



**ASHRAE Addendum a
to ASHRAE Guideline 0-2013**

Public Review Draft

**Proposed Addendum a to
Guideline 0, The Commissioning
Process**

**First Public Review (March 2019)
(Draft shows Proposed Changes to Current Guideline)**

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at www.ashrae.org/standards-research--technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

This guideline is under continuous maintenance. To propose a change to the current guideline, use the change submittal form available on the ASHRAE website, www.ashrae.org.

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(This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline. It has not been processed according to the requirements for a guideline and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE.)

FOREWORD

This addendum to Guideline 0 recognizes and addresses changes in industry terminology resulting from the evolution of whole-building commissioning into the life cycle and sustainable facilities measurement and verification processes. Additionally, this addendum to Guideline 0 addresses achieving consistency of the defined commissioning terms between Guideline 0 and ANSI/ASHRAE/IES Standard 202, Commissioning Process for Systems and Buildings.

Note: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~strike through~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.

Modify Section 4 as shown. The remainder of Section 4 is unchanged.

4. DEFINITIONS

Basis of Design (BoD): a document that records the concepts, calculations, decisions, and product selections used to meet the OPR Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

checklists: verification checklists that are developed and used during all phases of the Cx commissioning process to verify that the OPR Owner's Project Requirements are being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements.

commissioning (Cx): ~~See Commissioning Process.~~

Commissioning Authority (CxA): ~~an entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.~~

Commissioning Process (Cx ~~Process~~): a quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that ~~the facility and all of its~~ the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the OPR Owner's Project Requirements.

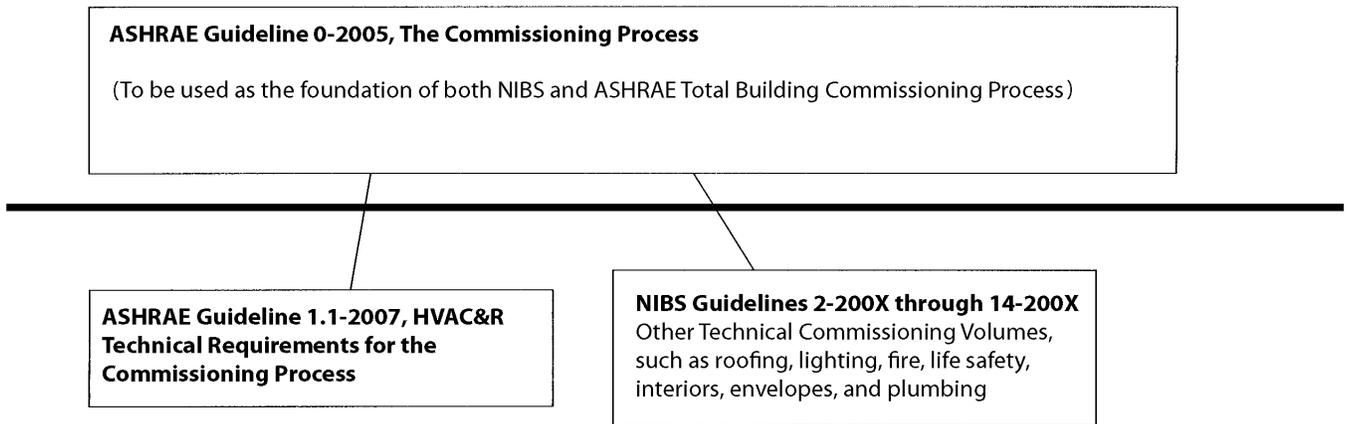


Figure 1—~~Relationship between commissioning guidelines~~

(Note to Reviewers: Addendum deletes Figure 1 in its entirety)

construction checklist: a form used by the ~~contractor~~ Project Team to verify that appropriate materials and components are on-site, ready for installation, correctly installed, and functional, and in compliance with the OPR. ~~Also see checklists.~~

construction documents: these includes a wide range of documents that vary from project to project and with the Owner's needs, ~~and with~~ regulations, laws, and jurisdictional requirements ~~countries~~. Construction documents usually include the project manual (specifications), plans (drawings), and general terms and conditions of the contract.

Construction Team: consists of professionals responsible for providing materials and labor to construct the systems and assemblies in the project. Where a construction project follows a design/build approach, the Construction Team includes licensed design professionals who are part of the Design Team.

contract documents: these include a wide range of documents that vary from project to project and with the Owner's needs, ~~and with~~ regulations, laws, and jurisdictional requirements ~~countries~~. Contract documents frequently include price agreements; construction management process; subcontractor agreements or requirements; requirements and procedures for submittals, changes, and other construction requirements; a timeline for completion; and the construction documents.

Cx: abbreviation for "Commissioning Process". See *Commissioning Process*.

Commissioning Process Activities (Cx Process Activities): components of the Cx Commissioning Process.

Commissioning Plan (Cx Plan): a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Cx Commissioning Process.

Commissioning Process Progress Report (Cx Process Progress Report): a written document that details detailing activities completed as part of the Cx Commissioning Process and significant findings from those activities, that which is continuously updated during the course of a project. Usually incorporated into the Commissioning Plan as an ongoing appendix.

Commissioning Process Report (Cx Process Report): a document that records the activities and results of the Commissioning Process. Usually developed from the final Commissioning Plan with all of its attached appendices.

Cx Provider (CxP): an entity, identified by the Owner, who leads, plans, schedules, and coordinates the CxP Team to implement the Cx.

Commissioning Team (Cx Team): the individuals who through coordinated actions are responsible for implementing the Commissioning Process.

Cx Provider Team (CxP Team): the team of specialists and related support staff who are responsible for the

management of actions and the generation of deliverables by the CxP as outlined in the contract between the Owner and the CxP and in the Cx Plan. The CxP Team may consist of several companies, including subcontractors to the CxP who acts at the contact to the Owner.

Cx testing: the evaluation and documentation of the equipment and assemblies, delivery and condition, installation, proper function according to the manufacturer's specifications, and project documentation to meet the criteria in the OPR.

design review, code or regulatory: a review of a document conducted by staff or designated entity of an authority having jurisdiction to determine whether the content of the document complies with regulations, codes, or other standards administered by the jurisdiction.

design review, constructability: the review of effective and timely integration of construction knowledge into the conceptual planning, design, construction, and field operation of a project to achieve project objectives efficiently and accurately at the most cost-effective levels to reduce or prevent errors, delays, and cost overruns.

design review, peer: an independent and objective technical review of the design of the project, or a part thereof, conducted at specified stages of design completion by one or more qualified professionals for the purpose of enhancing the quality of the design.

Design Team: the licensed professionals responsible for producing the complete set of permit documents required for construction.

evaluation: the process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems and their performance are confirmed with respect to the criteria required in the OPR.

issues and resolution log: a formal and ongoing record of problems or concerns and their resolutions that have been compiled raised by members of the Commissioning CxP Team during the course of the Cx Commissioning Process.

Ongoing Cx Commissioning Process (OCx): a continuation of the Cx Commissioning Process well into the occupancy and operations Phase to continually improve the operation and performance of a facility to meet current and evolving CFR or OPR. verify that a project continues to meet current and evolving Owner's Project Requirements. Ongoing Cx Commissioning Process Activities occur throughout the life of the facility; some of these will be nearly-close to continuous in implementation, and others will be scheduled or unscheduled (as needed).

Owner's Project Requirements (OPR): a document that details the functional requirements of a project and the expectations of how it will be used and operated, including. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, training requirements, documentation requirements, and supporting information. (The term Project Intent is used by some owners for their Commissioning Process Owner's Project Requirements.)

recommissioning: an application of Cx the Commissioning Process requirements to a project that has been delivered using Cx, the Commissioning Process. This may be a scheduled recommissioning developed as part of an Ongoing Commissioning Process, or it may be triggered by use change, operations problems, or other needs.

retrocommissioning: the Commissioning Process Cx applied to an existing facility that was not previously commissioned. This guideline does not specifically address retrocommissioning. However, the same basic process should be followed from Predesign through Occupancy and Operations to optimize the benefits of implementing the Commissioning Process philosophy and practice.

systems manual: a system-focused composite document that includes the design and construction documentation, facility guide and operation manual, maintenance manual information, training information, Cx records, and additional information of use to the Owner during occupancy and operations. the Occupancy/Operations Phase.

test procedure: a written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems to verify compliance with the OPR.

training plan: a written document that details the expectations, schedule, duration, budget, and deliverables for Cx of Commissioning Process Activities related to training of project operations operating and maintenance personnel, users, and occupants.

verification: the process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the OPR. ~~Owner's Project Requirements.~~

Modify Section 5 as shown. The remainder of Section 5 is unchanged.

5. PREDESIGN PHASE

5.2. Predesign-Phase Cx Process Activities

5.2.1. Predesign-Phase Cx Process Responsibilities

5.2.1.1. During the Predesign Phase, a Cx Team is formed to oversee, implement, and accomplish the Cx Process Activities detailed in this guideline. Responsibility for leadership of the Cx Team should be defined and assigned at the beginning of the Predesign Phase. The term used for the person with overall responsibility for the Cx Process is "Cx Provider Authority (CxPCA)."

[...]

5.2.1.3. Essential team members during the Predesign Phase include Owner's representatives, the CxPCA, predesign and programming professionals, design professionals, and (if known) the construction/program/project managers. The CxPCA can assist the Owner in identifying and selecting these initial Cx Team members. Owner's representatives will include the project manager, occupants or users, facility manager, and operation and maintenance personnel. Including operation and maintenance personnel on the Cx Team will help ensure that important operation and maintenance issues are included in the Owner's Project Requirements. The Owner will generally need to reconcile conflicting project requirements and provide feedback on decisions to the Cx Team. The design team members and CxPCA can assist the Owner in reconciling conflicting technical requirements.

[...]

5.2.1.5. Predesign-Phase Cx Process Activities described in this section to be performed by the design team must be included in the scope of services described in the "Owner-Design Professional Service Agreement." These Cx Process Activities may be more than are normally required in their scope of services. The scope of services in the "Owner-Design Professional Service Agreement" should also include the requirement to cooperate with the CxPCA during Predesign, Design, and Construction phases of the project.

5.2.2. Develop OPR

5.2.2.2. The CxPCA facilitates the development of the OPR. Input will be gathered from all team members.

[...]

5.2.3. Identify the scope and budget for the Cx Process

5.2.3.1. The scope of the Cx Process will vary from one project to another. The Cx Team develops the scope for the Cx Process. The experiences of the programming team, users, designers, CxPCA, and the Owner with similar and previous facilities and projects can aid in establishing a scope for the Cx Process.

5.2.3.2. A well-defined scope permits the establishment of an appropriate budget allocation for the Cx Process. The Cx Process budget should be realistic, distributed by phase, activity, and entity (Owner, CxPCA, design professional, and contractors), and not subject to reduction without an express change in the Cx Plan.

Modify Section 6 as shown. The remainder of Section 6 is unchanged.

6. DESIGN PHASE

6.1. Introduction

6.1.3. Design-Phase Cx Process Activities described in this section that are to be performed by the design team and special consultants must be included in the scope of services described in the "Owner-Design Professional Service Agreement." These Cx Process Activities may be more than are normally required in

their scope of services. The scope of services in the “Owner-Design Professional Service Agreement” should also include the requirement to cooperate with the CxPCxA during Predesign, Design, and Construction phases of the project.

6.2. Design-Phase Cx Process Responsibilities

6.2.1. Design-Phase Cx Process Responsibilities

6.2.1.2. Essential team members during the Design Phase include the Owner’s representatives, the CxPCxA, design professionals, and construction/program/project managers (if known).

6.2.5. Construction Checklists

6.2.5.6. When a test data form is required for a specific system or assembly, there should be an item in the associated construction checklist for the test data form to be submitted to the CxPCxA.

6.3. Design-Phase Acceptance Requirements

6.3.1. The Cx Process should include the formal acceptance by the Owner of the BoD and the updated OPR during the Design Phase, following review and comment by the CxPCxA.

Modify Section 7 as shown. The remainder of Section 7 is unchanged.

7. CONSTRUCTION PHASE

7.1. Introduction

7.1.3. Construction-Phase Cx Process Activities described in this section that are to be performed by the design team and special consultants must be included in the scope of services described in the “Owner-Design Professional Service Agreement.” These Cx Process Activities may be more than are normally required in their scope of services. The scope of services in the “Owner-Design Professional Service Agreement” should also include the requirement to cooperate with the CxPCxA during Predesign, Design, and Construction phases of the project.

7.2. Construction-Phase Cx Process Activities

7.2.1. Construction Phase Cx Process Responsibilities

7.2.1.4. Essential team members during the Construction Phase include Owner’s representatives, the CxPCxA, design professionals, contractors, suppliers/vendors, and construction/program/project managers.

[...]

7.2.6. Conduct Preconstruction Cx Process Meeting

7.2.6.1. Early in the Construction Phase, the CxPCxA shall conduct a preconstruction Cx Process meeting with the Cx Team.

[...]

7.2.9. Develop Test Procedures

7.2.9.1. Test procedures define the means and methods to carry out the tests that are accomplished during the Construction Phase. Test procedures provide the following:

- a. Participants required for the test, which may include the primary contractor, secondary contractors, design professionals, the CxPCxA, operators, the local authority having jurisdiction, and manufacturers associated with the equipment, system, or assembly.

[...]

7.2.10. Test Execution

7.2.10.1. During test execution there can be witnessing of tests, verification of tests, or verification of test data reports. Typically, only one of these is performed by the CxPCxA for a specific test or series of tests.

[...]

7.3. Construction-Phase Acceptance Requirements

- 7.3.1. The Cx Process should include the formal acceptance by the Owner of the systems manual, verified test reports, and training reports, consistent with the recommendations of the CxPCxA and appropriate other Cx Team members.

Modify Section 8 as shown. The remainder of Section 8 is unchanged.

8. OCCUPANCY/OPERATIONS PHASE

8.1. Introduction

- 8.1.2. The active involvement of the CxPCxA and Cx Team during the initial portion of the Occupancy/Operations Phase of a project is an integral aspect of the Cx Process.

- 8.1.3. Occupancy/Operations-Phase Cx Process objectives include the following:

- a. Using the CxP'sCxA's project knowledge and experience to minimize contractor callbacks

[...]

- 8.1.4. Occupancy/Operations-Phase Cx Process Activities described in this section that are to be performed by the design team and special consultants that must be included in the scope of services described in the "Owner-Design Professional Service Agreement." These Cx Process Activities may be more than are normally required in their scope of services. The scope of services in the "Owner-Design Professional Service Agreement" should also include the requirement to cooperate with the CxPCxA during Pre-design, Design, and Construction Phases of the project.

[...]

8.2. Occupancy/Operations-Phase Cx Process Activities

8.2.1. Occupancy/Operations-Phase Cx Process Responsibilities

- 8.2.1.2. Essential team members during the Occupancy/Operations Phase include Owner's representatives, the CxPCxA, design professionals, contractors, and construction/program/project managers.

[...]

- 8.2.2. The CxPCxA should aid in the coordination of the callback of contractors during the Occupancy/Operations Phase. Since the CxPCxA has been involved since the Pre-design Phase, he/she has the ability to identify which contractors should be contacted to resolve an issue.

[...]

8.3. Occupancy/Operations Phase Acceptance Requirements

- 8.3.1. The Cx Process should include the formal acceptance by the CxPCxA and the Owner of any deferred training, the final project systems manual, and the final Cx Process Report during the Occupancy/Operations Phase.

Modify Informative Appendix C as shown. The remainder of Informative Appendix C is unchanged.

INFORMATIVE APPENDIX C—COST AND BENEFITS OF THE COMMISSIONING PROCESS

C2. DISCUSSION OF NEW COST ITEMS

[...]

C2.1 Design Professional. In addition to the design professional's typical scope of work, including the preparation of design drawings and specifications, the Cx Process often requires that the design professional work with the CxPCxA to integrate the Cx Process Activities into the project specifications. These activities typically include the following:

[...]

C2.2 CxPCxA. The activities accomplished by the CxPCxA as defined in this guideline require that additional funds be allocated during the Predesign, Design, and Construction Phases.

Modify Informative Appendix D as shown. The remainder of Informative Appendix D is unchanged.

INFORMATIVE APPENDIX D—COMMISSIONING PROCESS DOCUMENTATION MATRIX

Table D-1 Documentation Matrix

Phase	Document	Input By	Provided By	Reviewed/ Approved By	Used By	Notes
Predesign	OPR	O&M, Users, Capital Projects, Design Team (?)	CxPCxA or Designer	Owner	CxPCxA, Design Team	Design Team may not be hired yet
	Commissioning Plan	Owner, Design Team (?), CxPCxA	CxPCxA	Owner	CxPCxA, Owner, Design Team	Design Team may not be hired yet
	Systems Manual Outline	O&M, CxPCxA	Owner or CxPCxA	Owner	Design Team	May be included in OPR
	Training Requirements Outline	O&M, Users, CxPCxA, Design Team	Owner or CxA	Owner	Design Team	May be included in OPR
	Issues and Resolution Log	CxPCxA	CxPCxA	N/A	CxPCxA, Design Team	May be only format at this phase
	Issues Report	CxPCxA	CxPCxA	Owner	Design Team, Owner	
	Predesign-Phase Cx Process Report	CxPCxA	CxPCxA	Owner	Owner	Close of Phase Report
Design	OPR Update	O&M, Users, Capital Projects, Design Team	CxPCxA or Designer	Owner	CxPCxA, Design Team	
	Basis of Design	Design Team	Design Team	Owner, CxPCxA	Design Team, CxPCxA	
	Construction Specifications for Cx	Design Team, CxPCxA, Owner	Design Team or CxPCxA	Owner	Contractors, CxPCxA, Design Team	May also be provided by Project Manager/Owner's Rep.
	Systems Manual Outline Expanded	Design Team, CxPCxA, O&M, Contractor (?)	Design Team or CxPCxA	Owner, CxPCxA	Design Team, Contractor	Contractor may not be hired yet
	Training Requirements In Specifications	O&M, Users, CxPCxA, Design Team	Owner or CxPCxA	Owner	Design Team	Contractor may not be hired yet
	Design Review Comments	CxPCxA	CxPCxA	Owner	Design Team	
	Issues and Resolution Log	CxPCxA	CxPCxA	N/A	CxPCxA, Design Team	

Table D-1 Documentation Matrix

Phase	Document	Input By	Provided By	Reviewed/ Approved By	Used By	Notes
	Issues Report	<u>CxPCxA</u>	<u>CxPCxA</u>	Owner	Design Team, Owner	
	Design-Phase Cx Process Report	<u>CxPCxA</u>	<u>CxPCxA</u>	Owner	Owner	Close of Phase Report
Construction	OPR Update	O&M, Users, Capital Projects, Design Team	<u>CxPCxA</u> or Designer	Owner	<u>CxPCxA</u> , Design Team, Contractors	
	Basis of Design Update	Design Team	Design Team	<u>CxPCxA</u> , Owner	Design Team, <u>CxPCxA</u>	
	Cx Plan Update	Design Team, <u>CxPCxA</u> , Owner, Contractor	<u>CxPCxA</u>	<u>CxPCxA</u> , Owner, Design Team Contractor	<u>CxPCxA</u> , Owner, Design Team, Contractors	
	Submittal Review Comments	<u>CxPCxA</u>	Design Team	Design Team	Contractor	
	System Coordination Plans	Contractor, Design Team	Contractor	<u>CxPCxA</u> , Design Team	Contractor, <u>CxPCxA</u>	
	Inspection Checklists	<u>CxPCxA</u> , Contractor, Design Team	<u>CxPCxA</u>	<u>CxPCxA</u> , Design Team	Contractor	
	Inspection Reports	Contractor	<u>CxPCxA</u>	<u>CxPCxA</u> , Owner	Contractor	
	Test Procedures	<u>CxA</u> , Contractor, Design Team	<u>CxPCxA</u>	<u>CxPCxA</u> , Design Team	Contractor	
	Test Data Reports	Contractor	<u>CxPCxA</u>	<u>CxPCxA</u> , Owner	Contractor	
	Commissioning Meeting Agendas and Minutes	<u>CxPCxA</u>	<u>CxPCxA</u>	All	All	
	Training Plans	Design Team, <u>CxPCxA</u> , O&M, Contractor	Contractor or <u>CxPCxA</u>	Owner, <u>CxPCxA</u>	O&M, Users, Contractor	
	Systems Manual	Design Team, <u>CxPCxA</u> , O&M, Contractor	Contractor	Owner, <u>CxPCxA</u>	O&M, Users	
	Issues and Resolution Log	<u>CxPCxA</u>	<u>CxPCxA</u>	N/A	<u>CxPCxA</u> , Design Team, Contractor	
	Issues Report	<u>CxPCxA</u>	<u>CxPCxA</u>	Owner, Design Team	Design Team,	
	Preliminary Construction Cx Process Report	<u>CxPCxA</u>	<u>CxPCxA</u>	Owner	Owner	Prior to Occupancy

Table D-1 Documentation Matrix

Phase	Document	Input By	Provided By	Reviewed/ Approved By	Used By	Notes
	Final Construction-Phase Cx Process Report	<u>CxPCxA</u>	<u>CxPCxA</u>	Owner	Owner	Close of Phase Report
Occupancy and Operations	OPR Update	O&M, Users, Design Team	<u>CxPCxA</u> or Designer	Owner	<u>CxPCxA</u> , Design Team, Contractors	
	Basis of Design Update	Design Team	Design Team	<u>CxPCxA</u> , Owner	Design Team, <u>CxPCxA</u>	
	Maintenance Program	O&M, Contractor, <u>CxPCxA</u>	Owner or <u>CxPCxA</u>	Owner, <u>CxPCxA</u>	O&M, Users	
	Test Procedures	Contractor, <u>CxPCxA</u> , O&M, Design Team	<u>CxPCxA</u>	Design Team, <u>CxPCxA</u>	Contractor	
	Test Data Reports	Contractor	<u>CxPCxA</u>	<u>CxPCxA</u> , Owner	Contractor, O&M	
	Issues and Resolution Log	<u>CxPCxA</u>	<u>CxPCxA</u>	N/A	CxA , Design Team, Owner, Contractors	
	Issues Report	<u>CxPCxA</u>	<u>CxPCxA</u>	Owner	Design Team, Owner, Contractors	
	Cx Process Report	<u>CxPCxA</u>	<u>CxPCxA</u>	Owner	Owner	Final Report
	Recommissioning Plan	O&M, Users, <u>CxPCxA</u>	<u>CxPCxA</u> or Owner	Owner	Owner	

Notes:

1. The term “contractor” is understood to refer to any of several entities that provide construction services. Depending on the project, this could include, among others, the owner’s representative, construction manager, contractors, and subcontractors.
2. Abbreviations: CxPCxA: Commissioning Provider Authority; O&M: operations and maintenance personnel; OPR: Owner’s Project Requirements.

Modify Informative Appendix E as shown. The remainder of Informative Appendix E is unchanged.

INFORMATIVE APPENDIX E—COMMISSIONING PROCESS REQUEST FOR QUALIFICATIONS

[...]

E1. BACKGROUND

_____ (Owner) is seeking the services of a qualified CxPCxA for _____. The project is a _____ gross ft², ____ story, Class __ [type] _____ building in [city & state] _____, _____, with a project budget of \$_____ million. The facility is expected to be composed of _____% [space type], _____% [space type], and _____% [space type].

The project is currently in the early predesign phase. The expected schedule is to start design by _____

_____, start construction by _____, and occupy by _____.

The management structure is traditional design/bid/build with full design documents and specifications being developed by an architectural/engineering firm. The construction documents will be let out to bid and a general contractor will be hired to complete the construction. The Owner's primary construction representative on site will be provided by the separately contracted services of a construction manager. The CxPCxA will be hired by and report directly to the Owner.

E2. SCOPE OF WORK

[...]

E2.1 Cx Process During the Predesign Phase. The Cx Process Activities completed by the CxPCxA during the Predesign Phase include the following:

[...]

E2.2 Cx Process During the Design Phase. The Cx Process Activities completed by the CxPCxA during the Design Phase include the following:

[...]

E2.3 Cx Process During the Construction Phase. The Cx Process Activities accomplished by the CxPCxA during the Construction Phase include the following:

[...]

E2.4 Cx Process During the Occupancy/Operations Phase. The Cx Process Activities accomplished by the CxPCxA during the Occupancy/Operations Phase include the following:

[...]

E3. LIMIT OF RESPONSIBILITIES

The CxPCxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxPCxA may assist with problem-solving or resolving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and design professionals.

[...]

E5. DESIRED QUALIFICATIONS

It is desired that the person designated as the CxPCxA satisfy as many of the following requirements as possible:

- a. Has acted as the principal CxPCxA for at least three projects during the past year. [Note that the size of the project should be accounted for. Whereas one proposer may have done ten projects all small in size, another proposer that accomplished one large and complex project may have equal credentials].

[...]

- f. The CxP'sCxA's firm will demonstrate depth of experienced personnel and capability to sustain loss of assigned personnel without compromising quality and timeliness of performance.
- g. The CxPCxA will be an independent contractor and not an employee or subcontractor of the general contractor or any other subcontractor on this project, including the design professionals.

E6. INSTRUCTIONS TO PROPOSERS

[...]

- a. List the key individual who will be the CxPCxA for this contract and describe his or her relevant qualifications and experience. This information is required in addition to any detailed resumes the proposer submits. The contract will require that this individual be committed to the project for its duration.
- b. Provide project and professional references and experience for three to five commissioning projects for which

the proposer was the principal CxPCxA in the last three years. Include a description of the projects, identify when the proposer came into the projects, and describe the involvement of each individual on the proposer's team in the projects.

[...]

E10. MINIMUM REQUIREMENTS FOR CONTRACT EXECUTION

E10.2 Insurance. The CxP'sCxA's firm shall obtain, at the firm's expense, and keep in effect during the term of the project, \$[*list required insurance amount*].

Modify Informative Appendix F as shown. The remainder of Informative Appendix F is unchanged.

INFORMATIVE APPENDIX F—ROLES AND RESPONSIBILITIES

[...]

The responsibilities of the owner, CxPCxA, design professionals, construction manager, contractors, and manufacturers are detailed below.

F1. OWNER

[...]

- h. Review and comment on the CxP'sCxA's Cx Process Progress Reports.
- i. Review and comment on the CxP'sCxA's verification reports.
- j. Review and accept the CxP'sCxA's Cx Process Report.

F2. COMMISSIONING PROVIDER AUTHORITY

[...]

- h. Execute the Cx Process through the writing and review of Cx Process Reports, organization of all Cx Team meetings, tests, demonstrations, and training events described in the contract documents and approved Cx Plan. Organizational responsibilities include preparation of agendas, attendance lists, arrangements for facilities, and timely notification to participants for each Cx Process activity. The CxPCxA shall act as chair at all commissioning events and ensure execution of all agenda items. The CxPCxA shall prepare minutes of every Cx Process activity and send copies to all Cx Team members and attendees within five workdays of the event.

[...]

- n. Schedule the initial owner training session so that it will be held immediately before the contractor training. This session will be attended by the owner's O&M personnel, the design professionals, the contractor, and the CxPCxA. The CxPCxA will review the OPR and the design professional(s) will review the BoD.

[...]

F3. DESIGN PROFESSIONAL

[...]

- d. Prepare contract documents, including the integration of the Cx Process requirements and activities provided by the CxPCxA.

[...]

- h. Attend the prebid and preconstruction meetings as scheduled by the CxPCxA.
- i. Specify and verify that the operation and maintenance of the systems and assemblies has been adequately detailed in construction documents.
- j. Review and incorporate as appropriate the CxP'sCxA's comments from submittal reviews.

[...]

- n. Review and comment on the CxP'sCxA's periodic Cx Process Progress Reports and Issues and Resolution Log

reports.

F4. CONSTRUCTION MANAGER

[...]

- g. Remedy deficiencies identified by the CxPCxA during verification of the installation or testing.

[...]

F5. CONTRACTOR

[...]

- g. Provide submittals to the owner, design professionals, and the CxPCxA.
- h. Notify the CxPCxA when systems and assemblies are ready for testing.
- i. Demonstrate the performance of assemblies and/or operation of systems to the CxPCxA.
- j. Complete the construction checklists as the work is accomplished. Provide the completed construction checklists to the CxPCxA.

[...]

Modify Informative Appendix H as shown. The remainder of Informative Appendix H is unchanged.

INFORMATIVE APPENDIX H—ACCEPTANCE PLAN

[...]

H1. PREDESIGN PHASE

The OPR and the Cx Plan are formally accepted by the Owner during the Predesign Phase, after review and comment by the CxPCxA. The general process for accepting these documents is:

- a. The CxPCxA develops a draft of each document and provides it to the Cx Team.
- b. The Cx Team provides comments on the draft documents.
- c. The CxPCxA works with the Cx team to resolve any issues.
- d. The CxPCxA recommends acceptance of the documents to the Owner and provides copies for review.

H2. DESIGN PHASE

[...]

The general process for accepting the BoD is as follows:

- a. The CxPCxA provides a list of information required and the format for the BoD to the design professionals prior to the start of design.
- b. The design professionals gather and organize the information during the creation of the design.
- c. The design professionals submit the BoD to the Owner and CxPCxA for review and comment with each design submittal.
- d. Upon correction and resubmittal, the Owner accepts the BoD based on the recommendation of the CxPCxA.

The general process for accepting the contract documents is as follows:

- a. The design professionals submit the final package to the Owner and CxPCxA for review.
- b. The CxPCxA evaluates the contract documents using random sampling to determine their ability to achieve the OPR.
- c. The CxPCxA meets with the design professionals to discuss and resolve comments.
- d. Upon resolution of comments, the CxPCxA recommends to the Owner acceptance of the documents.
- e. Owner reviews the comments, their resolution, and accepts the contract documents.

H3. CONSTRUCTION PHASE

[...]

The general process for accepting the systems manual is as follows:

- a. The CxPCxA tracks the contractor submittals for the required documentation.
- b. Within XX days of submittal acceptance for a system or assembly, the contractor submits a draft systems manual to the Owner, CxPCxA, and design professionals.
- c. The CxPCxA consolidates the reviews and meets with the design professionals to discuss and resolve.
- d. The contractor submits to the CxPCxA changes to the accepted submittals throughout construction.
- e. XX days prior to the first training session, the contractor submits the final systems manual to the Owner, CxPCxA, and design professionals.
- f. The Owner accepts the final systems manual based on the recommendation of the CxPCxA.

The general process for accepting the training program is as follows:

- a. The CxPCxA provides the training agendas to the contractor.
- b. The contractor develops the training program, including identifying the trainer, the schedule of sessions, and the material to be developed. This information is submitted to the Owner, CxPCxA, and design professionals for review and comment.
- c. Based on the recommendation of the CxPCxA, the Owner accepts the training program.
- d. The contractor then develops the training material and submits it to the Owner, CxPCxA, and design professionals for review and comment XX days before the first training session.
- e. Based on the recommendation of the CxPCxA, the Owner accepts the training materials.
- f. The contractor implements the training program.
- g. The CxPCxA randomly quizzes the trainees two weeks after the completion of a session.
- h. The contractor submits copies of all training materials and edited videotapes of the sessions.
- i. The CxPCxA recommends acceptance of the completed training program to the Owner.

The general process for accepting the facility is as follows:

- a. Throughout construction the CxPCxA randomly samples the completion of the construction checklists for meeting the OPR.
- b. The CxPCxA directs the completion of system and assembly testing by the contractor and documents the results.
- c. The CxPCxA works with the contractor in resolving any issues identified during testing.
- d. The CxPCxA verifies that all system documentation is received from the contractor.
- e. The CxPCxA presents a preliminary Construction-Phase Cx Process Report prior to occupancy that provides an evaluation of meeting each element of the OPR, including recommendations to the Owner for acceptance/rejection of the facility.
- f. The CxPCxA provides a final Construction-Phase Cx Process Report with details on the Cx Process Activities completed during the Construction Phase.

H4. OCCUPANCY/OPERATIONS PHASE

[...]

The general process for accepting the seasonal test results is as follows:

- a. The CxPCxA directs the completion of seasonal system and assembly testing by the contractor and documents the results.
- b. The CxPCxA works with the contractor in resolving any issues identified during testing.
- c. The CxPCxA verifies that all updated system documentation is received from the contractor.
- d. The CxPCxA recommends to the Owner acceptance of the seasonal testing results.

The general process for accepting the Cx Process Report is as follows:

- a. The CxPCxA provides the Cx Process Report to the Owner, design professionals, and contractor for review and comment.
- b. The CxPCxA incorporates comments and provides a final copy to the Cx Team members.
- c. The Owner accepts the Cx Process Report, ending the CxP'sCxA's responsibilities.

Modify Informative Appendix I as shown. The remainder of Informative Appendix I is unchanged.

INFORMATIVE APPENDIX I—OWNER'S PROJECT REQUIREMENTS WORKSHOP GUIDANCE

[...]

I2.1 OPR Workshop. The OPR workshop is typically facilitated by the CxPCxA, who elicits the primary concerns of the project team. The workshop is organized to encourage identification of all requirements, to encourage interaction and discussion among all team members, and to arrive at group consensus of priorities for the OPR.

[...]

I2.2 OPR Documentation. The OPR workshop will identify key items and priorities important to the project team, the owner, users, and the Cx Team. However, it does not provide specific values. For example, the number one item in the OPR may be good air circulation in the rooms. It is the responsibility of the CxPCxA to take the individual requirements developed by the project team and translate them into physical properties that can be measured, designed, and documented.

This transformation of the OPR often requires input from a variety of sources, including the design team, contractors, specialists, standards, and guidelines. Typically, the CxPCxA has sufficient experience in the planning, design, construction, and operation of facilities to provide the oversight of such a task.

Modify Informative Appendix L as shown. The remainder of Informative Appendix L is unchanged.

INFORMATIVE APPENDIX L—SPECIFICATIONS

[...]

L1.2 Cx is a quality-oriented process for achieving, verifying, and documenting that the performance of facility systems and assemblies meets defined objectives and criteria. The Cx Process begins at project inception during the Predesign Phase and continues for the life of the facility through the Occupancy/Operations Phase. During the Predesign Phase, the OPR (OPR) are determined and documented by the Cx Team, which includes the Owner, Cx Provider Authority (CxPCxA), design professionals, operation and maintenance personnel, occupants, and users.

[...]

L2. THE COMMISSIONING PROVIDER AUTHORITY (CxPCxA)

L2.1 The primary role of the CxPCxA is to verify achievement of the OPR throughout the project, from Predesign Phase through Occupancy/Operations Phase. The Owner should perform this role.

L2.2 When the Owner cannot perform the CxPCxA duties with qualified personnel, then the CxPCxA should have a separate professional services agreement with the Owner, as this avoids conflicts of interest and provides independence from the other parties (the Owner's project manager, designers of record, construction managers, suppliers, and construction contractors). This professional services agreement defines the duties, rights, and responsibilities of the CxPCxA for each phase of the project. This separate relationship allows the CxPCxA to act independently as director of Cx Process Activities, to focus on achieving the OPR, and to communicate directly with the Owner.

L2.3 The CxPCxA is a group of personnel with expertise and experience in the design, construction, and operations of the various systems and assemblies included in the project. These personnel are led by an individual who has expertise and experience in successfully implementing the Cx Process.

L2.4 If the CxPCxA is an employee, associate, or partner of the same organization as the designer of record or

construction management firm, there is a conflict of interest. While not a recommended approach, in these instances the CxPCxA must have a separate professional services agreement, be organizationally separate from the design team or construction management team, and define and manage the conflicts of interest to provide the Owner with the independence required for the Cx Process to be successful.

L2.5 The CxPCxA does not perform testing; it directs the process and directs the recording of the results. The CxPCxA plans, schedules, and supervises Cx Process Activities to verify achievement of the OPR. The contractor completes construction checklists, performs tests, and accomplishes other Cx Process Activities.

L3. ORGANIZATIONAL STRATEGY FOR INCLUSION OF COMMISSIONING ACTIVITIES IN THE SPECIFICATIONS

L3.2 *Supplementary Conditions*: Modify the general conditions of the contract for construction in a document titled “Supplementary Conditions.” Among other provisions, define the CxPCxA and include the CxP’sCxA’s duties, rights, responsibilities, and limits of authority and additional requirements for substantial completion. AIA Document A511, “Guide for Supplementary Conditions,” provides guidance about how to write supplementary conditions.

TABLE L-1 Description of Specification Sections

Section Number	Document/Section	List of Contents	Scope of Contents
01100	SUMMARY	Work covered by contract documents Identification of separate prime contractors	Describe Cx Process Activities as a part of the project. Alert the contractor that the Owner has contracted for commissioning with a separate <u>CxPCxA</u> . Delineate scope of Cx Process.
01310	PROJECT MANAGEMENT AND COORDINATION	Provisions about coordination of Cx Process Activities among contractors and subcontractors; project meetings	Add requirements to include <u>CxPCxA</u> in coordination meetings (particularly “Preconstruction Meeting”). Coordination of meetings and conferences.
01330	SUBMITTAL PROCEDURES	Procedures for submittals	Submittal requirements for Cx Process Activity Reports and schedules should be specified in Sections 01811 to 01819. Add requirements here for additional copies from contractor to <u>CxPCxA</u> and for approved submittals to be distributed to <u>CxPCxA</u> .
01400	QUALITY REQUIREMENTS		Coordinate with Cx Process Activities, witnessing of tests, and test reports.
01500	TEMPORARY FACILITIES AND CONTROLS		Include office space for <u>CxPCxA</u> and utility services for Cx Process Activities.
01782	OPERATION AND MAINTENANCE DATA		Include requirements for <u>CxPCxA</u> to review and recommend approval of systems manual. Same procedures as described for Section 01330-Submittals

TABLE L-1 Description of Specification Sections

Section Number	Document/Section	List of Contents	Scope of Contents
01820	DEMONSTRATION INDIVIDUAL SECTIONS IN DIVISIONS 2 THROUGH 16	Field Quality Control Tests Adjusting and Balancing Cleaning Demonstration	Coordination requirements with the <u>CxPCxA</u> A statement requiring system, subsystem, or equipment to be commissioned as a part of its parent system, A statement requiring contractor to complete construction checklists and perform tests.

L3.3 General Requirements for the Cx Process: Specifications in Division 1 include the general requirements for contractors relating to Cx Process Activities. The “Summary” Section describes, in general, how the contractors, separate contractors (if there is more than one prime contractor), or the construction manager must interact with the CxPCxA. Administrative procedures for the Cx Process are specified in the Division 1 Section “Commissioning.”

[...]

L3.4.1 During construction, the CxPCxA verifies that contractor activities, such as installation and start-up; testing; demonstration and training of the Owner’s operator and maintenance personnel; and systems manual, meet the OPR. Coordinating activities by the contractor in support of the CxPCxA should be specified within the section where the component is specified (i.e., in individual sections in Divisions 2 through 16) if special requirements are necessary. The following are examples of requirements to include in individual sections in Divisions 2 through 16:

L3.4.1.1 Installation and Start-Up: Include requirements for involvement of factory-authorized service representative in individual sections and for the completion of construction checklists.

L3.4.1.2 Testing: Include requirements to support the CxPCxA in verifying test results, ranging from coordinating testing, to witnessing the test, to utilizing contractor personnel and test equipment to verify the test report.

[...]

L4. INTRODUCTION TO GUIDE SPECIFICATIONS

[...]

**SECTION 01 9113
 GENERAL COMMISSIONING REQUIREMENTS**

PART 1—GENERAL

[...]

1.3 DEFINITIONS

[...]

- A. Cx Plan: A document, prepared by CxPCxA, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- B. CxPCxA: Commissioning Provider Authority.

[...]

1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The

commissioning team shall consist of, but not be limited to, representatives of **[each]** contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxPCxA.

B. Members Appointed by Owner:

1. CxPCxA: An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxPCxA under a separate contract.

1.5 OWNER'S RESPONSIBILITIES

- A. Provide the OPR documentation to the CxPCxA and **[each]** contractor for information and use.

[...]

- C. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxPCxA and **[each]** contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 [EACH] CONTRACTOR'S RESPONSIBILITIES

- A. **[Each]** contractor and their subcontractors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxPCxA for resolution of issues recorded in "Issues and Resolution Log."
3. Attend and participate in commissioning team meetings held **[weekly]** **[biweekly]** **[monthly]** **[variable]** **<Insert frequency>**.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the Commissioning Provider~~commissioning authority~~.
6. Complete **[paper]** **[electronic]** construction checklists as Work is completed and provide to the Commissioning Provider~~commissioning authority~~ on a **[daily]** **[weekly]**, **<Insert frequency>** basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Provider.
8. Accomplish commissioning process test procedures.

1.7 CxP'SCxA'S RESPONSIBILITIES

Include CxPCxA responsibilities in this Article that have impact on contractor activities and responsibilities.

[...]

- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, CxPCxA will report the failure in the "Issues and Resolution Log."

[...]

Modify Informative Appendix M as shown. The remainder of Informative Appendix M is unchanged.

INFORMATIVE APPENDIX M—CONSTRUCTION CHECKLISTS

[...]

2. PREINSTALLATION CHECKS

The following must be completed on delivery of equipment/component to the work site.

		Contractor	Initial	<u>CxPCxA</u>
2A	Physical Checks [insert physical checks to be verified prior to installation, such as “free of damage” and cleanliness]	Yes / No		
2B	Component Verification [insert component checks to be verified prior to installation, such as location and type of components]	Yes / No		

3. INSTALLATION

The following items need to be verified during installation. Fill in blanks with check, specific information, or circle “yes” or “no.” For any negative responses, complete Section 4.

		Contractor	Initial	<u>CxPCxA</u>
3A	[insert title of major installation step] [insert items to verify as installation step is accomplished]	Yes / No		
3B	[insert title of major installation step] [insert items to verify as installation step is accomplished]	Yes / No		
3C	[insert title of major installation step] [insert items to verify as installation step is accomplished]	Yes / No		
3D	[insert title of major installation step] [insert items to verify as installation step is accomplished]	Yes / No		
3E	[insert title of major installation step] [insert items to verify as installation step is accomplished]	Yes / No		

Modify Informative Appendix N as shown. The remainder of Informative Appendix N is unchanged.

INFORMATIVE APPENDIX N—QUALITY-BASED SAMPLING EXAMPLES

[...]

N1. DESIGN-PHASE SUBMISSIONS

A critical step in the Cx Process is the review of the design submissions from the design professionals. It is important to remember that the role of the CxPCxA is to verify that the OPR is met and that the system is designed in a quality manner.

[...]

N1.5 Design Professional Actions. Comments provided by the CxPCxA should be formally replied to by the design professionals. If systemic issues are identified during the CxP’sCxA review, the design process should be stopped and the issues resolved. It is expected at the next submission that the CxPCxA will again use random sampling that will result in a review of different areas on the drawings and the specifications and that will identify whether the systemic issue has been resolved. Back-checking of the specific items may be appropriate, but not as the sole means of verifying resolution of the issue.

N2. CONTRACTOR PHASE SUBMISSIONS

The focus of the review of contractor submittals by the CxPCxA during construction is different from that accomplished by the design professional. Whereas the design professional reviews all submittals against the contract

documents (specifications), the CxPCxA compares a sample (typically 5%–10%) of a submittal against the OPR and BoD. This different approach is due to the fact that the commissioning process role is to verify achievement of the OPR using quality tools.

[...]

- d. Results: Document results of the review. Typically, if consistent issues are identified, the general quality of the submittal to achieve the OPR is lacking and the recommendation provided to the design professional should be to reject the submittal. In the CxPCxA write-up, it is important to state that a sampling approach was used to avoid having the design professional or others assume that the CxPCxA reviewed everything.

[...]

Modify Informative Appendix O as shown. The remainder of Informative Appendix O is unchanged.

INFORMATIVE APPENDIX O—SYSTEMS MANUAL

[...]

The CxPCxA shall be responsible for verifying the development of the systems manual.

[...]

- a. General
 2. **OPR (facility level).** A copy of the final OPR for the facility is included in this section. This document was initially developed during the Predesign Phase and was updated throughout the project by the Owner, CxPCxA, or design professionals.

[...]

- b. **xxx System/Assembly**
 2. **OPR (xxx System/Assembly level).** A copy of the final OPR dealing with this system/assembly is included in this section. This document was initially developed during the Predesign Phase and was updated throughout the project by the Owner, CxPCxA, or design professionals.

[...]

Modify Informative Appendix P as shown. The remainder of Informative Appendix P is unchanged.

INFORMATIVE APPENDIX P—TRAINING MANUAL AND TRAINING NEEDS

[...]

This appendix is a collection of various requirements for training and identifies needs for the training manual. The training manual includes the training plan, which is composed of the training syllabus and agenda that are provided to the contractor by the Owner with help from the CxPCxA.

[...]

P1. TRAINING SYLLABUS

P1.2 Sessions.

[...]

The Commissioning Provider Authority (CxPCxA) will be notified of the scheduled training time and provided with a copy of the training material fifteen days prior to each training session. The CxPCxA will review the material and share comments with the Owner and the design professionals. If any aspects do not meet the requirements of the specifications, this will be communicated through the design professionals. The CxPCxA will attend 25% or more of the training sessions.