

**MEMORANDUM OF AGREEMENT
OHIO SCHOOL FACILITIES COMMISSION
COMMISSIONING SERVICES**

This Memorandum of Agreement for Commissioning Services (Agreement) is by and between the Ohio School Facilities Commission (Commission), 10 West Broad Street, Suite 1400, Columbus, Ohio 43215, and (Commissioning Authority),.

WHEREAS, the mission of the Commission is to provide funding, management oversight, and technical assistance to Ohio school districts for construction and renovation of school facilities in order to provide an appropriate learning environment for Ohio's school children; and

WHEREAS, the Commission desires to implement and monitor a systematic process of quality control to ensure that major building systems in newly completed school facilities are installed and functioning as designed; and

WHEREAS, the Commissioning Authority (CxA) is pre-qualified by the Commission as an individual or firm with experience in developing and/or implementing effective commissioning (Cx) programs for institutional facilities; and

WHEREAS, the CxA is an independent party with no affiliations to a design team or participating contractors in a school facilities program; now

THEREFORE, in consideration of the foregoing premises and mutual promises herein contained, the Commission and the CxA agree as follows:

ARTICLE I — SCOPE OF SERVICES

- 1.1 The CxA shall provide professional services for the purpose of confirming that major building systems in newly completed school facilities are good operational systems that are low on maintenance and operating costs and perform interactively according to the contract documents.
- 1.2 The CxA shall perform services with professional standards of skill, care and reasonable diligence in accordance with generally accepted Cx practices, the terms of this Agreement and the Commission's Cx Guidelines as updated from time to time, attached as Appendix I to this Agreement.
- 1.3 Basic Services provided by the CxA are defined as services starting in the design phase through the warranty phase and include seasonal Cx. The CxA shall review design documents, develop a Cx specification, develop and coordinate the execution of a testing plan, which includes observing and documenting system's performance to ensure that systems are functioning in accordance with the design intent of the contract documents and School District objectives.
- 1.4 Special services provided by the CxA are based upon a scope of work that is appropriate for the phase of the project. The CxA will develop a scope of work, schedule and fixed lump sum total cost for special services for approval by the Commission.

- 1.5 Services provided by a pre-qualified CxA are an eligible expense of the project budget when approved by the Commission.
- 1.6 The CxA may provide Cx services through one or more Subconsultants employed by the CxA. Any Subconsultant shall be an independent third party with no affiliations to a design team or participating contractors in a school facilities program. All Subconsultants shall be approved by the Commission before providing services. The Commission retains the discretion to reject the services of a Subconsultant to provide Cx. The Commission, in consultation with a School District, retains the discretion to reject a Subconsultant for a specific project.
- 1.7 The CxA is not responsible for design or general construction scheduling, cost estimating, construction management, or performing corrective work, but may assist with problem solving or addressing non conformance issues or deficiencies.
- 1.8 Offshore Services. Vendor affirms that it will abide by the terms of Executive Order 2011-12K, and no services under this contract will be performed offshore. Vendor agrees to disclose: 1) the location(s) where all services will be performed under this contract; 2) the location(s) where any state data associated with any of the services being provided, or seek to provide, will be accessed, tested, maintained, backed-up or stored; 3) the change of any location(s) for any services being provided under this Contract; and 5) the principal location of business for Vendor and all subconsultants supplying services to the state under this Contract.

ARTICLE II – COMPENSATION

- 2.1 Selection by Co-Owners The CxA is pre-qualified and assigned by the Commission to provide Cx services and will be required to provide a lump sum fee proposal for Basic Services and Special Services.
- 2.2 Fixed Fee for Basic Services. Basic Services, as described in the Cx Guidelines Appendix I, will be compensated at the rate negotiated in accordance with the fee schedule prescribed in Appendix I, Attachment A and not to exceed 75 cents per square foot, which shall include all the CxA fees and expenses for services. The CxA shall be compensated an established percentage of the Fixed Fee on a monthly basis in proportion to services performed in accordance with the percentages listed below. Projects that engage Basic Services Cx after the design phase may have the payment schedule modified by agreement prior to commencing work.

- **Design Phase (26%)**
Design Review & Analysis, Document Review, Cx Plan, Meetings, Reporting and Checklists

Schematic.....	6%
Eco Charrette.....	2%
Design Drawing.....	6%
Owners Design Intent Narrative.....	1%
A/E Basis of Design Review.....	1%
Energy Modeling Review.....	2%
Construction Drawing.....	5%
Cx Plan.....	1%

LEED Documentation.....	2%
• Construction Phase (57%)	
<i>Documents, Meetings, Site Visits and Equipment, Systems & Work Start-Up, Testing & Verifications, Reporting and Checklists</i>	
Pre-Functional Test.....	15%
Functional Testing.....	25%
<i>Completion of Functional Testing Activities, Retests and Verifications, and Review</i>	
1st Report Delivery.....	5%
<i>First full round Cx Report except for Seasonal & Warranty Cx, Meetings</i>	
Seasonal Testing.....	5%
Construction Phase Final Cx Report.....	7%
<i>Completion of Functional Testing Activities, Retests and Verifications, Meetings, Reporting and Checklists, Redline and Shop Drawing Review</i>	
• Post Occupancy Phase (17%)	
<i>Actions, Reporting, Resolution and Delivery Reports, Meetings and systems and site inspections</i>	
Trend Report.....	1%
Warranty Period (Eleven Month) Inspection.....	8%
Re-Cx Plan.....	1%
Owners Systems Manual.....	5%
Final Commissioning Report.....	2%

- 2.3 Fee Proposal for Special Services. By request, the CxA will provide a lump sum fee proposal to the Co-Owners for the performance of Special Services, as described in the Cx Guidelines Appendix I, with a breakdown of the fee amount associated with each separate facility. All lump sum fee proposals for Special Services are subject to Commission approval. The CxA shall be compensated an established percentage of the Fixed Fee on a monthly basis in proportion to services performed in accordance with the percentages listed below. Projects that engage special services Cx after the design phase can have the payment scheduled modified by agreement prior to commencing work. Same As Above in Section 2.2
- 2.4 Contract with School District. The Co-Owners will engage the services of the CxA according to terms specified in this Agreement and any supplemental terms agreed to between the CxA and the Co-owners.
- 2.5 Additional Services. The CxA may provide a fee proposal to the Co-Owners for the performance of Additional Services that may assist the School District, including without limitation, the Cx services for non-Design Manual spaces and equipment, design review in such areas as indoor environmental quality, maintainability, structural, envelope and moisture, energy efficiency, and staff evaluation and training. A proposal for Additional Services is not required to be segregated by cost for each facility, but may be to provide services to the School District for overall commissioning program needs.. All lump sum fee proposals for Additional Services are subject to Commission approval.

ARTICLE III – CONFLICTS of INTEREST, INDEMNIFICATION and LIMITATION of LIABILITY

- 3.1 Conflicts of Interest. Unless waived or otherwise modified in writing by the Commission, the CxA and any of the CxA's Subconsultants, having provided Cx services for a School District, shall abstain from participating, either directly or indirectly, in any service contract, executed by the applicable School District, for the design, repair and cyclical upkeep of any applicable building systems or components.
- 3.2 Indemnification. The CxA shall defend, indemnify and hold harmless the Commission and a School District from and against any and all claims, demands, suits, damages, costs, expenses and fees which are or may be asserted against the Commission or a School District to the extent caused by the negligent acts or negligent omissions of the CxA in performing services under this Agreement.
- 3.3 Limitation of Liability. The CxA shall not be responsible for and shall not have control or charge of the means, methods, techniques, procedures or scheduling used by a School District in the operation of a completed facility. By providing services pursuant to this Agreement, the CxA in no way assumes or abrogates the responsibilities or obligations of any contractors, or other parties providing services to perform such services for the School District in accordance with their respective contract documents, nor shall CxA be responsible for the acts or omissions of such other parties.

ARTICLE IV — MISCELLANEOUS

- 4.1 Ohio Services. Unless otherwise authorized by the Commission, the CxA services shall be performed within the State of Ohio.
- 4.2 Limitation of Authority. The CxA shall not have any authority to bind the Commission or School District for the payment of any costs or expenses without the express written approval of the Commission or the School District, as applicable.
- 4.3 Ethics. The Consultant represents that it is familiar with all applicable ethics law requirements, including without limitation Sections 102.04 and 3517.13 of the Ohio Revised Code, and certifies that it is in compliance with such requirements. Effective prospectively, December 15, 2005, by executing the this Agreement, the Consultant affirms that no party listed in Division (I) or (J) of Section 3517.13 of the Ohio Revised Code, or spouse of such party, has made, as an individual, within the two previous calendar years, or one calendar year subsequent to December 15, 2005, if this Agreement is entered into prior to January 1, 2007, one or more contributions totaling in excess of \$1000.00 to the Governor or the Governor's campaign committee.
- 4.4 Non-Discrimination. The CxA represents that the CxA is in compliance with all applicable equal employment opportunity requirements under law as required by Section 153.59 of the Ohio Revised Code and any other applicable state or federal laws.
- 4.5 Law of Ohio. This Agreement shall be governed by the law of the State of Ohio to the exclusion of any other jurisdiction.
- 4.6 Amendments. This Agreement may be amended only by an amendment prepared by the Commission and signed by both the CxA and the Commission. No provision of any Amendment

shall be applicable to a School District unless the terms and conditions of any Amendment are acknowledged by the School District.

- 4.7 Termination. This Agreement may be terminated by either party, without cause, upon fifteen (15) days written notice to the other party. In the event of termination by a School District of the CxA services, the CxA shall be entitled to compensation, upon submission of a proper invoice, for the work performed prior to receipt of notice of termination.
- 4.8 Unresolved Finding for Recovery. The CxA represents that the CxA is not subject to a finding for recovery under Section 9.24, Ohio Revised Code, or that CxA has taken the appropriate remedial steps required under Section 9.24, Ohio Revised Code, or otherwise qualifies under this section.
- 4.9 Declaration Regarding Material Assistance/Nonassistance to a Terrorist Organization. For all contracts in excess of \$100,000, the Consultant is required to certify that the Consultant does not provide material assistance to any organization that is on the United States Department of State Terrorist Exclusion List. The Declaration Regarding Material Assistance/Nonassistance to a Terrorist Organization form to be executed by the Consultant is attached to the signature page and labeled Exhibit 1.
- 4.10 Ohio's Encouraging Diversity, Growth and Equity (EDGE) Program. Upon execution of the Agreement, the CxA shall notify the Commission in writing of the name, address and federal tax I.D. number of the EDGE Business Enterprises the CxA has identified to comply with the EDGE Business Enterprise participation goal of 5 percent.
- 4.11 Quarterly Reporting. The CxA shall report amounts received for Basic Services, Special Services and Additional Services under this Agreement and amounts paid to the EDGE Business Enterprises each January 1, March 1, July 1 and October 1 during the Agreement period.
- 4.12 Offshore Services. Vendor affirms that it will abide by the terms of Executive Order 2011-12K, and no services under this contract will be performed offshore. Vendor agrees to disclose: 1) the location(s) where all services will be performed under this contract; 2) the location(s) where any state data associated with any of the services being provided, or seek to provide, will be accessed, tested, maintained, backed-up or stored; 3) the change of any location(s) for any services being provided under this Contract; and 5) the principal location of business for Vendor and all subconsultants supplying services to the state under this Contract.

ARTICLE V - TIME OF PERFORMANCE

- 5.1 This Agreement shall remain in effect until June 30, 2014
- 5.2 If the CxA is continuing to provide services to School Districts at the time of the expiration date, the parties may extend this Agreement by executing an "Intent to Extend" letter.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date and year written below.

Firm

By: _____

Print Name: _____

Date: _____

OHIO SCHOOL FACILITIES COMMISSION

By: _____

Richard M. Hickman
Executive Director

Date: _____

Appendix I

OHIO SCHOOL FACILITIES COMMISSION: COMMISSIONING GUIDELINES

INTRODUCTION

Commissioning (Cx) is a quality assurance process that works to ensure the Owners Project Requirements (OPR) and the Design Intent (DI) of a building is fully realized. It requires a systematic approach to review, verify, and document that the specified components and systems have been designed, installed, properly started up, and functionally tested to proper operation of equipment through all modes and conditions, including seasonal systems tests. The process begins at the beginning of the schematic design phase and extends through project completion, closeout, and warranty reviews. Documentation of Cx activities is provided to the building owner as a Systems Manual that outlines the events and findings of the project, including a comprehensive review of all findings, recommendations, and resolutions of identified problems. Cx is not intended to replace or eliminate any requirements or responsibilities for reviews, inspections, or other quality control measures by any other firm, organization, or party. Designers, contractors, construction managers (CM), and project managers maintain their obligations as a function of their roles and responsibilities.

In September 2007, the Ohio School Facilities Commission (OSFC) adopted Resolution 07-124 with the intention that all new and substantially renovated buildings under OSFC jurisdiction be designed to achieve USGBC's Silver certification level as defined within their LEED for Schools rating system. The language of Resolution 07-124 requires emphasis on energy performance, implicitly requiring enhanced Cx. The United States Green Building Council (USGBC) encourages best practices in building design through its Leadership in Energy and Environmental Design (LEED®) building certification and professional accreditation. As part of LEED certification, basic building Cx is required. Additional credit is available for projects that incorporated and document enhanced Cx processes.

Beginning in July, 2012 the OSFC is combining Cx services with the services previously provided under a separated prequalification agreement for maintenance plan development. The combined service will provide enhanced focus on the integration of the facility operations and staff into the design/build process. The commissioning agent CxA will work together with the owners to develop and deploy facility maintenance and operations (M&O) program that meets the financial and operational needs of the district. This process will include the Cx systems manual, OSFC maintenance plan documents and processes, district facility M&O assessment, and assisting the facility staffs exposure and to the construction process. The facility M&O engagement and deployment will begin at OPR and conclude after the eleven month (warranty) review.

As defined by the USGBC, Cx is:

EA Prerequisite 1 – Fundamental Cx – INTENT: Verify that the building’s energy-related systems are installed, calibrated, and perform according to the Owner’s Project Requirements, Basis of Design, and Construction Documents.

EA Credit 3 (EAcr3) – Enhanced Cx – INTENT: Begin the Cx process early during the design process and execute additional activities after systems performance verification is completed.

DEFINITIONS AND ROLE CLARIFICATION

Definitions:

- School District (SD or (Co-Owner)
- Ohio School Facilities Commission (OSFC or Co-Owner)
- Ohio School Design Manual (OSDM)
- Architect/Engineering Firm (A/E)
- Construction Manager (CM)
- Commissioning (Cx)
- Commissioning Agent (CxA)
- Design Team (A/E, CM)
- Project Team (A/E, CM, Contractor, Owners)
- LEED Accredited Professional (LEED-AP)

The CxA serves as the Owner’s contractual representative and will act in the Owner’s best interest by following accepted industry and professional standards and meeting the LEED Enhanced Cx requirements as defined by LEED for Schools. The CxA may not be an employee of or in contract with the A/E or CM on the project and will work independently from both; however, the CxA will collaborate with the A/E and CM throughout the design and construction process to meet deadlines and provide feedback to the Owner and the Design Team as the process moves forward. The CxA will work with the Design Team to upload appropriate information into the LEED Online web-tool as required for the submittal for LEED certification.

The CxA (*by specific project-modified Cx scope agreement*) will be responsible for the planning and scheduling of all Cx related activities and shall coordinate those duties with the entity responsible for overall project scheduling.

The School District (**Owner**) is expected to be fully engaged and active in the Cx process. The Owner will work with the A/E to define the Owner’s Project Requirements (OPR). The CxA will review and verify the OPR for completeness and clarity. The CxA will also review on a regular basis to verify the documents align with the Owners’ current expectations. Although the A/E is responsible for developing the OPR it remains the responsibility of the CxA to have a written OPR document that will be the basis for the Cx scope and process.

The Project **Architect of Record** (A/E) is the leader of the LEED process for the project. The A/E is responsible for initial development of the OPR and for the development of the Design Intent. The design intent includes the OPR, the Basis of Design (BOD), and the related documents for the project. These documents comprise the body of the Design Intent document required as part of the project’s LEED submittal and will be provided to the CxA for their review and verification.

It is the specific responsibility of the CxA to customize the Cx process outlined below to meet the OPR, the OSFC LEED for Schools requirements and the LEED Enhanced Cx requirements.

Requirements for Prequalification OF THE CxA

- After final selection by the OSFC; as a prerequisite for prequalification the CxA must present to the OSFC examples of all Cx documents to be used in providing their Cx services. The CxA will meet with the OSFC to review the delivery and application of the Cx services using those documents;
- After final selection by the OSFC; as a prerequisite for prequalification the CxA must present to the OSFC examples of all maintenance planning documents to be used in providing their Cx services. The CxA will meet with the OSFC to review the delivery and application of the MPA services using those documents;
- After final selection by the OSFC; as a prerequisite for prequalification the CxA must meet with the OSFC to be trained on the OSFC tools and expectations for delivering the Cx services.
- The CxA will report on a quarterly basis the status of all their Cx projects. This report will include project status, top issues from the issues log, Status of OPR and DI, status of facility training needs and actions, status of the maintenance plan and other reporting as specified by the OSFC;
- The CxA will deliver a Cx project summary final report to the OSFC for each project within thirty days of completing the Cx of each facility.

QUALIFICATIONS AND RESPONSIBILITIES OF THE CxA

- The CxA firm shall provide and use an electronic on-line Cx tracking and reporting service as their primary Cx tracking tool.
- Experience requirements: LEED for Schools EAcr3 requires the CxA to have documented CxA experience in at least two building projects and OSFC requires three years of recent direct Cx project experience; all project leaders and subject matter experts will have at least three years of direct Cx experience.
- The CxA shall be a LEED-AP or become a LEED-AP during the scope of his or her first Cx project with the OSFC following the adoption of these guidelines;
- The CxA building envelope thermographer shall have at least three years direct experience and have a Level 2 Certification;
- The CxA will have at least three years direct experience in Cx and at least five years directly related operational experience of the systems and equipment that they are assigned;
- The CxA firm shall have a proficient understanding of the OSDM;
- The CxA shall have a proficient understanding of the OSFC facility maintenance planning webtool and other documents;
- The CxA will have a proficient understanding of parametric energy modeling programs such as the U.S. Department of Energy's Quick Energy Simulation Tool (eQUEST);
- The CxA shall be proficient in the use of Energystar's *Portfolio Manager*;
- The CxA will review and verify the OPR and DI documents developed by the A/E. The CxA shall assist the Owner in developing the required OPR document that reflects the Owner's needs and the OSFC Program of Requirements (POR). The CxA will provide their narrative of the OPR to the A/E to use for creating the BOD technical document for the project. Together the OPR and the BOD documents will constitute the Design Intent documentation requirement for LEED;
- The CxA shall create documentation for appropriate credit submittals to the LEED Online web-tool as directed by the project's A/E;
- The CxA shall keep the Owner apprised of and involved in decision-making regarding system optimization, corrections, and issues as they arise;
- The CxA shall collaborate with the CM (or the Design Team) regarding scheduling of all Cx activities;
- The CxA shall inform the Design and Project Team and specifically CM of system corrections and/or optimizations that should be addressed in a timely fashion;

- The CxA shall have access to an appropriate inventory of tools, equipment, instruments, and software necessary to perform Cx tasks. All CxA-provided equipment and instrumentation shall be current on all applicable certifications. CxA-provided equipment and instrumentation shall remain the property of the CxA;
- The CxA is expected to have an expert level proficient understanding of the trades and related technology for Cx;
- The CxA may rely on other Design Team members to create the systems operations and maintenance (O&M) manual(s) and to verify that appropriate training for operating personal and building occupants is completed;
- The CxA shall have proficient knowledge and proven ability to implement a facility and district wide operations and maintenance plan. The CxA will work with the district staff and the OSFC in developing an plan that is actionable by the district.
- The CxA shall be proficient in the use of the OSFC Maintenance Plan webtool, OSFC Provisional Maintenance Plan and the requirements associated with the OSFC Maintenance Plan Approval Process.
- Should specialty or proprietary software, equipment, or tools be required for Cx activities; the CxA shall work with the CM and contractor or vendor to obtain training and access in the use of such tools. Tools will be noted in the Cx report for future re-Cx (RCx) projects.

COMMISSIONING OUTCOMES FOR OSFC BUILDING PROGRAM PROJECTS

The following are quality assurance outcomes for all OSFC building projects:

1. Verify the Owners Project Requirements (OPR) and The Design Intent (DI) for completeness and for consistency;
2. Develop Cx plan (set objectives, schedule reviews, verify performance, create reports and summaries of findings, review O&M schedule, develop RCx plan) based on OPR, BOD, and LEED Design Intent;
3. Participate in critical tasks of the Design Team, including compilation of phase review submittals, eco-charrettes, energy modeling, plan reviews, etc.;
4. Achieve LEED-Silver Certification; obtaining LEED for Schools EAcr3 (Enhanced Commissioning);
5. Document successful completion of all elements of the OPR and LEED Design Intent;
6. Ensure quality equipment installation, functioning system interfaces, and effective controls;
7. Optimize equipment control, design, and performance for greatest resource efficiency;
8. Verify appropriate lighting levels in all spaces as required by LEED-for-Schools and the OSDM, whichever is the highest standard;
9. Verify occupant Comfort and Safety;
10. Provide the Owner with a completed Systems Manual documenting the findings, recommendations and resolutions of the Cx process.
11. Assist the Owner with their OSFC Provisional Maintenance Plan, Work with the district and the OSFC to modify the maintenance plan to meet the needs of the district;
12. Work with the district to gain OSFC approval for the maintenance plan;

SCOPE OF COMMISSIONING WORK PERFORMED BY THE CxA

1. Mechanical and Heating, Ventilating, and Air Conditioning (HVAC) systems;
2. Building Automation and Environmental Controls Systems;
3. Electrical Systems: Normal Power Distribution (Main to Sub-Panel), Emergency Power System, and Alternative Energy Systems;
4. Classroom Acoustics as prescribed by A/E and the OSDM;
5. Chiller System and Cooling Tower Exterior Noise Review;
6. Domestic Hot Water and Rainwater Recovery Systems;
7. Lighting and Lighting Controls;

8. Building Envelope Cx (Including Design Phase);
9. Thermographic imaging of building walls, doors and windows and roof system;
10. Thermographic imaging of electrical systems and rotating mechanical equipment (i.e. pumps, motors, etc.);
11. Re-Cx Plan;
12. Review and Verification of Contractor-provided Facility Staff Training;
13. Review CM's Air Quality Management Plan for the Project;
14. Provide verification services for districts applying for Energystar certification

SCOPE OF WORK (Process Requirements)

1. Cx Plan;
2. Cx Schedule;
3. Cx Logs and Reports;
4. Organize and Lead the Cx process;
5. LEED for Schools Enhanced Cx;
6. Review, verify and comment on the OPR;
7. Review, verify and comment on the Design Intent documentation, including the BOD for the operation and performance of the facility and the building systems to be Cx;
8. Design Phase Review, Eco Charrette;
9. Review and comment the Daylighting Based Design Process and verify completion by the A/E;
10. Review and comment on the energy modeling and verify completion by the A/E.
11. OSFC Facility Maintenance Plan (OFMP);
12. Facility staff skills assessment;
13. Review, verify and comment on the district computerized maintenance management system

SCOPE OF WORK (*Renovated Space*)

Renovated facility space will be commissioned. The scope of work will depend on the nature and use of the space, the systems contained within the space, and the interdependency of any new construction and the renovated space. The CxA will include the renovated space Cx in the Cx plan.

All facilities either partially or wholly included into the OSFC master plan will be included as a whole facility into the OSFC Maintenance Plan. Systems, equipment, staff or service contracts that are partially or wholly outside the OSFC master plan and also have a significant effect on the same within the master plan shall be included into the OFMP.

SCOPE OF WORK (*Specialty Services*)

Cx of systems and other services that extend beyond the *Scope of Cx Work Performed by the CxA* as stated above may be considered specialty services. Specialty services can only be included into the scope of work if agreed to by the Co-Owners.

DATA AND DOCUMENT COLLECTION AND VERIFICATION

The CxA is expected to collect all data, documents, and information necessary to complete its task. The CxA will work with the CM and the Project Team to define the timing and schedule for document collection, review and reporting for the Cx effort. The CM is the central source for project-related documents and correspondences. The CM is to collect and

distribute the documents and other necessary information for the CxA and the Project Team. As necessary for commissioned systems, the following are included:

1. Review of latest available drawings, specifications, and documents;
2. Review records that are appropriate to understand Design Intent, as detailed in the BOD;
3. Review drawings and documents to verify that they conform to the Design Intent;
4. Construction Phase investigation, verification, and review;
5. Develop and set into the contractor's bid specifications a document of Certification of Readiness for Commissioning. This document must be completed and signed by each contractor stating that the equipment or system has been installed, tested to the designed specifications by the contractor and is now ready to be commissioned. The certification must be specific as to the equipment and/or systems being certified as ready,
6. **Change Orders:** Review and comment of applicable approved change orders. The CxA will state in the issues log "No Change Orders Reviewed" if no change orders are made or provided to the CxA. Review as these documents are related to the A/E's Design Intent. Simultaneous reviews can be performed. The CxA will define process with the CM to manage the CxA's accounting for the final approved change orders. All Change orders will be included into the Issues Log.
7. Review and comment Redline and Record Drawings to identify if the A/E has incorporated information into the Owner's record documents, The CxA will state in the issues log "No Redline or Record Drawings Reviewed" if no Redline or Record Drawings are made or provided to the CxA
8. Post-system startup and post-occupancy evaluation of trend data for system operations, performance, and energy usage. This includes lighting and lighting control systems, building automated systems control points, energy/performance measurement established by the A/E, Energy consumption (*Energystar's Portfolio Manager*). The Owner will participate with the use of Portfolio Manager and supply necessary ongoing information. The CxA will identify trending requirements of the installing contractor as part of the Cx specification. Trends and evaluations shall be based upon the requirements set by the A/E and the CxA.

MEETINGS GUIDELINE

It is expected that the CxA will meet with members of the project team as often as needed and as reasonably requested by the owner or other members of the design team. The meetings must be Cx and or OFMP relevant and include an agenda for discussion. The agenda is to be provided by the meeting organizer and in advance of the scheduled meeting. Use of technology is encouraged to reduce travel requirements. Use of technology is also encouraged in conjunction with necessary site visits and personnel meetings. The meeting expectations shall be clearly defined in the CxA's Cx plan.

1. Within two weeks from assignment to a project the CxA will deliver a Cx plan and schedule to the Owners;
2. The CxA will plan and coordinate with the CM the schedule for Cx-related and required meetings.
3. Multiple Cx scope topics as defined in these guidelines may be combined into a single meeting as quality and efficiency allow.
4. The CxA will regularly communicate with all members of the project team as required by project status, activity, and need. These meetings include, but are not limited to:
 - a. Owner POR and DI, Eco Charrette, Executive Core, Daylighting
 - b. 50% and 95% Design Drawing, Value Engineering
 - c. Sequence of Operations Design review meeting;
 - d. Cx relevant Contractor meetings, Project Cx and Project Status meetings,
 - e. Controls Contractor Pre-Submittal Meeting
 - f. Kick-off and start-up, monthly construction meeting
 - g. Warranty, Final Cx Report delivery and Systems Manual delivery meeting.

- h. OSFC provisional maintenance plan delivery, facility staff skills assessment, OFMP report delivery
 - i. One year post Cx completion level 2 performance audit;
 - j. Facilitated partnering and mediation meetings
 - k. Other meetings as determined by the commission
5. Coordinate with the project CM to blend or schedule Cx meetings with other regular project related meetings whenever possible.

COMMISSIONING SERVICES (Basic Services Performed by the CxA)

DESIGN PHASE:

1. Review and verify design for general conformance with the OPR and the BOD;
2. Review and comment on a ongoing basis the projects estimated design/operational energy efficiency using as the baseline the OSFC goal of 25Kbtu/sqft.;
3. Review and verify the designed energy efficiency is compliant with the OSDM requirements;
4. Identify if the concepts for building systems developed during pre-design and earlier design phases are included in subsequent design phases;
5. Incorporate all OSFC Quality Engineering Group provided review comments and responses into the Cx issues log;
6. Review and comment on the accessibility and serviceability of equipment and systems;
7. Ensure that no significant deficiencies exist in the contract documents related to Cx or OFMP development;
8. Review and verify the life-cycle-cost analysis of systems and equipment with a significant impact to the cost of construction or the cost of operation by the district;
9. Review and comment on issues that impact on the facility O&M, functionality, and staffing;

ALL PHASES:

Incorporate all applicable LEED for Schools requirements and required activities for Enhanced Cx into the Design Phase Cx Plan. Update this plan as the project progresses through all phase of the project.

1. Verify that Cx is incorporated into all phases;
2. Review and verify the Cx schedule and project timeline for milestones and critical path.
3. Perform reviews of design;
4. Review, verify and comment on updates to the OPR;
5. Review, verify and comment on completion of Daylighting and Energy Modeling by the A/E;
6. Coordinate Cx planning and updates to the Cx plan;
7. Develop and maintain Cx issues log;
8. Review and comment on the design documents as they are developed;
9. Review and comment on all related change orders;
10. Perform necessary reviews, observations, and verifications;
11. Develop Cx procedures customized to the exact systems and controls installed;
12. Supervise or perform verification and functional performance testing.

PRE DESIGN PHASE

The CxA (*with the assistance of the CM*) will define Cx roles and responsibilities of the Project Team members.

1. The CxA will conduct the Cx kick-off meeting. This meeting is to be a standalone meeting;
2. The CxA will review and develop narrative of the OPR;
3. The CxA will review and verify the OPR and DI for clarity and completeness
4. The CxA will develop a draft Design Phase Cx plan;
5. The CxA will verify the Cx schedule is incorporated into the project schedule;
6. Meetings will be held only as needed for these Cx purposes;

SCHEMATIC DESIGN PHASE

Perform review approximately at the 30% complete status.

1. Develop the Design Phase Cx Plan;
2. Participate in Design Charrette, provide summation and comment on process and outcome;
3. Review, verify and comment on the initial Energy Modeling provided by the A/E;
4. Review, verify and comment on the BOD for the operation and performance of the facility and the building systems;

DESIGN DEVELOPMENT PHASE

Perform review at least at the 50% complete status.

1. Review documents for general compliance with the BOD as required and in coordination with the A/E;
2. Perform focused reviews of the design, drawings, and specifications for systems and components included in the Cx scope of work;
3. Review and comment on energy modeling and verify the A/E has completed;
4. Review and comment on sequences of operation verify the A/E has completed;
5. Refine the Cx scope and preliminary Cx plan as required by changes to the design; itemize systems to be commissioned;
6. Review design documents to determine their effect on the verification, testing and balancing, electrical testing, maintenance and Cx and overall performance of the equipment and systems. Make recommendations;
7. Assist the A/E in the compilation and completion of a preliminary **Design Systems Manual** (to include the BOD) that will provide the operations staff useful operational detail;
8. Update the preliminary Design Phase Cx plan;

CONSTRUCTION DOCUMENT PHASE

Perform review at least at the 95% complete status and back-check at 100% status.

1. Develop a draft construction phase Cx plan for each system to be commissioned;
2. Assist in the development of specific testing specifications;
3. Develop equipment start-up checklist. The Cx checklist must not void any manufacturer's warranty;
4. Develop verification test procedures;
5. Develop scope of the functional performance test and the functional interface specifications for the appropriate systems;
6. Develop full Cx specifications for all commissioned equipment and integrate into the specifications with the A/E and CM. The Cx specification will include, as applicable, a detailed description of the responsibilities of all parties, details of the Cx process; reporting and documentation requirements, including formats; alerts to coordination issues, deficiency resolution; construction checklist and startup requirements; the functional testing process; and specific functional test requirements, including testing conditions and acceptance criteria for each piece of equipment being commissioned;

7. Review design documents to verify that the A/E has adequately addressed integration issues between equipment, systems, and disciplines to ensure that responsibilities are clearly described in the specifications;
8. Review and comment on controls and verify the sequences of operation. Verify that they meet the OPR and DI;

BID PHASE AND PRE CONSTRUCTION:

The CM will provide document control and distribution for the project. The CxA will define and coordinate document handling and reporting requirements with the CM.

1. Ensure that Cx is adequately reflected in contract documents;
2. Verify that the controls contractor pre-submittal meeting is in the bid specifications and scheduled;
3. Attend (*in person or electronically*) pre-bid meeting to answer Cx-related questions;
4. The CM will provide the necessary documents to the CxA. They will distribute the documents and information provided by the CxA to the Project Team.

CONSTRUCTION PHASE:

The CM will provide document control and distribution for the project. The CxA will coordinate document handling and reporting requirements with the CM.

1. Verify the A/E and CM's Indoor Air Quality Management (IAQ) Plan for the construction project;
2. Conduct periodic site visits and inspections (*as identified by the Cx plan and at appropriate intervals as determined by the CxA and in coordination with the CM*) throughout the construction phase to verify that systems and equipment are installed in a manner that will allow the Cx process to proceed smoothly and in compliance with the plans and specifications, in accordance with the Cx plan and construction milestones, and will be documented via a submitted written report noting all pertinent observations and deficiencies;
3. The Cx process shall not void or violate any manufacturer's or contractor warranties or guarantees;
4. Coordinate the Cx planning and work with the contractors and CM to ensure that Cx activities are being incorporated into the project schedule. Confirm that the CM and the contractor have included updated Cx milestones in the critical path;
5. Schedule and conduct trade or division specific contractor Cx kick-off meeting with each contractor group;
6. Notify the CM as to when CxA personnel are on-site;
7. Coordinate all Cx planning meetings and activities in accordance with the preliminary and/ or modified Cx plan and issue meeting agendas for all Cx meetings (the CM will record and distribute meeting minutes);
8. Coordinate and direct the Cx activities in a logical, sequential, and efficient manner using consistent protocols and forms, centralized documentation, and clear and regular communications; update the construction phase Cx plan as necessary;
9. Request and review additional information required to perform Cx tasks, including O&M materials, contractor start-up, and checkout procedures;
10. Perform submittal review concurrent with the A/E's review and provide recommendations to the A/E for acceptance or rejection for temperature controls, air handling units, boilers, chillers, switchgear, and emergency generator. All other submittals for the systems being Cx shall be reviewed by the CxA for information after the submittal is approved by the A/E.
11. Review requests for information for impact on Cx and Owner's objectives;
12. Verify the A/E and CM review of coordination drawings to ensure that all trade contractors are making a reasonable effort to coordinate work;
13. **Envelope:** The CxA will conduct field reviews of the building envelope and periodic progress inspection/verification as planned and scheduled by the CxA. Meetings can be combined as appropriate with other meetings or events. This will include but not be limited to:
 - a. Design review

- b. Pre Bid Meeting
 - c. On site Masonry and Roofing Pre-Construction Cx Meeting
 - d. Mock-up
 - e. Periodic review progress of work and conformance to the construction documents
 - f. Final Inspection
 - g. Eleven Month Inspection
14. **Envelope:** The CxA will review and document the inspection and related documentation performed by the A/E and CM as a part of the CxA's periodic inspections and document reviews;
 15. **Envelope:** Field review of mock-ups to verify that they meet the design intent. Verify that the mock up is located and remains in a visible and prominent location; Verify that the mock-up is representative of the building design and that the features are present and consistent with the actual building.
 16. **Envelope:** Verify Enclosures (envelope) system and assemblies are be evaluated on the basis of air and water tightness, Review and comment on any *Air Barrier Testing* performed as a aprt of the project requirements. Air barrier testing is not to be performed by the CxA;
 17. **Envelope:** Verify that all building enclosure assemblies and systems (*window, doors, louvers*) are inspected;
 18. **Envelope:** The CxA final inspection shall occur after the contractors, manufactures, and A/E final inspections;
 19. **Envelope:** Perform thermal graphic imaging of the building envelope including the roof, roof to wall assembly, doors and **windows**. The thermographer must hold at least a Level II Themographers certification and have at least three years relevant practical experience.
 20. **Envelope:** Laboratory testing is not a part of the basic services. Testing will be included as a specialty service as conditions warrant. Gravimetric testing will be the method used for the retrieval and testing of core samples per ASTM guidelines;
 21. **Envelope:** Test to occur following Occupancy and before the eleven month warrantee period as conditions permit;
 22. **Envelope:** Witness and verify building pressurization testing as specified by the A/E and contract requirements;
 23. **Change Orders:** Review applicable approved change orders. Review as related to the Owner's POR and the Design Intent. (*see titled sections Data and Document Collection and Verification Item #5*);
 24. Write and distribute checklists for commissioned equipment. Use of contractor-supplied construction checklist is permissible if reviewed and accepted by the CxA in the Cx plan;
 25. Develop an enhanced start-up and initial systems checkout plan with contractors for selected equipment if the manufacture's or A/E's requirements are considered insufficient. Manufacturer's warranties must not be violated;
 26. Perform site visits, as necessary, to observe component and system installations. Attend Cx-relevant planning and job-site meetings to obtain information on construction progress. Include into the Cx Plan. The CM will provide all related construction-meeting minutes for review and comment relating to the Cx process. Assist in resolving any discrepancies (*see titled section Meeting Guidelines*);
 27. Witness/verify HVAC piping pressure test and flushing, sufficient to be confident that proper procedures were followed; Verify those present (i.e. Controls Contractor, Mechanical Contractor, A/E, CM, Facility Director, etc);
 28. Verify any ductwork cleaning and testing in a sufficient manner to be confident that proper procedures as specified by the A/E and the CM's IAQ plan were followed;
 29. Document construction checklist completion by reviewing completed construction checklists and CxA selected site observations;
 30. Document systems startup by reviewing start-up reports and by selected on-site observations;

31. Write the functional performance test procedures customized to the exact equipment and systems approved by the A/E during the submittal process. Include any necessary assistance with installing contractors, no related warranties are to be violated;
32. Coordinate witness and document manual functional performance tests performed by installing contractors. Coordinate retesting as necessary. Coordinate retesting with the CM until satisfactory performance is achieved (*see below titled section Functional Test and Sampling Item #13*);
33. Analyze functional performance trend logs and monitoring data to verify equipment and systems performance (*see this section Items 42 and 43i*);
34. **Seasonal Testing:** The CxA is to utilize and direct the district facility staff to help perform seasonal testing and post occupancy testing, trending and reporting;
35. **Seasonal Testing:** Tests on respective HVAC equipment shall be executed, during both the heating and cooling seasons. However, some overriding of control values to simulate conditions shall be allowed but will not replace testing under actual conditions;
36. **TAB:** Verify air and water systems balancing by reviewing completed reports, by spot testing, and by selected on-site observations;
37. **TAB:** Check portions of the TAB service for air and water HVAC systems and verify with the CxA's own in-house or subcontracted equipment and technicians;
38. **TAB:** Verify, test, and inspect the Test and Balance (TAB) fieldwork phase of the project. CM to verify the proper distribution of all TAB-generated Deficiency Reports. Randomly verify the validity of returned deficiency reports to verify that the corrections have been made;
39. **TAB:** Assist in the TAB follow-up on uncorrected deficiency items and items inaccurately reported as having been corrected;
40. **TAB:** Review, verify, and comment on the final TAB report with the A/E signature;
41. **Electrical:** Perform thermographic imaging of the electrical system panels, switch gear, and critical equipment and connections;
42. Maintain a master issues log and separate record of functional testing. Report all issues as they occur directly to the CM with duplicate copies to the Owner. Report all issues to the Owner at regularly scheduled meetings or as necessary or otherwise directed. Provide written progress reports and test results observations and recommended actions to the CM;
43. Review all commissioned equipment warranties;
44. Review and verify the O&M manuals for commissioned equipment;
45. Review and verify the planning, content and completeness of the contractor-provided training of the School District's operations personnel as related to the facility new equipment and systems; CxA is not required to attend all training classes;
46. Include all Cx related trending into the Cx plan. Establish data trend logging and reporting for monitoring the performance of the systems and facility from systems installation through a one-year period and/or a full year cycle of seasonal change. This includes, but is not limited to, building controls system control points and energy/ performance measurement points and standards as established by the A/E, loop tuning of primary/critical equipment and systems, energy consumption (*Energystar's Portfolio Manager*); CxA to review, verify and report as a minimum at the sixth and eleven month post-construction periods (*see this section Items 29 and 43i*);
47. Compile a Systems Manual that consists of the following:
 - a. OPR (by Owner, A/E, CxA);
 - b. Design narrative and BOD (by A/E);
 - c. CxA narrative of the above Items a. and b.;

- d. Performance Metrics, if completed during design; space and use descriptions, single line drawings and schematics for major systems (*provided by A/E*), control drawings, sequences of control (*provided by contractor*), and a table of all set-points and implications when changing them, schedules, instructions for operation of each piece of equipment for emergencies, seasonal adjustment, startup and shutdown (*provided by A/E and Contractor*);
- e. Document instructions for energy savings operations and descriptions of the energy savings strategies in the facility as related to the designed intent as provided by the A/E;
- f. A complete set of reproducible drawings indicating as-built conditions of all systems including but not limited to automatic temperature controls schematics, piping, ductwork, electrical systems, lighting and lighting controls systems and equipment incorporating all changes made during construction; provided by the A/E, Contractor, and CM and reviewed by the CxA. Documents and drawings must be reviewed and approved by the A/E;
- g. A Re-commissioning (RCx) Plan and recommendations for RCx;
- h. Energy tracking recommendations, also to include Energy Star's *Portfolio Manager*;
- i. As related to Item # 42 and 43i listed above: Recommend standard energy and systems performance trend logs with a brief description of what to look for in them (all by CxA).

WARRANTY PERIOD

1. Provide required opposite season or deferred testing and deficiency corrections if required and provide the final testing documentations for the Cx Record and O&M manuals;
2. Verify controls sequence and operation remain functioning consistent with design and operational intent and that drift has not occurred;
3. Return to site for the OSFC eleven-month walk-through and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Cx. Interview facility staff and identify problems or concerns they have with operating the building as originally intended. Review trend data and other relevant documentation and reports. Make suggestions for improvements and for recording these changes in the O&M manuals;
4. Review the approved facility maintenance plan for inclusion established ongoing trending procedures and of RCx;
5. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports and documents and requests for services to remedy outstanding problems.
6. **Envelope:** Perform thermal graphic imaging of the building envelope including the roof, roof to wall assembly, doors and windows. The thermographer must hold at least a Level II Thermographers certification and have at least three years relevant practical experience.
7. **Seasonal Testing:** The CxA is to utilize and direct the district facility staff to help perform seasonal testing and post occupancy testing, trending and reporting;
8. **Seasonal Testing:** Tests on respective HVAC equipment shall be executed, during both the heating and cooling seasons. However, some overriding of control values to simulate conditions shall be allowed but will not replace testing under actual conditions;

REPORTING GUIDELINES

The CxA is expected to report all progress and events in an efficient and timely manner. Reporting frequency may vary according to the project status and Cx work performed. The reporting must be *(but is not limited to)* to the CM. The CM is responsible for the proper and timely distribution of documents, reports, and other correspondences to the Project Team, including:

1. Owner's Design Intent;
2. A/E Project Basis of Design;
3. Design Phase's Cx Reports;
4. CxA narratives of the OPR;
5. Construction Phase Cx Reports at appropriate intervals per Cx plan and 100% completion;
6. Energy Model Review;
7. Monthly Cx Status Report starting at the functional testing phase;
8. Periodic Issues Database Report;
9. Functional Testing Phase Reports by System;
10. Seasonal Testing and Eleven Month Period Report;
11. Compiled Owner Systems Manual;
12. Final Cx Report including Narratives (Closeout).

COMPILE A COMMISSIONING RECORD, WHICH SHALL INCLUDE:

1. A brief summary report that includes a list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the CxA regarding the adequacy of the equipment and systems, documentation, and training meeting the contract documents in the following areas:
 - a. Owners Project Requirements;
 - b. A/E's Design Intent, Basis of Design;
 - c. Equipment meeting the equipment specifications;
 - d. Equipment installation;
 - e. Functional performance and efficiency;
 - f. Equipment documentation;
 - g. Operator training.
2. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, Cx process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented.
3. Issues log, Cx plan, progress reports, submittal and O&M manual reviews, training record, test schedules, construction checklists, start up reports, functional tests and trend log analysis.

OSFC REPORT

Provide to OSFC a brief commentary on issues related to the OSFC construction process and OSDM in an issue/recommendation/resolution format. This report is delivered separately from the Project Cx log/report. This report is to be delivered at least at the end of the Cx process and near the delivery of the Cx final report.

FUNCTIONAL TEST AND SAMPLING

The CxA will identify the testing process and what is to be tested (i.e., critical, primary, noncritical).

1. CxA will complete functional tests of system components as previously described;
2. All critical and primary systems shall be tested.
3. Functional testing of all equipment and systems to be Cx will include but not be limited to verifying proper operation of systems, checking for calibration of all sensors and controls, commanding damper and valve actuators fully opened and closed, observing responses, verify that all systems and devices go to their fail safe position upon shutdown, verify that standby equipment properly operate upon loss of primary devices or power, and verify that the various control loops have been tuned and operate according to the sequence of operation and the Engineers designed intent;
4. The functional testing of automatic control systems will also include but not be limited to a checkout of required graphics programming, review of the programming for compliance with the sequence of operation, and analysis of trend data for proper systems response and loop stability;
5. **Lighting and Acoustics:** Classroom and office lighting and noise level testing to be accordance with the OSDM and A/E specifications;
6. **Lighting and Acoustics:** The Owner is to be trained to conduct basic classroom lighting and noise level testing. The Owner will independently survey all classrooms. The CxA will review the Owner-generated report. This Owner survey does not replace or eliminate any contractor or A/E requirement or obligation;
7. **Lighting:** Light levels to be tested under daytime and nighttime conditions in the twenty percent (20%) estimated worst case classroom and offices to ensure visual comfort and light levels;
8. Multiple identical pieces of equipment of non-life safety or non-critical equipment may be functionally tested using a sampling strategy;
9. **Acoustics:** Performance tests shall include testing for maximum background noise as defined by the OSDM. Tests are to be taken in twenty percent (20%) of estimated worst-case instructional spaces;
10. **TAB:** Randomly test at least ten percent (10%) of estimated worst-case final TAB report data for each group of identical equipment;
11. **TAB:** The sample set must not be smaller than three;
12. **TAB:** If ten percent (10%) of the sample group fails a second group of ten percent (10%) is selected and tested. If the second test fails then the whole group fails. The TAB agency shall be liable for retesting a part or all of the specific HVAC systems before undergoing further performance verification;
13. **Controls:** Verify contractor control input/output (I/O) point-to-point (PTP) termination. Use random statistical sampling; by testing at least ten percent of the estimated worst-case or most critical points;
14. **Controls:** All controls will be randomly tested for correct I/O PTP terminations. All invalid PTP terminations shall be corrected. Any specific control system having more than five-percent (5%) invalid PTP terminations shall be completely rechecked by the controls contractor;
15. **General:** If at any point, frequent failures are occurring or necessary work remains incomplete or unattended and testing is becoming more troublesome and more than verification, the CxA will stop and immediately inform the CM. The responsible subcontractor will be required to perform and document a checkout of all the remaining units, prior to continuing with the functional testing. The CM must be informed of the Cx progress and will coordinate any initial work and remediation. Excessive retesting and verification may be considered additional service of the CxA.

ADDITIONAL ASSIGNMENTS

Any additional assignments not specifically set forth in the agreement shall be compensated on an hourly rate basis approved by the OSFC.

APPENDIX A

Reference list of Cx process, systems and equipment related documents to be provided to the CxA by the CM:

1. Owner's Project Requirements
2. Design Intent and Basis of Design
3. Energy Modeling
4. Design Review:
 - i. Schematic Design
 - ii. Design Drawing
 - iii. Construction Drawing
5. Submittal Review
6. Project Schedule
7. CM's Construction Project Air Quality Management Plan
8. Request for Information
9. Change Orders
10. Red Line Drawings
11. Operations & Maintenance Manuals
12. Other as defined by the CM and CxA

Payment for Cx Services:

Basic Scope:

The square footage (Sqft) number to be used in the calculation is first based upon the total project (*all facilities included in the master plan*). If there is a significant time laps between construction of individual facilities (*within the master plan*), the Cx cost calculation will be based upon that facility. The CM will provide the facility and project square foot data.

New Construction Cost Calculation (Base Fee):

- ◆ Maximum Cost per Square Foot: \$0.75/Sqft
- ◆ Minimum Cost per Square Foot: \$0.55/Sqft

End of Document
