals

*This section should provide an overview of the proposed project, and call out key project objectives, including goals and associated metrics, and briefly refer to processes, requirements, or criteria that apply to the project’s implementation.*

*The Agency should make explicit any specific requirements around local or state legislation that bidders may be required to adhere to, and/or may be less familiar with or unaware of.*

The [*XX school / school district*] is soliciting a proposal from a qualified Commissioning Services firm (the Commissioning Agent (CxA)) to guarantee that the systems and equipment specified are installed and operating correctly according to original design and engineering documentation for a project that improves the indoor thermal environment, indoor air quality and energy performance of the school’s [*XX building*]. This is to be achieved by implementing a commissioning plan for the systems and equipment that serve the building(s).

The CxA is to provide the following services: provide and implement a commissioning plan that meets the needs of the school district, meet industry standards, identify issues, and improve efficiency.

## Primary Objective Goals

The primary objectives for conducting these activities are:

* Enhance documentation of the operational and maintenance (O&M) requirements for the equipment and systems included.
* Document baseline operating conditions through trending of performance measurements.
* Optimize control systems through review of metered data and trend logs, and functional equipment testing.
* Identify operational and maintenance enhancements that result in improvements in energy efficiency, occupant comfort, or indoor air quality.
* Identify staff O&M training needs.
* Coordinate and direct the commissioning activities in a logical, sequential, and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
* Coordinate the commissioning work with the design team and construction manager, to ensure that commissioning activities are being incorporated into the master schedule.

# Systems to be Commissioned

*This section should include a detailed system and equipment description in this document, with sufficient detail provided to indicate the areas of focus for the project - example text is provided below. The description should be sufficiently detailed for the CxA to understand the basis of the project and to provide guidance for them to conduct any additional investigations as needed.*

*This section should also contain all the information that pertains to the technical services of work to be done at the Agency project site. The content should identify and describe all supporting documentation that will be made available to the CxA, to inform the development of their proposal, and that will influence their approach to project services.*

*All relevant supporting information should be included. Several essential elements to include are listed below:*

* *Site address*
  + *Building/campus description*
  + *Include gross square footage*
  + *Include the number of buildings on the campus*
    - *Include details of buildings that the scope of work applies to*
    - *Include space type descriptions i.e., admin offices, classrooms, workshops etc.*
* *Describe the existing building equipment or systems relevant to the scope of the project, specifically noting what are new conditions, equipment or systems to commission, e.g.:*
  + *HVAC systems consisting of boilers, chillers, pumps, piping, and air distribution.*
  + *Building Automation System consisting of HVAC digital controls.*
  + *Building envelope including the different types of curtain wall assemblies (specify roofing, windows and doors, construction joints, etc.) Plumbing system consisting of domestic hot water, cold water, waste and vent piping systems, domestic hot water (DHW) and plumbing fixtures and valves.*
  + *Electrical (service switchgear, switchboards, distribution panel boards, transformers, motor control centers, power monitoring and metering, transient voltage surge suppressors, variable speed drives, grounding and ground fault systems, overcurrent protective devices, low voltage busway, thermographic survey, electronic calendaring or directory, white sound system).Lighting and lighting controls.*
  + *Solar photovoltaics system.*

*An example description follows, which should be modified to suit the existing conditions.*

***EXAMPLE BEGINS →*** [*The* [*XX*] *school site consists of* [*X*] *buildings, of* [*X*] *vintages. The* [*XX*] *Building (Building* [*X*] *on location map) is the focus of this project. The* [*Main Building*] *has an occupied square footage of* [*XX*]*, was constructed in the* [*1970’s*]*, and is in* [*fair*] *condition.*

*The building was originally designed as a junior high school, in an open classroom*

*concept. Currently there are four academic “houses” within the building. Upon occupying the new 3 floor addition at the Middle School, the existing vacated academic wing will be demolished to allow for development of a new student commons, driveways, parking areas and play areas. The project’s scope includes abatement and demolition services required to complete the work.*

*Program Summary:*

* *Light/ Comprehensive Renovation approx. 50,000 sf (Art & Music, Gym, Cafeteria,*
  + *Auditorium)*
* *New addition for 3 story Academic Core approx. 90,000 sf (grades 6-8)*
* *New addition for 2 story PreK wing approx. 47,000 sf*
* *Administrative offices*

*Commissioning activities to include:*

* *HVAC systems: Heating, ventilating and air conditioning systems, and all mechanical equipment forming a part of these systems including, but not limited to, all boilers, chillers direct expansion refrigeration equipment, fuel storage and handling systems, pumps, piping air handler systems, terminal equipment, fans, exhaust systems, ventilation systems, variable frequency drives, heat recovery systems, thermal solar systems, and automated temperature controls and energy management systems.*
* *Plumbing systems and all equipment forming a part of these systems including but not limited to potable and not-potable water systems, water pressure booster systems, service water heating systems, sanitary waste and vent systems, laboratory waste and acid neutralization systems, natural gas systems, and compressed air systems.*
* *Electrical Power Systems and all equipment forming a part of these systems including, but not limited to, electrical supply and distribution systems, emergency and standby power systems including automatic transfer switching systems, lighting and lighting control systems, low voltage systems, grounding and bonding systems, audio visual systems, and interfaces to automated temperature/building automation control systems.*
* *Building Automation and Controls and all equipment forming a part of these systems including but not limited to, the interface of these systems with HVAC systems, fire alarm and security systems.*

***← EXAMPLE ENDS***

*The following documentation is provided to the CxA during the commissioning process in order to ensure a comprehensive evaluation of the system’s functionality and compliance with design intent.*

***EXAMPLE BEGINS →***

* *Project Specifications*
  + *Detailed description of the project’s functional requirements, performance standards, and quality expectations for each system and equipment*
* *Project Drawings (if available at time of the proposal)*
  + *Conceptional design through construction level drawings.*
* *Technical Specifications*
  + *Performance characteristics of equipment specified including manufacturer information*
* *Operational Requirements*
  + *Owner operational intent including scheduling and desired comfort/temperature requirements*
* *Performance Criteria*
  + *Measurable parameters used to evaluate system performance during commissioning. Examples include temperature ranges, airflow rates, pressures, energy consumption*

***← EXAMPLE ENDS***

The CxA will be expected to provide commissioning services from the Schematic Design Phase and continue through preparation of construction documents, bidding, construction, close-out and building occupancy as phased or as otherwise noted. The CxA, will be expected to support the Owner through all submissions related to the project as necessary.

# Commissioning Plan and Schedule

*This section should describe in full, parts of the commissioning plan and its schedule, including detailed information about pre-functional checks, functional performance tests, control system tuning/optimization, equipment specifications, installation verifications, documentation of findings and a timeline for completing each state of the commissioning process to ensure the system operates according to design specifications and meets energy efficiency standards.*

1. A project schedule and planning phase information will be made available to the CxA for the development of a comprehensive commissioning plan (i.e., design phase, construction phase, field verification, functional verification, acceptance phase, post acceptance phase, training, documentation warranty review, seasonal testing, etc).

2. The CxA shall develop a commissioning plan that defines the commissioning process for the various phases of project development. This plan shall include a schedule of commissioning process activities and identify the parties that will perform these activities.

3. The commissioning plan shall be updated as the project progresses, and more information is available or when the project requirements change.

4. The CX shall work with the design team to integrate the commissioning process into the contract documents so as to describe the Contractor’s responsibilities.

Reference example commissioning plans and commissioning resources:

* Commissioning plan for a 16,500 square foot library:
  + <https://files.wmich.edu/s3fs-public/attachments/u301/2014/149_Commissioning%20Plan_R10093.Preliminary%20Cx%20Plan_Submitted_2013%2004%2016_0.pdf>
* Monitoring Based Commissioning plan that uses Energy Management and Information Systems (EMIS) for ongoing monitoring and analytics. This MBCx Plan can be used to implement meter analytics with an energy information system (EIS), and/or heating, ventilation and air conditioning (HVAC) operational fault detection and diagnostics (FDD):
  + https://buildings.lbl.gov/sites/default/files/MBCx%20Plan%20Template\_June%202017\_Final.pdf

Examples of key elements of a commissioning plan:

***EXAMPLE BEGINS →***

* *Design Phase*
  + *Create the preliminary commissioning plan*
  + *Create the Basis of Design (BOD) document*
  + *Provide a design review*
  + *Provide specification development*
  + *Create construction checklists, tests and startup documentation*
* *Construction Phase*
  + *Provide Submittal review*
  + *Provide O&M manual review*
  + *Provide construction checklists*
  + *Provide field observations*
  + *Provide document commissioning issues*
* *Acceptance Phase*
  + *Provide checklist verification*
  + *Verify record drawings*
  + *Verify testing, adjustment, balancing (TAB)*
  + *Perform functional performance testing (FPT)*
  + *Perform Building automation system (BAS) sequence of operation review*
  + *Participate in Owner training*
* *Occupancy/Warranty Period Phase*
  + *Provide final commissioning report*
  + *Provide systems manual from equipment manufacturers*
  + *Perform seasonal testing*
  + *Provide warranty review*
  + *Provide lessons learned*

***← EXAMPLE ENDS***

# Basis of Design

*This section should describe what needs to go into the Basis of Design document based on the owner’s project requirements (OPR) documents. It outlines the guiding principles and reasoning behind the project’s design approach.*

The CxA and members from the Project Team shall establish the project design intent and create a Basis of Design (BOD) document. The CxA shall verify the facilities’ functional, performance and environmental goals are clearly described in the BOD. The CxA shall use the requirements outlined in the BOD during the Cx process, to ensure they are being followed and maintain the project design intent throughout all phases of the project.

Specific items to address in the BOD are:

* Project overview
* Design objectives
* Technical specifications
* Sustainability considerations
* Building project size and layout
* Schematic Design (SD) Phase (with examples)
* Floor plans
* Schematic site plans
* Crucial building sections, with detail as appropriate
* Exterior elevations
* Sufficient details for the design team to proceed to the next phase of design development with approval from the Agency or their representatives (see description of approval requirements in the final bullet point)
* Relevant energy efficiency standards, energy and/or energy cost savings performance goals
* Safety and compliance requirements (including applicable codes), e.g.:
* ASHRAE 90.1 (energy performance)
* ICC International Energy Conservation Code (IECC)
* NFPA 70 - National Electric Code (NEC)
* UMC Uniform Mechanical Code (UMC)
* ASHRAE Standard 55 - Thermal Environmental Conditions for Human Occupancy
* ASHRAE Standard 62.1 - Ventilation for Acceptable Indoor Air Quality
* Local, state, and federal
* Other construction requirements shall be identified in the design documents.

●  *Specify any client approvals required during the design phase from all relevant authorities, and that are necessary to proceed with design development. See the following resources for examples. The second link provides various resources that may be applicable to your project.*

*[*[*https://efficienthealthyschools.lbl.gov/guides-and-packages*](https://efficienthealthyschools.lbl.gov/guides-and-packages)*]*

*[*[*https://efficienthealthyschools.lbl.gov/design-and-contracting-documentation*](https://efficienthealthyschools.lbl.gov/design-and-contracting-documentation)*]*

# Design Review

*This section should thoroughly examine the engineering design documents and specifications of a building system to ensure they meet the project requirements, industry standards, and the owner's needs, identifying potential issues early on before construction begins, and verifying that the systems can be effectively commissioned once installed; essentially, it's a quality check to mitigate risks and guarantee the final system functions as intended.*

The CxA shall review the 70% design submittal documents to verify the design achieves project intent and project requirements. The final construction documents (100%) will be reviewed to verify the project intent requirements have been incorporated. Design review meetings will be held to discuss documented review comments with the design team. The CxA shall communicate with the engineering design team throughout the design process to verify that all comments and concerns are addressed.

The design review shall include:

* Creation of a design development task schedule. This may be included as part of the scope of work proposal, or as part of the RFP response. This will consist of:
* Site Access Approvals & Schedule Design Kick-off Meeting
* Survey and Assessment Phase (if needed)
* Design Development (DD) Phase reviews (with examples)
  + - Comprehensive building sections
    - Detailed and accurate elevations
    - Initial specifications of equipment
  + Design progression document reviews (e.g. 70% DD)
* Cost estimates that reflect the 100% DD set

# Pre-Construction

*This section should include scope for the CxA to develop the process and activities to coordinate with the engineering team and develop a systems plan for selected equipment.*

The CxA shall coordinate with the Engineering Project Team to develop a consensus for the communication channel to be used during the project. The CxA shall document the outcomes of this coordination effort and provide team members with results.

* At the Pre-Construction meeting the CxA will provide an overview of the commissioning process and the activities that are to be completed by the general construction contractor and subcontractor.
* Develop an enhanced start-up and initial systems checkout plan with CxAs for selected equipment.

# Construction Phase Verification

*This section should be supported by the desired project management program / implementation schedule. Agencies should specify requirements for regular reporting (i.e., no less frequently than quarterly) that will cover the general progress of the project. They should also consider how best to support planning and mitigation for issues that may contribute to delays. Agencies may wish to provide a project planning and implementation template that meets their requirements to ensure a satisfactory response.*

Referring to the construction documents, the Contractor shall describe the construction services to be provided under this SOW, adding relevant detail where necessary. This should include the following:

* Conduct meetings prior to the beginning of each segment of work to be commissioned to discuss details on how the commissioning process will be implemented in accordance with the commissioning plan. Review submittal data and contract requirements. These meetings will include a team from the following: the general construction contractor, appropriate subcontractor representation, and engineering design team representatives.
* Site construction administration, and requirements and documentation to be produced for all construction job meetings. The CxA shall develop a construction checklist and provide an electronic database to track the progress of the installation and verify the completion of these lists. The [*XXXXX i.e. Construction contractor]* will fill out documents properly and scanned into the project-maintained database.
* Description of necessary construction activities, including materials, methods, and safety considerations to assure compliance with all safety, plans, specifications, and other contract documents.
* Document identifying key construction milestones and deliverables, and describing key project constraints.
* Documentation to support and report construction activities
  + Construction schedule
    - Revised versions submitted as required
  + As-built drawings
  + Commissioning plan
  + Commissioning report
* Periodically [*Monthly]* the CxA will visit the site and review the process with the contractor to verify the commissioning process is followed and that issues are addressed when discovered. Day-to-day follow-up will be the responsibility of the contract. The CxA shall document each site visit.
* CxA will check construction components, equipment, controls, and tests periodically using sampling checklists completion and construction completion to verify the quality is being achieved and that the equipment, systems, controls, and submittal data meets the project intent requirements and construction documents.
* CxA verification process of different systems will utilize statistical sampling and spot checks as appropriate to verify that the contractor’s quality control process and assurance process is working and achieved desired results.
* Related to the project implementation schedule and planning, Contractors should develop a risk register that appropriately identifies, allocates and manages project risks.
* Specify any approvals required during the construction phase.
* Develop an enhanced start-up and initial systems checkout plan with CxAs for selected equipment.
* Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress.
* Where appropriate:
  + Witness HVAC piping pressure test and flushing, sufficient to be confident that proper procedures were followed. Include testing documentation in the Commissioning Record.
  + Witness any ductwork testing and cleaning sufficient to be confident that proper procedures were followed. Include documentation in the Commissioning Record.
* Document construction checklist completion by reviewing completed construction checklists and by selected site observation.
* Other services offered during this phase with a narrative of these services.

# Submittals Review

*This section should be for the CxA to identify any potential issues with proposed equipment or systems early on, before installation, by comparing them against the project's commissioning requirements and design documents.*

The CxA shall review the contractor’s submittals, shop drawings, and manufacturers data and provide a list of comments and suggestions and verify all comments are addressed. The scope shall include:

* Request and review of additional information required to perform commissioning tasks, including O&M materials, CxA start-up and checkout procedures. Before start-up, gather and review the current control sequences and interlocks and work with CxA and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
* Review submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the design team and Construction Manager reviews.
* Review requests for information and change orders for impact on commissioning and Agency objectives.
* Review coordination drawings to ensure that trades are making a reasonable effort to coordinate.
* Write and distribute construction checklists for commissioned equipment.

# Training

*This section should be to review the training for the Agency’s operating personnel. It covers the technical aspects of the systems installed including design, installation, operation, control strategies, testing procedures, and how to properly use the tools to operate the systems and equipment installed with a focus on verifying systems functioning as intended and meets the owners requirements, including hands-on experience with equipment inspection, performance testing, and data analysis to ensure proper documentation and reporting for the Agency.*

The CxA shall review the contractor’s proposed training forms and agenda(s) to verify the training is representative of the installed systems and beneficial to the owner.

* The CxA shall attend and participate in key training sessions to verify the content is provided as expected from the training sessions.
* The CxA will oversee the videotaping of this training.
* The CxA will provide feedback and if additional training is required, additional training sessions will be developed and scheduled.

# System Performance Test

*This section should include all functional testing, analysis, initial troubleshooting, final acceptance related to all tests, including verifying temperature, airflow, motor speeds, control system responses to different conditions, ensuring the system operates according to the design specifications and meets owner’s requirements. It shall also describe the timeframe over which the CxA should review and verify system performance, noting that for some systems (e.g. HVAC) it may be required to observe operation under different climatic conditions.*

The CxA shall develop a schedule for functional performance tests (FPT). The CxA will develop all necessary procedures to verify that the systems deliver what is expected from project intent and construction documents.

Based on statistical sampling, the systems will be tested to ensure that the project meets intent. This includes sample testing of specific system tests like TAB, controls, fire, alarm, etc. Based on the findings from the FPT, the results will be summarized by the CxA in a report with recommendations for further improvements and a summary of how any issues were resolved shall be submitted. The systems performance testing scope shall include:

* Documentation of systems start-up by reviewing start-up reports and by selected site observation.
* Approval of air and water systems balancing by spot testing and by reviewing completed reports and by selected site observation.
* Coordination of functional testing for all commissioned systems and assemblies. Witness and document manual functional performance tests performed by the Construction Contractor for all commissioned systems and assemblies, except: a) some smaller equipment may be tested and documented by the Construction Contractor at the CxA’s discretion, b) electrical equipment testing and regulated testing may be directed and documented by the Construction Contractor with only spot witnessing and report review by the Commissioning Agent. The functional testing shall include operating the system and components through each of the written sequences of operation, and other significant modes and sequences, including start-up, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure, security alarm when impacted and interlocks with other systems or equipment. Sensors and actuators shall have factory calibration and the contractor should provide factory calibration certificates for the CxA to verify. The CxA shall spot-check during functional testing. Analyze functional performance trend logs and monitoring data to verify performance. Coordinate retesting as necessary until satisfactory performance is achieved. Tests on respective HVAC equipment shall be executed, if possible, during both the heating and cooling seasons. However, some overwriting of control values to simulate conditions shall be allowed. Functional testing shall be done using conventional manual methods, control system trend logs, and readouts or standalone data loggers, to provide a high level of confidence in proper system function, as deemed appropriate by the Commissioning Agent and The Agency.
* After functional testing and initial trouble shooting is complete, monitor system operation and performance for selected data points for two days up to two weeks, based on complexity of the system with simpler systems requiring fewer days and data points, by requesting trend logs from the Construction Contractor from the building automation system. The duration of the trending needs to cover all modes of operation which may be several months if seasonal performance is required. For needed system points not able to be trended by the building automation system, furnish and install temporary portable data loggers that will monitor up to 20 points. Analyze monitored data to verify operation and performance and issue a written report. This time frame and monitoring points may be modified to accurately commission the building.
* Maintain a master issues log and a separate record of functional testing. Report all issues through the Construction Manager as they occur. Provide through the Construction Manager written progress reports and test results with recommended actions.

# Commissioning Report

*This section should summarize all documents, experiences, issues, and benefits derived from the commissioning project.*

The CxA shall summarize all documents, experiences, issues, and benefits derived from the commissioning project. The initial report will be delivered prior to the acceptance of the project by the facility.

A [*XXX (6- month]*) follow up meeting will occur. A final commissioning report will include additional comments and experiences of the project team and delivered after the 1-year warranty period. All of the information and the results of the project will be compiled into the final report.

Example report shall include an executive summary, list of participants and the role of each participant, brief building and systems description, an overview of the scope of commissioning and testing and a general description of the testing and verification methods.

1. For each piece of commissioned equipment, the report shall address the adequacy of the equipment, documentation and training, in satisfying the requirements of the Contract Documents in each of the following areas:

* Equipment/system specifications and design intent
* Equipment/system installation
* System functional performance and efficiency
* Description of the verification method used (manual testing, trend logs, data loggers, or other as appropriate) and observations and conclusions from the testing
* Non-compliance issues referenced to the specific functional test inspection, trend log, and other records where the deficiency is documented
* Equipment/system operations and maintenance
* Record documentation
* Operator and maintenance training

1. All outstanding non-compliance items shall be specifically listed in the report, and recommendations for improvement to equipment or operations, future actions, commissioning process changes, and other appropriate matters shall also be listed.
2. Appendices shall contain all acquired sequence documentation, Issues Log, meeting minutes, progress reports, deficiency lists, site visit reports, findings, unresolved issues, communications, and all other relevant information.
3. Pre-functional checklists and functional performance tests and monitoring data and analysis shall be provided in a separate labeled binder.

# Systems Manual

*The CxA is expected to produce a comprehensive reference document that details the design, construction, testing, and operation of a building's systems, providing essential information for building operators and maintenance staff to understand how to properly operate and maintain the systems throughout the building's life cycle; essentially acting as a living record of the building's systems and their functionality.*

The CxA shall review the Contractors O&M documents for compliance with the contract documents. Using the information from the submittals, the CxA shall develop an electronic system manual in PDF format. This manual shall include all systems and components within the facility as defined by the project specifications. At a minimum, it shall include all mechanical, electrical, controls, architectural, relevant communications, etc. Using the information gathered, the final systems manual will be developed including scanning in data that could not be obtained from manufacturers and vendors.

# Operation and Warranty Review

*This section should be all operations and warranty questions that occur during the first year after start up.*

During the first year of operation the CxA will meet with the owner to verify that the operation of the building is as intended at the 12-month warranty (Min quarterly meetings).

* During the first year of operations the CxA shall serve as a resource on the installation and design and provide a minimum of [XX (min 8)] hours of support.
* Based on observations during the first year of operation, suggestions on how to further improve the current system will be documented in the final report.
* Review the preparation of the O&M manuals for commissioned equipment.

# Handover and Closeout

*This section should describe in full the prerequisites to project handover and sign off from The Agency or Agencies Representative.*

The CxA shall complete the following tasks and comply with the relevant requirements of the process and protocols described by the documents identified herein:

**Mandatory Handover Procedures and Related Documentation**

* + Commissioning Report, signed by a state-registered Professional Engineer (PE).
  + Develop and document a performance assurance plan that includes strategies for measuring and presenting baseline consumption and operating hours, design consumption and operating hours, as-installed consumption, and operating hours for each ECM; provides for appropriate commissioning, M&V, operations and maintenance (O&M), and periodic process review to assure performance at design targets for the life of the equipment. Training on all equipment, with video recordings of the trainings available when possible
  + Operations and Maintenance (O&M) equipment manuals provided, including operating procedures, maintenance procedures, frequency, cut sheets, parts lists, warranties, guarantees, and detailed drawings for all equipment installed.
  + Certify a 10-year warranty that covers the design, construction, and equipment-provided O&M services.
  + Close out documentation and certification of project completion in accordance with contract documents.

**Construction Site Condition**

* The site must be restored to pre-construction condition, including making all infrastructure, surfaces and finishes in accordance with standard of construction work.
* Appropriate disposal of all site materials - compostables, reusable materials, recyclable materials (including recyclable material fractions) and waste.
  + - Hazardous work processes and hazardous materials utilized or generated in the performance of this contract shall be controlled and disposed of by the CxA in a manner that is safe and in accordance with the appropriate local, state and US Government laws and directives established for the control of those processes and materials.

# Project Deliverables

*This section should include a list of all documentation and deliverables expected from the project, such as design documents and drawings, construction plans, reports, and any other relevant items.*

The scope of work for the CxA shall include the following deliverables, as described earlier:

* Commissioning plan, updated as the project progresses
* Design review comments
* Functional performance test forms (sample blank and completed forms)
* Trip reports
* Contractor performance evaluation reports
* Deficiency reports, updated weekly
* Systems O&M manual (electronic copy)
* Training agendas
* Training materials

● Warranty documentation for all equipment

* Initial commissioning report
* Final commissioning report
* Re-commissioning management manual (Optional)

# Reference Standards Requirements (examples)

*This section should describe in full set of standards and guidelines the Commissioning Agent should follow. This does not include construction codes and standards.*

The CxA shall reference the following standards and guidelines which the performance of the systems and equipment are measured, ensuring that they meet the specific quality, operations, and functionality.

* ASHRAE Standard 202, Commissioning process for Building and Systems.
* ASHRAE Guideline 0, The Commissioning Process.
* ASHRAE Guideline 1.1, HVAC Commissioning Guidelines.
* ASHRAE Guideline 1.4, Procedures for Preparing FSM.
* LEEDTM, New Construction Reference Guide.
* NFPA 4: Standard for Integrated Fire Protection and Life Safety System Testing.
* NFPA 3: Recommended Practice for Commissioning of Fire Protection and Life
* Safety Systems.
* NFPA 110 Standard for Emergency and Standby Power Systems.
* NFPA 111 Standard on Stored Electrical Energy Emergency and Standby Power Systems

# 

# 

# Appendix: Facility Profile

1. Facility Location, Address, and Primary Contact Information

Name of Campus/site:

Address of Building:

Building Contact:

Phone:

Email:

1. Site Physical Data

Total Facility Floor Area:

Floor Area Affected by Project (if Different):

Space Use Types and Number:

Building A

|  |  |  |
| --- | --- | --- |
| Space Types | Number | Total Floor Area |
| Classrooms |  |  |
| Administration |  |  |
|  |  |  |

1. Site Operating Schedule

|  |  |  |  |
| --- | --- | --- | --- |
| Semesters and Holidays | Operating Hours | Start Date | End Date |
| Fall |  |  |  |
| Spring |  |  |  |
| Spring Break |  |  |  |
|  |  |  |  |

1. Utility and Energy Data

Utility and Fuel Use Summary (at least 12 months):

|  |  |  |  |
| --- | --- | --- | --- |
| Month, Year | Fuel Type | Consumption | Consumption per Unit Area (kBtu/ft2) |
|  |  |  |  |