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**[Name of Organization]**

Request for Proposal

To Provide

Building Commissioning Services

For

**[Project Name]**

**[Using Agency]**

[date]

***Application of this Form***

***This form is an RFP intended to be sent to a single CxP who has been selected through an RFQ process to provide the commissioning services for a specific project.*** *This form 1.3.1 Pt B is intended to be used in conjunction with form 1.3.1 Pt A (RFQ). This RFP is not intended be used to evaluate more than one CxP (it doesn’t have a comparison scoring section). Form 1.3.2 Pt B is used for that situation..*

*This RFP is intended for project structure with an independent commissioning provider (CxP) who is directing all of the Cx effort and co-executing much of it with the contractor. In the case where the contractor is required to hire a “test engineer” who will be directing and executing most day-to-day commissioning tasks with oversight by the independent CxP, the responsibilities in this document should be appropriately modified.*

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# General Information and Requirements

## Overview

Through an RFQ process the [ owner name / firm ] (Owner) has pre-qualified and selected [ CxP RFQ awardee firm ] (Consultant, CxP or Proposer) as the Commissioning Provider (CxP) for the [ owner project ] (Project), should a mutually acceptable scope and fee be negotiated. To that end, the Owner requests a fee proposal (Proposal) for the Project for the Scope of Work given below.

**Owner Representative for this RFP.** Direct correspondence for this RFP to:

[insert name, position, address, phone number and email address]

The project description, schedule and funding details are found in the RFQ previously responded to. [If these were not included in the RFQ this CxP responded to, include them here.]

## Proposal Terms and Conditions

This RFP is deemed not an offer by Owner and the Consultant recognizes that Owner reserves the right to accept or reject, at its sole discretion and without any explanation, any and all proposals furnished in response to this RFP, or to negotiate separately with any source in any manner deemed necessary by Owner to serve its best interests, and to terminate negotiations at any time without incurring any liability. Owner is not obligated to accept any Proposal from Consultant or to award a contract on the basis of this RFP.

## RFP Schedule of Events

[Edit and fill in dates.]

|  |  |
| --- | --- |
| 1. Owner issues this RFP: |  |
| 2. Questions or requests for clarifications may be made by email by midnight of: |  |
| 3. Deadline for submission of proposals (by 7am the following morning, Owner’s time): |  |
| 4. Owner issues notification to finalist firm: |  |
| 5. Notification of award: |  |

## Proposal Price Guarantee

The prices quoted in Proposal will be considered firm for a period of 90 days from submission date of the Proposal. The Consultant agrees to honor said pricing if an award is made during the 90 day period, with an in-service date within one (1) year.

## Contractual Arrangements

**Cx Contract and Independence**. The Commissioning Provider (CxP) will be hired by and report directly to the Owner. Any contract resulting from this solicitation will be in the form of the Owner’s Services Agreement. A copy of which is attached to this RFP.

**CxP Engagement.** The Commissioning Provider (CxP) manages the commissioning effort beginning in [pre-design, or design] .

**Change in Personnel.** If the commissioning firm’s personnel or sub-consultants change for this project, the Owner must review and approve the replacement personnel, in advance. The replacement personnel shall have, at minimum, equivalent qualifications as the original personnel.

**Insurance Requirements.** The following insurance requirements shall be met by the CxP firm and their sub-consultants. As part of this response, provide a signed letter vouching that this requirement is met. Insurance certificates will be required prior to contract signing.

[List insurance requirements.]

**Project Delivery Procurement and Contract Basis** (not the Cx contract). The project delivery procurement method will be [direct contract with Owner] [direct contract with design firm].

The construction contract basis will be [select contract basis below, or add appropriate method, then delete all other contract bases] [with full design documents and specifications developed by an architecture/engineering firm].

* Design/Bid/Build basis
* Design/Build basis
* Not-to-Exceed basis
* Time-and-Materials basis
* Firm Fixed Price basis

## Attachments for This Portion of the RFP

The following documents are attached to this RFP: [edit list below or insert any documents attached to this RFP]

* Sample Owner Services Agreement
* Owner’s project requirements (OPR) for this building
* Owner’s programming report
* Word file of Exhibit 1 (Cx Team)
* Word file of Exhibit 2 (Cx Fee)

# Proposal Contents

The proposal should include and be organized as follows:

**A.** (1 page) A signed cover letter referring to this RFP, including a listing of the total fee for each phase.

**B.** A proposal with the following sections:

**1. Staffing.** (< 1 page) Describe any changes to the team members or roles from that which you submitted in the RFQ for pre-qualifying. Include Exhibit 1 herein.

**3.** **Alternative Approaches.** (< 1 page) If the proposer has any recommended changes or alternative approaches to the Scope of Work, describe them and include the total cost differential by Phase from the Fee Proposal in Table 1.

**4.** **Insurance.** (< 1 page) Include signed statement indicating your firm and sub consultants comply with the insurance requirements in this RFP.

**5. Fee Proposal and Assumptions.** (< 1page) Summarize your fee proposal and document any assumptions and clarifications you feel are needed.

**6. Fee Breakdown.** Provide *Exhibit 2 Commissioning Fee Breakdown* filled in.

### Exhibit 1. Commissioning Team Members Providing Significant Effort on Project

Provide a resume for each individual.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Role** | **Name** | **Firm** | **Primary Discipline** | **Cx Certific-ations & Licenses1** | **Fully Loaded Hourly Rate ($)** | **% of Total Project Hrs by This Party** |
|  |  |  |  |  |  |  |
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1Commissioning provider certification(s) and professional licenses currently held.

# Fee Proposal

[If the CxP is being engaged prior to Pre-design or prior to Design, use the following paragraph:]

Fill out Exhibit 2 completely with *firm fixed lump sum* fees for labor and expenses for the Pre-design and Design Phases based on the Scope of Work. Provide *estimates* broken down by line items in the Exhibit for Construction and Occupancy phases. When any of the above change (schedule, scope, systems), the CxP shall negotiate a contract modification with the Owner. Near the end of Design the Construction and Occupancy phases will be negotiated to a fixed fee.

[If the CxP is being engaged during Design and the list of systems and assemblies to be commissioned is fairly firm use the following paragraph:]

Fill out Exhibit 2 completely with *firm fixed lump sum* fees for labor and expenses for the balance of Design phase tasks identified in the Scope of Work and for the Construction and Occupancy phases. When any of the above change (schedule, scope, systems), the CxP shall negotiate a contract modification with the Owner.

[If the CxP contract is going to be time and materials, not to exceed, replace references to fixed lump sum fee above, accordingly.]

[Correct the Cx Fee Breakdown table template by deleting phases or line items not included in the scope.]

### Exhibit 2 Commissioning Fee Breakdown

| **#** | **Tasks** | | **Total Prime Firm Staff Hrs** | **Prime Firm Labor Cost ($)** | **Sub-Consul-tant Labor Hrs** | **Sub-Consul-tant Labor Cost ($)** | **Total Cost ($)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Pre-Design Phase** | | | | | | | |
| 1 | Develop OPR & Design Cx Plan, Partnering, & Other tasks | |  |  |  |  |  |
| 2 | Expenses—Prime Firm (travel, per diem, hotel, other) | | ----- | ----- | ----- | ----- |  |
| 3 | Expenses—Subconsultant(s) | | ----- | ----- | ----- | ----- |  |
| **4** | **Total Pre-Design** | |  |  |  |  |  |
| **Design Phase** | | | | | | | |
| 1 | Develop OPR & Design Cx Plan, if not done in Pre-Design | |  |  |  |  |  |
| 2 | Review design packages | |  |  |  |  |  |
| 3 | Develop Cx specs & Const Cx Plan | |  |  |  |  |  |
| 4 | All other tasks | |  |  |  |  |  |
| 5 | Expenses—Prime Firm (travel, per diem, hotel, other) | | ----- | ----- | ----- | ----- |  |
| 6 | Expenses—Subconsultant(s) | | ----- | ----- | ----- | ----- |  |
| **7** | **Total Design** | |  |  |  |  |  |
| **Construction Phase** | | | | | | | |
| 1 | Update or write Cx Plan & schedule | |  |  |  |  |  |
| 2 | Review submittals and develop construction checklists | |  |  |  |  |  |
| 3 | Before-testing field work (field observation, checklist back-checking, startup witnessing, test readiness verification, meetings) | |  |  |  |  |  |
| 4 | Write functional test forms | |  |  |  |  |  |
| 5 | Issue Log and issue management | |  |  |  |  |  |
| 6 | Functional tests & trends (directing, executing, documenting) | |  |  |  |  |  |
| 7 | Training and O&M manuals (agendas and verification) | |  |  |  |  |  |
| 8 | All other tasks | |  |  |  |  |  |
| 9 | Expenses—Prime Firm (travel, per diem, hotel, other) | | ----- | ----- | ----- | ----- |  |
| 10 | Expenses—Subconsultant(s) | | ----- | ----- | ----- | ----- |  |
| **11** | **Total Construction** | |  |  |  |  |  |
| **Occupancy and Operations Phase** | | | | | | | |
| 1 | Develop Systems Manual | |  |  |  |  |  |
| 2 | Finish outstanding testing & manage issues | |  |  |  |  |  |
| 3 | Develop & submit Summary Const Phase Cx Report | |  |  |  |  |  |
| 4 | Compile & submit Cx Record | |  |  |  |  |  |
| 5 | Conduct seasonal testing | |  |  |  |  |  |
| 6 | Check-ins with Operators and on-site Building Operations Review | |  |  |  |  |  |
| 7 | All other tasks. If significant, itemize. | |  |  |  |  |  |
| 8 | Expenses—Prime Firm (travel, per diem, hotel, other) | | ----- | ----- | ----- | ----- |  |
| 9 | Expenses—Subconsultant(s) | | ----- | ----- | ----- | ----- |  |
| **10** | **Total Occupancy & Operations** | |  |  |  |  |  |
|  | **TOTAL ALL PHASES** | |  |  |  |  |  |
|  | | | | | | | |
|  | | [If Building Enclosure Cx is fully detailed in Section C of the Scope of Work, then use the next sentence so the Owner can compare between CxP’s for this highly variable cost element: Delete the row below.]  Special itemization: Total cost for Building Enclosure commissioning during construction (checklist development, field inspection, test writing, witnessing and documentation, including sampling per Scope of Work C): $\_\_\_\_\_\_\_\_\_\_\_\_ | | | | | |
|  | | [If Building Enclosure Cx is not fully detailed in Section C of the Scope of Work, then use the next sentence and fill in the desired allowance for the CxP to include in their fee: Delete the row above.]  Included in the above fee is an allowance for the CxP to perform all phases and elements of the Building Enclosure commissioning (pre-design through construction. Details will be developed later. Allowance to be included above: $\_\_\_\_\_\_\_\_\_\_\_\_\_. | | | | | |

# Scope of Work

[If the plans and specifications are complete or nearing completion, delete all the Pre-Design and Design Phase tasks. However, it is advised that if the project hasn’t gone out to bid, the Commissioning Provider conduct a design review similar to Design Phase Task 6 and that they provide some language for, or at least a review of the commissioning language in the specifications and needed addenda issued.]

## General

The project will be commissioned in compliance with the intent of the Building Commissioning Association’s *New Construction Building Commissioning* *Best Practices* (attached) and in accordance with applicable elements of *ASHRAE Guideline 0 The Commissioning Process* and *ASHRAE Standard 202 The Commissioning Process for Buildings and Systems,* except where noted in this RFP.

The project will be commissioned to meet the requirements in the [ List any state code or other regulatory requirements (if CA Title 24, indicate that the Contractor will perform the code Acceptance Tests which will not affect the testing scope of the CxP.) ]

The project will also be commissioned according to [list any existing Cx specifications or Owner standards that must be complied with.] Additionally, the project is seeking [LEED v (x), Green Globes, …. Insert Organization Name] certification and the commissioning process in those programs will be required. [State the level of commissioning if that applies for the program being followed, e.g., LEED Fundamental, Enhanced Cx, Option 1 (specify path 1 or 2, or Option 2 Envelope Cx, etc.] The response to this RFP shall list areas of conflict between the guidelines of the above references and the Scope of Work below.

The CxP is an independent advocate for the Owner, directs the overall commissioning process and makes the final recommendations to the Owner regarding functional performance of the commissioned building systems and assemblies (listed in Section C).

The commissioning team shall be led by an independent lead CxP who shall serve as the point of contact and be actively involved in review and oversight of all aspects of the commissioning process. This person shall be responsible to direct, execute and manage the evaluation by the commissioning team of the design, construction, and operation of the commissioned systems’ compliance with the OPR and construction documents (plans, specifications, addenda). The lead CxP shall serve as a key member of the team working in concert with the engineer of record, Contractor and/or Construction Manager and sub-contractors in tracking, trouble shooting, and resolving all issues.

The Commissioning process does not take away from or reduce the responsibility of the Design Professional and Contractor to provide a finished and fully functioning product.

## Commissioning Scope and Tasks

For the systems and assemblies listed in Section C, the CxP shall provide services in accordance with the documents listed in Section A above with the following exceptions: Occupancy Phase tasks listed in the *BCA Best Practices* not listed in this Scope of Work are not part of the scope. [list other exceptions]

The following tasks will be accomplished by the CxP:

### Pre-Design Phase

1. Develop Owner’s Project Requirements (OPR):  
   [If the OPR is developed by the design team and Owner rather than the CxP and Owner, alter this section to state that and require the CxP to facilitate and confirm that the OPR developed by others meets the requirements of this section.]
2. The OPR defines the expectations, goals, benchmarks and success criteria for the project that the Owner desires to be documented and tracked. The OPR sets the functional goals that the design is judged against and establishes the basis of the criteria used during construction to verify actual performance. The OPR does not list items that are already required by code. The OPR is generally not a description of what specifically will be included in the project design, but is the feature and categorical performance criteria to be met by the design.
3. The OPR document shall contain at a minimum the following for the commissioned systems and assemblies: [list systems to be part of OPR]
4. For the above systems and assemblies requirements for the following categories will be included in the OPR: design and construction processes and schedules, energy efficiency, sustainability, indoor environmental quality (temperature, humidity, ventilation, lighting, connection to outdoors), safety, security, component and assembly quality, reliability, durability, flexibility, redundancy and cost, staff training, operation and maintenance, documentation, commissioning rigor, ongoing monitoring or commissioning and other Owner directives. [Delete any categories in the above list that are not important to the Owner. Requiring all on this list may make the OPR costly and cumbersome in application]
5. The elements of the OPR shall be verifiable and ideally and optionally include specific success criteria.
6. The OPR is supported by the basis of design (BOD) or design narrative written by the design team and included with design package submissions. The basis of design documents the primary thought processes and assumptions behind the design decisions and describes the design elements being incorporated to meet the OPR.
7. The OPR will be developed by the CxP with significant Owner and other stakeholder collaboration and input, with ultimate approval by the Owner.
8. Utilize any Owner programming documents and develop and utilize questionnaires and/or interviews or workshops to identify the OPR.
9. Submit the OPR to the Owner and Stakeholders for review and comment and submit modifications accordingly.
10. Attached is an example of the rigor desired for the OPR, though it may not have all the desired categories. [attach an example or delete this article]
11. Develop a design phase commissioning plan and submit to the Owner that provides:
12. A project specific overview of the commissioning process, listing all systems to be commissioned.
13. The project teams’ roles and responsibilities throughout the project, including that of the commissioning team, design consultants, contractors and construction manager and Owner with recommendations for inclusion of these in their respective contracts.
14. General communication, coordination and management protocols, schedule and deliverables for the Design Phase.
15. Design Review Requirements: The review objectives and scope for each system to be reviewed and the process for each design review required, including comment adjudication.
16. Scope and process for developing the commissioning specifications.
17. CxP shall participate in [insert number] partnering meetings in person and [insert number] by conference call during Pre-Design.

### Design Phase

[If the CxP is engaged beginning in mid-Design, delete Design phase tasks that will not now be part of their scope.]

1. Perform the OPR activities described in Pre-Design as soon as possible in Design, if the CxP is not contracted during Pre-Design.
2. Revise the Design Phase Cx Plan developed in Pre-Design, as necessary. If none was developed, develop one per the requirements listed in Pre-Design. Provide to the Owner and Design Team.
3. Conduct a design phase planning and scoping meeting with the design team and Owner.
4. With each design package from the Design Team, review and update the OPR as needed. Review the Basis of Design (BOD) and recommend changes to make it accurate.
5. Provide focused design checklists for the design team to facilitate important, but sometimes forgotten concepts of good design and items that encourage better or best practice.
6. Utilize the applicable items in the four State of CA design review checklists NRCC-CXR-02-E thru -04-E, or other checklists equivalent in rigor.
7. Perform focused reviews of the design and specifications against the OPR and BOD. Submit comments and review and adjudicate concerns and responses with the Owner and Design Team. Back check the incorporation of comments in the next design submission.
8. The following table provides the requirements of the reviews to be accomplished by the CxP:

[Writer: Requiring all commissioning disciplines to be included for commenting in all review phases can be costly. Focusing effort may be appropriate. Delete phases and systems not desired for review (but they can still be in the balance of commissioning scope if listed in Section C). Note if any design reviews are required also by state code and if that documentation will be part of the Cx scope.]

**Table 1. Design Review Scope**

| **Phase** | **Systems to be Reviewed and Commented On** | **Scope of Reviews** | **Review Rigor** |
| --- | --- | --- | --- |
| Schematics / Concepts | All Cx’d that have some development | *Moderate:* Review is high level, looking for areas where the OPR may be difficult to achieve. *Rigorous:* Moderate, plus make comments where the concepts could be enhanced. | ☐ moderate ☐ rigorous |
| Design Development | HVAC, controls, lighting controls, domestic water heating, emerg power, building enclosure, fire alarm, fire protection, elec gear, security, telecom, other: | *Moderate:* Primarily review for commissioning facilitation and operations and maintenance issues and obvious areas where OPR may not be met. *Rigorous:* Moderate, plus  a deeper look into OPR compliance, review the BOD, energy efficiency, indoor environmental quality, functionality for tenants, environmental sustainability, life cycle cost (qualitative), durability and safety. | ☐ moderate ☐ rigorous |
| Construction Documents-Mid | HVAC, controls, lighting controls, domestic water heating, emerg power, building enclosure, fire alarm, fire protection, elec gear, security, telecom, other: | Same as Design Development. And, for *Moderate*: Review training, O&M documentation and commissioning requirements. And, for *Rigorous:* Moderate, plus review ongoing monitoring requirements, identify vague and incomplete issues likely to cause change orders and do extra effort on confirming controls are well thought out, completely defined and workable. | ☐ moderate ☐ rigorous |
| Construction Documents-Late | Same as above, except: | Same as Mid-Construction Documents. | ☐ moderate ☐ rigorous |

1. Reviews for constructability and physical coordination are not explicitly in the CxP’s scope, but issues observed shall be documented.
2. Review to verify compliance with building codes are not explicitly in the CxP’s scope, but issues observed shall be documented.
3. Facilitate, participate in and track outcomes of [insert number] controls integration meetings with the CxP and appropriate members of the design team and controls representative of the contractor if known. Review control system features, strategies, sequences and interlocks between systems and disciplines, etc., identify and facilitate resolving conflicts and see they are incorporated into the design.
4. Confirm that the design team develops clear, complete and rigorous: a) sequences of operation for all dynamic equipment, b) Fire alarm response matrix, c) Emergency power response matrix, by approving formats and completed documents from the design team.
5. Develop project specific commissioning specifications.
6. The commissioning specifications shall provide a clear and complete description of the commissioning process and the roles and responsibilities of the Contractor.
7. Definitions, responsibilities by party, submittal requirements, coordination, meetings, process and requirements relative to installation, construction checklist creation and execution, start-up, test-readiness confirmation, functional test development and execution, deferred and seasonal testing, issue and non-conformance, training of Owner personnel, O&M documentation, systems manual requirements, documentation and closeout. Identify by equipment, who is writing construction checklists and functional tests, approving the forms, directing, executing and documenting tests, etc.
8. The above elements applicable to all systems commissioned shall be provided in a General Commissioning Requirements section, provided in draft during Design Development.
9. Specific testing and monitoring (trends), sampling and other unique requirements shall be developed for each system in a separate appropriate specification section, e.g., mechanical, electrical, plumbing, fire alarm, envelope or enclosure.
10. A few representative construction checklists and functional tests shall also be provided for reference.
11. An initial measurement and verification (M&V) plan shall be provided to comply with LEED requirement [insert the specific level or requirement], and/or an initial ongoing commissioning plan, and/or a monitored based commissioning plan shall be provided to comply with LEED requirement [insert the specific level or requirement] . These plans are only detailed enough to allow identifying in the plan what monitoring points need to be included in the construction plans and specifications. See that needed points are a required in the project documents. [Owner should consult with the design engineer and CxP to determine if any of these plans should be part of this project.]
12. The commissioning specifications shall be updated as required for the 100% construction documents submission.
13. Create a Construction Phase Commissioning Plan.
14. The Cx Plan shall augment the process given in the Cx specifications, providing some repeat of the general commissioning requirements.
15. Additionally, provided shall be more specificity for this project, including more detail on the communication, management, and access reporting and approval protocols, the submittal process, field observations, construction checklist and functional testing development, coordination, execution and documentation, air and water balancing management, meeting schedule and frequency, including controls integration meetings, communication protocols, scheduling issues, progress reporting, testing in phases, issue management, subcontractor task delineation, training, systems manual development, etc.
16. The Cx Plan document does not include the construction checklists and functional tests which are developed during the Construction Phase, though samples may be part of the plan.

### Construction Phase

1. Conduct a planning meeting with the Owner and General Contractor/Construction Manager.
2. Update the Construction Phase Commissioning Plan or write it if it was not completed during Design.
3. Attend preconstruction meetings and/or mockups for the following equipment or process that warrants input from the Cx Team: [list systems and assemblies, such as air and water balancing or certain fenestration assemblies].
4. Create a Cx schedule and have the contractor integrate it into the construction schedule.
5. Conduct a Commissioning kick-off meeting with General and subcontractors. Review the Cx Plan and specifications and process highlighting the trades’ responsibilities.
6. Review Contractor submittals.
7. Review and comment for compliance with the plans, specifications, OPR and for commissioning facilitation for the following equipment and systems: air and water balancing agenda, all HVAC systems, building automation system, lighting controls, emergency power and fire alarm response matrices, [List the other systems that are more likely to have compliance issues and that are more critical to the project delivery and operation. It may costly and not efficient to have the CxP comment on ALL submittals, hence the next article.].
8. Review for information only and to assist in developing construction checklists and functional tests for the following equipment and systems: [list the systems that apply, such as coordination shop drawings, piping … ].
9. Prior to controls programming, hold a controls integration meeting where the submittal review comments of controls sequences and drawings are discussed and issues resolved. Track and submit issues.
10. Develop project and equipment specific construction checklists from submittals, O&M data and other sources for all commissioned equipment similar to the representative checklist attached, except [list equipment not included or that will be developed by others]. Checklists verify that appropriate components are onsite, ready for installation, correctly installed, set up, calibrated and functional. Incorporate Contractor comments of the forms.
11. Develop project specific functional test procedures for all commissioned equipment similar to the representative test attached, except [list equipment not included or that will be developed by others], according to Table 2 Testing Responsibility Table.
12. Test procedures shall be developed uniquely for each project and are composed of repeatable, step-by-step narrative procedures and include the test prerequisites and set up conditions, the test process of perturbing or observing the system or set points, the expected outcomes, the acceptance criteria and a place to record the results.
13. Test procedures shall confirm every sequences in the building automation system sequences of operation and relevant features and sequences of on-board controllers including staging, interlocks to other equipment, alarms, manual operation, time of day schedules, off-hours operation, fire mode, loss of power and equipment failure, etc.
14. All larger, more complex, process critical or life-safety equipment shall be individually tested. Testing only a sample of some equipment or assemblies may be allowed where such equipment or assemblies are small in physical size or importance, are numerous and are not complex or critical for process or life-safety.
15. Systems that are monitored through a building automation system, shall be trended by the CxP after manual testing is complete. Trend requirements will be included in the functional test forms. Trends shall confirm proper operation of all major control loops, equipment staging and time of day scheduling, etc. [If there is no building automation system (BAS) or if there is important equipment that isn’t tied to the BAS, insert that the CxP shall provide and install data loggers to monitor and confirm proper operation of the main control loops and performance of equipment (list).]
16. Provide functional test procedures to the contractor early and so they can execute the tests on their own prior to formal functional testing with the CxP. Incorporate Contractor comments into the forms.
17. Test procedures developed by the Contractor or vendors shall be approved by the CxP.
18. Review minutes of Owner, Architect, Contractor meetings to keep abreast of project progress.
19. Review requests for information and change orders of commissioned equipment. Comment as warranted to maintain the OPR.
20. Develop and manage the Commissioning Issues Log in a spreadsheet or database application that allows sorting and filtering and efficient displaying and printing of data. Keep log updated as issues are identified. Regularly submit the log to the Owner and Contractor.
21. Facilitate quicker and better resolution of issues by assisting the project team with resolution of issues. The CxP is not responsible for issue resolution, but is expected to provide input when they may have a unique and valuable perspective due to their expertise or onsite familiarity with the project and when such input can be readily done without much analysis.
22. Conduct construction site observations beginning when the commissioned equipment is shipped to the site.
23. Make observations about equipment model and features meeting submittal requirements, equipment condition, installation, scheduling, coordination and in the proper utilization of construction checklists. The observations will check things randomly in construction checklists and will target other areas deemed necessary by the CxP.
24. Document issues in the Cx Issues Log that require addressing by the Contractor and forward the log to the Owner and Contractor in a timely manner. Construction progress reports are not desired.
25. Frequency of visits must be sufficient for the CxP to keep abreast of progress and to allow for catching significant issues early. Attendance at part of major equipment startup is desired. Excessive visits are not desired. Propose the frequency and number of visits by discipline.
26. Conduct regularly scheduled commissioning coordination meetings. Take and distribute minutes. Propose meeting frequency. An example might be something like: Meetings shall be include: Planning and kickoff meetings, plus one meeting per month once duct work has been set and twice a month once the first major piece of HVAC equipment is started. When testing begins, meetings shall be weekly until occupancy. Note, for small projects these frequencies may need significant compression.
27. Submit commissioning progress reports to the Owner and Contractor at one half the frequency as commissioning meetings.
28. Fully develop the plans for those that are in scope of the following: M&V Plan, Ongoing Commissioning Plan, Monitored Based Commissioning Plan. Confirm that all points and data streams are installed and recording properly. [edit this article as applicable]
29. Review startup and factory test reports of commissioning equipment and confirm compliance with the manufacturer’s recommendations and good practice
30. Observe some of the air and water balancing work sufficient to be reasonably confident it is being done correctly. Review the balance report. Back check a 5% sample of the work with the balancer using their equipment.
31. Confirm formal functional test readiness through field observation, review of start-up reports and construction checklists, observation of control system and equipment operation, including trending and when required review of contractor's pre-tests of system operation.
32. Schedule, direct and document functional testing.
33. The Cx Team shall utilize observations, active tests and trending or monitoring of systems and assemblies to evaluate compliance with the construction documents and OPR. The testing rigor required is described in the functional test procedure articles above.
34. Prior to or at the beginning of testing, critical sensor and actuator calibrations and building automation system graphics shall be confirmed accurate.
35. CxP shall write, direct, execute and document tests on approved test forms per the Testing Responsibility Table 2 below. Record issues on the Issues Log and forward to Contractor and Owner in a timely manner. CxP shall witness tests executed and documented by others per the testing table below sufficient to be reasonably confident they are being done properly and shall review completed test reports.
36. Sampling. Testing only a sample of like equipment shall be conducted as follows (Contractor testing described below is in addition to the Contractor pre-tests):

(1) For all sampling testing by the CxP, if there are any failures, the Contractor shall make needed corrections to all like units and to units with the same or similar elements that failed in the entire project and then show the CxP how the units’ corrections and programming were made and shall document random retesting of the rest of the project of the same percentage the CxP originally tested using the CxP’s forms. CxP will review retesting documentation and may use allotted retesting hours for random back-checking of the corrections.

(2) Terminal boxes or radiators (air or water): CxP tests all sequences and features on [ select typically 10% to 30% ]. On all units CxP executes building automation system reports or queries during heating and cooling mode to verify proper valve and damper actuation and room temperature control.

(3) Lighting occupancy sensors: CxP shall test [ select typically 20% to 30% ] with the Contractor. Contractor tests and documents the balance.

(4) Daylight dimming controls: CxP shall test [ select typically 30% to 50% ] with the Contractor. Contractor tests and documents the balance.

(5) The building enclosure elements: Refer to Building Enclosure in Section C.

(6) [ insert details of other sampled equipment ]

(7) For the above cases for the balance of equipment the Contractor tests alone, the CxP reviews the test reports and field back checks [ select typically 5% to 20% ].

1. Trend logs of BAS controlled equipment over a week’s time at no greater than 5 minute intervals of temperature, flow, speed, pressure, position, status, set points, etc. shall be utilized to confirm proper operation of all primary control loops (space, coil, duct and water temperature and duct and room pressure control, speed, resets, economizer functions, major equipment staging, etc.). Trending requirements are also given in the functional test development article above.

(1) The CxP shall view and analyze trends and record deficiencies in the Issues Log. The Contractor shall set up the trends specified by the CxP.

(2) Once systems are working properly, the CxP shall print graphs demonstrating the proper operation of the primary control loops of all equipment and submit with the active functional testing reports.

(3) When critical data is not available through a BAS, monitoring and recording of performance data is accomplished by using stand-alone data loggers provided, set and analyzed by the CxP.

1. CxP retesting of deficiencies in this scope is limited to a total of [ insert hours ].
2. Completed tests shall be submitted to the Owner.

**Table 2. Testing Responsibility Table** [edit as required]

| **Equipment** | **Write Tests** | **Direct Tests** | **Execute Tests** | **Document Tests** | **Witness Test Only** |
| --- | --- | --- | --- | --- | --- |
| HVAC & controls | CxP | CxP | Contr | CxP | ---- |
| Lighting controls | CxP | Both\*\* | Contr | Both\*\* | ---- |
| Electrical gear | Certified testing co. of Contr. | Certified testing co. of Contr. | Certified testing co. of Contr. | Certified testing co. of Contr. | CxP (sample\*) |
| Fire alarm & protection | CxP | Vendor | Vendor | Vendor | CxP (sample\*) |
| Plumbing | CxP | CxP | Contr | CxP | ---- |
| Security & Intercom | CxP | CxP | Contr | CxP | ---- |
| Building enclosure | CxP | CxP | Contr | CxP | ---- |
| Laboratory process | CxP | CxP | Contr | CxP | CxP (see exceptions) |
| Other: |  |  |  |  |  |

Contr = Contractor

\*\*Both, indicates that some equipment has shared responsibility as delineated in the Sampling article above.

*Table 2 Exceptions and Clarifications:*

a. For [insert systems such as hydronic piping pressure testing and flushing, duct cleanliness and pressure testing, smoke control testing, emergency generator, electrical gear, fume hood certifications, RODI systems, etc.] the [select proper party: vendor, contractor or certified testing company, specifying to which system they apply] shall write, direct, execute and document tests, with test forms submitted prior to the CxP for approval and filled in forms submitted to the CxP for approval. The CxP will sample witness enough of the testing to be reasonably confident proper test and documentation procedures are being following.

b. [Repeat or edit the previous sentence and/or edit the above table to reflect the desired process.].

[Building Enclosure CxP inspection and testing scope and rigor vary widely. If the scope of Building Enclosure commissioning is not known in detail and itemized in Section C below, then it is recommended that an allowance to the CxP be used until the scope can be more closely defined. Use the following language, if this is the case, else delete it.]

c. The Building Enclosure commissioning fee by the CxP will be set by an allowance in the fee table Exhibit 2 in the Fee Proposal section.

1. Facilitate and verify operator training.
2. Develop detailed training agendas for each system and assembly and provide to the Contractor to use during their training. From Owner input, include desired training rigor and attendee type. Include a place to mark each concept taught and have a log-in of attendees. [Note, an alternative method is for the CxP to only review the agendas developed by the Contractor. Adjust language accordingly, if this is the approach.]
3. Develop questionnaires for the trainees that evaluate the training and attach to the agenda submitted to the Contractor.
4. Attend [select “a few” or a percentage] of the trainings. [Note, normally the CxP does not attend many trainings.]
5. Review filled in agendas and questionnaires to confirm training adequacy. Submit documentation of this review.
6. Review O&M manuals for compliance with the specifications parallel with the A/E review. Submit documentation of this review with any deficiencies.
7. Confirm that the as-built drawings for specified systems have been submitted. CxP is not required to verify accuracy.

### Occupancy and Operations Phase

1. The CxP shall stay engaged for one year after substantial completion.
2. Finish outstanding functional testing and other incomplete tasks listed in the Construction Phase, including facilitating the resolution of outstanding issues.
3. Finish compiling the Systems Manual. The CxP receives System Manual elements electronically from others and provides some elements themselves, as noted below, and compiles them into one electronic suite of pdf documents, all organized, bookmarked and hyperlinked and submits to the Owner. Bookmarks must be down to the equipment level for submittals and O&Ms, startup reports, test record, etc. The Systems Manual is also provided in hard copy to the Owner, with the Contractor submitting their contributions directly to the Owner, as does the CxP (one copy provided). The contents of the Systems Manual generally follow ASHRAE Guideline 0, but departures below take precedence. Include the following systems in the Systems Manual: [insert the desired systems, which may not include all the commissioned systems].  
     
   Systems Manual Contents
   1. Table of Contents (bookmarked and hyperlinked)
   2. Executive Summary
   3. OPR and System Narratives
4. OPR (by Owner) and Systems Narratives (by design team).
5. System flow diagrams or schematics (when part of design documents, by design team).
   1. Operating Requirements
6. Owner approved building occupancy schedule (by CxP).
7. Equipment run-time schedules (by CxP).
8. Minimum outside air requirements (general building wide) (by design team).
9. By space: use, temperature, humidity, lighting level and any special noise, pressure, return air, air change requirements (by design team).
   1. Operating Parameters and Procedures
10. As-built sequence of operations for all equipment, including those with standalone controllers (by contractor).
11. As-built control drawings, including points list (by contractor).
12. A list of all user-adjustable set points and reset schedules, their purpose, and range of reasonable adjustments with energy implications when adjusting them—including the central building automation system and packaged equipment controllers (by CxP).
13. A description of and rationale for all major energy-saving features and strategies with operating instructions and caveats about their function and maintenance (by CxP).
14. Fire and emergency power response criteria in matrix format, including narratives of special procedures and sequences (format by CxP and content by contractor and design team).
15. For 24 hour facilities or those with critical processes, provide maintenance start-up and shutdown, manual, and restart operation procedures for equipment and systems controlled by the building automation system and by stand-alone equipment controllers (by CxP).
16. Special useful notes and instructions to operators not found in the O&M Manuals or control sequences coming out of the commissioning process (by CxP).
17. Training materials from the original trainings if different than the O&M manuals and any video recordings of trainings (by contractor).
    1. Performance Persistence and Optimization Program
18. Recommendations for recalibration frequency of sensors and actuators by type and use (by CxP).
19. Plan outline for monitored based Ongoing Commissioning or recommended frequency for periodic recommissioning testing by equipment type with reference to construction-completed tests and checklists, including blank forms (by CxP).
20. Description of the primary recommended standard trend logs in the control system and control system reports that will assist in maintaining comfort, energy efficiency, and system control, including report templates and sample plots with explanations of what to look for in the graphs. For this project include: [list as applicable: air handler functions (economizer, duct static pressure reset, supply air temp reset); boiler functions (HWST, HW pump control); chiller (CHWST, CWST, pump control)….] (by CxP).
21. Description and use instructions for any installed fault detection features (by CxP).
22. Description and use of the energy management and information system (EMIS) reports, when installed (by CxP).
23. Guidelines for establishing performance metrics and benchmarks and guidelines for tracking whole-building and primary end-use energy and efficiency (by CxP).
24. Suggestions for changes in the way things are controlled, set points, and sequence strategies for optimizing energy efficiency, comfort, and control coming out of the commissioning process to date (by CxP).
    1. Commissioning Record (all by CxP)
25. Summary commissioning report.
26. Issues log.
27. Issue resolution plan.
28. Lessons learned.
29. Cx Plan.
30. Cx Specifications.
31. Design, OPR and BOD review record.
32. Submittal reviews, including of TAB & O&Ms.
33. Testing schedule, progress reports and field observations.
34. Training record.
35. Completed and blank construction checklists and start-up reports.
36. Completed and blank functional tests and trend logs.
37. 10 month operations review and seasonal testing record.
    1. Maintenance Procedures (all by contractor)
38. O&M manuals.
39. Preventive maintenance procedures for all commissioned equipment. This shall be a link directly into the appropriate page of the respective O&M manual, but if no maintenance procedures are given in the O&Ms a list of procedures will need to be created. (O&Ms with links in pdf’s made by contractor).
40. Warranties.
    1. Construction Record (all by contractor)
41. Record drawings.
42. Specifications.
43. Approved submittals.
44. Approved change orders.
45. Air and water balance report (final).
46. Submit required documentation to USGBC LEED OnLine for LEED certification for the Cx credits.
47. Conduct seasonal testing at near peak heating and cooling conditions. Seasonal testing, primarily by trending when possible, shall be conducted for [insert “peak heating *and* cooling seasons” unless one will be covered at turnover testing] for [select heating and cooling plant, or packaged heating and cooling systems] . Also confirm space temperature control performance in all rooms, general building pressure and any special room differential pressure control. Submit reports to the Owner.
48. Conduct check-ins with operations staff and the building manager [insert number (2 to 4)] times during the first year. Ask about building operation and performance issues related to commissioned equipment. Provide technical support and assist with resolving issues or forward them on to the Contractor or design team as appropriate. Provide a brief report to the Owner of each check in. Provide [insert total hours] total hours of support for this task.
49. Conduct an on-site Building Operations Review about 10 months after substantial completion. Review the results of the Occupant survey if it is in the scope and review the results of the previous check-ins with the O&M personnel. Review work orders related to commissioned systems, review of alarm and complaint logs and review of selected trend logs of known problem areas and other critical areas to confirm proper performance and equipment operation. Document issues and proposed solutions and identify responsible parties. Submit a report of the Review to the Owner. Update the Cx Report.

**[Writer: The following are “Best Practice” tasks that are not always, but can be included in the CxP scope for the Occupancy and Operations Phase. Include as appropriate.]**

1. Develop an Occupant User Guide for the building that describes the special elements and features in the building occupants will be interacting with. Include instructions for the use and interactions with these systems for occupants. Cover the following systems: [ select the appropriate from: Lighting controls (schedules, occupancy sensors, daylighting controls, user overrides), thermostats and user adjustments, comfort complaint procedures, time of day HVAC schedules by floor, night set back impacts on temperature, overrides, occupancy sensors tied to HVAC, air diffuser design, special room pressure controls, automatic window shades, energy dash board, etc. ]
2. Evaluate project success through a lessons learned workshop. [If this task is included, add details to it by referring to the *BCA New Construction Best Practices*].
3. Optimize operation and efficiency of systems from as-built conditions by evaluating set points, schedules and sequences. [If this task is included, add details to it by referring to the *BCA New Construction Best Practices*].
4. Develop and begin implementation of an Ongoing Commissioning Program, including periodic and ongoing testing and fault detection, monitoring of energy performance parameters, development of energy benchmarks and correlations and long-term tracking of energy use and utilizing the correlations to detect degrading energy performance over time. [If this task is included, add details to it by referring to the *BCA New Construction Best Practices*].
5. Conduct an occupant survey 7 to 9 months after move-in. [If this task is included, add details to it by referring to the *BCA New Construction Best Practices*].
6. Update the OPR and Systems Manual to reflect any changes during the Occupancy and Operations Phase work.
7. Remain engaged for a second year from substantial completion. Monitor building performance. Provide suggestions for and assist the Owner making improvements to controls, building operations and maintenance. This task is limited to [two to four] staff days on site and [two to four] staff days off site.

## Systems and Assemblies to be commissioned

A modification in the contract with the CxP will be initiated should systems to be commissioned in the actual project change from this list.

[Writer: Edit this list to be as accurate as possible.]

**All HVAC Systems and Equipment Controls** (including, but not limited to):

Chilled water system (chiller, cooling tower,   
piping, pumps)

Heating water system (boilers, piping, pumps)

Under floor air distribution system

Air handlers (including minimum outside air control,  
CO2 monitoring, heat recovery, humidification)

Hydronic piping (including air separators and expansion tanks)

Ductwork

Thermal comfort, temperature and humidity control

Variable speed drives

Outside air valves

Perimeter heaters

Unit heaters

Air terminal boxes

Variable refrigerant flow (VRF) system

Computer room air conditioning units

Fan coil units

Restroom exhaust system

Misc. exhaust fans

Garage exhaust fans

Building automation and control system (BAS)

Data acquisition system

Atrium smoke control system

Radiant floor heating

TAB work

HVAC and envelope differential pressure relationships

**Electrical Systems**

Scheduled lighting controls

Exterior lighting controls

Daylight dimming controls

Lighting occupancy sensors

Wire and cable

Medium voltage shielded cable

Wiring devices (switches and outlets)

Switchgear

Motor control centers

Transformers

Variable frequency drives

Ground fault

Secondary grounding

Low voltage metal-enclosed switchgear

Bus duct

Emergency power generator system and ATS

Whole building power outage integrated test

Photovoltaics

[ Note: If electrical equipment besides lighting controls and emergency generator are to be tested by the CxP rather than the contractor’s certified testing company (by changing the assignments in Testing Responsibility Table above), then additional detail must be provided in this Scope such as more specifically what tests and inspections will be required for each equipment. Refer to NETA testing standards and specifications online.]

**Fire Life Safety**

Fire alarm system

Fire protection

Stair pressurization system

Fire smoke dampers

**Security and Data**

Access control security system

Closed circuit television system (CCTV)

Paging

**Plumbing:**

Domestic water system (booster pumps)

Domestic water heating system (heaters,   
circulation pumps, mixing valves)

Sump and ejector pumps

Irrigation systems and controls

Automatic fixture control

Grey/rain water system

Solar hot water

**Laboratory and Cleanroom**

General lab exhaust systems

Lab and room pressurization control

Air terminal units (supply and exhaust valves)

Room differential pressure controls and equipment (exhaust and makeup fans and terminals)

Fume hoods functionality (not including ASHRAE 110 tests or other certifications)

Hood and process exhaust systems

Exhaust scrubbers

Biological safety cabinets

Safety cabinets

Cold rooms

Bio-waste sterilization

Lab vacuum pumps

Lab air compressor

Cleanroom fan filter units

Cleanroom makeup air units

Cleanroom certification

Pure water systems

Process gas systems

Process coolers

**Building Enclosure**

[Indicate which components and tests are to be included below. If the Building Enclosure scope is not known at this time, generalize your expectation and provide an allowance for this effort for the CxP to include in their fee in fee table Exhibit 2 in the Fee Proposal section.]

The following will receive component inspections by CxP during [select at which of the following points these inspections will be made:] pre-installation-including a conference with installers, during installation, post-installation. CxP will inspect a sufficient fraction of components to be reasonably confident they are being installed properly. Contractor will also fill in construction checklists on each.

Roofing system – water-proofing, insulation, roof membrane, rain and ice shield, pitch, coping, flashing, curbs for mechanical equipment, downspouts, drains, scuppers.

Exterior wall opaque sections – curtain wall, storefront, masonry, brick / stone veneers, precast panels, metal panels, stucco, siding, sun shades, expansion joint cover assemblies.

Walls – vapor barriers, insulation, mortar nets, weeps, joints, sealants, masonry ties, damp proofing, composite sheet waterproofing, flashing.

Slab and landscaping on grade – slab vapor barriers & waterproofing, drainage slope, foundation drains, crystalline waterproofing.

Concrete walls of occupied areas below grade: waterproofing, French drains.

Doors, windows and skylights – sealants, mechanical operation, sills, flashing, end dams, hardware.

Performance Testing To Be Conducted: [for each test and assembly to be tested, specify by Contractor or CxP and what fraction or quantity will be tested]

Water tests of: roofs, slabs, doors, fenestration and/or exterior skin via mockups or insitu tests.

Infiltration evaluation via wind or pressure tests of: doors, fenestration and/or exterior opaque wall sections via mockups, wind tunnel or insitu tests.

Building-wide air leakage via pressurization tests.

Thermography tests of fenestration and door perimeters, exterior opaque wall sections and joints and/or roofing.

Structural wind loading tests of exterior skin mockups or other elements.

Potential special roof conditions - green roof; roof terrace/roof garden.

**Special Systems:**

Projection screens

Automatic window shades

Elevators

Electric coiling doors and grills

Loading dock lift

LEED features to meet the:

* Energy and Atmosphere Cx credits.
* M&V Credits (give level).
* Environmental Quality credits.
* Water Efficiency credits.

## Attachments to Scope of Work

* BCA New Construction Best Practices
* Owner’s standard commissioning specification, if available
* Sample OPR
* Representative construction checklist
* Representative functional test