
State of New Mexico Public School Facilities Authority

HVAC & Controls Performance Assurance Program



For Facility Design, Construction and Renovation

Revised November 1, 2013

Prepared by:



E/S3 Consultants, Inc.
PO Box 4595
Englewood, CO 80155-4595
TEL: 303-478-3729 FAX: 303-850-7281



TABLE OF CONTENTS

PROGRAM MANUAL	Page
1.0 Program Description	1
2.0 Definitions	11
3.0 Related Documents	14
4.0 Program Statement Phase	15
5.0 Schematic Phase	17
6.0 Design Development Phase	19
7.0 Construction Documents Phase	22
8.0 Construction Phase	28
9.0 11-Month Correction Period Phase	35
 APPENDIX MATERIAL	
Appendix A – Performance Assurance Contractor (PAC) Project Pricing Matrix	
Appendix B – PSFA Regional Manager Checklist	



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

1.0 PROGRAM DESCRIPTION

1.1 Overview

The New Mexico Public School Facilities Authority (PSFA) HVAC and Controls Performance Assurance Program was first launched in 2007 and has been successfully used in numerous school construction and renovation projects. The Program is designed to be integrated into all phases of a school construction or renovation project. It is to be used in conjunction with the New Mexico Public School Facilities Authority Request for Authorization of School Construction (RASC) process through the Program Statement, Schematic Design, Design Development, and Construction Documents phases. The HVAC and Controls Performance Assurance Program then continues through the Construction Phase and the 11-Month Correction Period.

The HVAC and Controls Performance Assurance Program shall be included in all school construction or renovation projects per PSFA policy unless an exception is specifically requested with justification by the responsible PSFA Regional Manager and approved by PSFA management. The program requirements are expected to be included in bid and construction documents to provide a defined process for assurance and documented verification that the HVAC and control systems for a school facility meet PSFA standards for acceptability, are installed and operating properly, and fulfill the functional and performance requirements of the design intent.

The Program utilizes the services of an independent third-party **HVAC and Controls Performance Assurance Contractor (PAC)** that holds a Price Agreement with the PSFA. The Program requires the professional services of an independent company or individual, who along with his subcontractors, is not contractually associated with business entities that sell, install or repair HVAC and control systems, which is experienced in the field of evaluation of HVAC and control systems design, installation, testing and balancing and is capable of maintaining an unbiased third-party position. The PAC is employed by the Owner to provide the Performance Assurance functions described for the program including the testing, adjusting, and balancing required for individual projects.

It also provides for collaboration on the part of the PSFA/District project team, the Design Team, and the independent PAC in the Design Stage to increase communication between all parties. Further, it defines roles and provides accountability for performance and is intended to ensure cooperation of all parties towards the solution of issues.

The services and costs of the PAC are divided into distinct Design and Construction Stages. The program also provides for involvement of the PAC as required during the 11-Month Correction Period. Engagement of the PAC will generally begin in the Design Development Phase. It is the intent of the PSFA HVAC and Controls Performance Assurance Program to use the same PAC for all stages of an individual project.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

Because the nature of this Program is dynamic, it may be revised periodically based upon ongoing evaluations and lessons learned. The most recent revision should be used for the design of school building construction and renovation projects.

1.2 PSFA Objectives for the Program

The design, installation, and proper operation of HVAC and control systems in public school facilities is critical to providing a comfortable learning environment for students and teachers. These systems also represent a major investment during building construction or renovation and incur continuing life cycle costs for maintenance, repair, and energy use over the service life of the building. It is therefore highly important that HVAC and control systems meet PSFA standards for functionality, maintenance/life cycle costs, community/district suitability, and energy costs.

To accomplish this, one of the PSFA's major objectives for the Program is to increase communication between all parties throughout the phases of a typical project. Further, it must be seamlessly integrated with the PSFA design and construction process to avoid additional steps and decisions that may introduce unacceptable delays.

The HVAC and Controls Performance Assurance Program shall be used to supplement the PSFA adequacy planning guide and other construction requirements and is available on the PSFA web site (www.nmpsfa.org) so the program can be incorporated into PSFA projects.

The Program is designed to provide clear direction and accountability for all participants in the design, construction, and maintenance for PSFA projects by:

- Defining roles and scopes of services.
- Formalizing process steps, equipment/systems checklists, performance verification reports, and other documentation.
- Including checklists and program requirements in bid and construction documents.
- Ensuring the approach of all parties is to be part of a solution to issues.

The HVAC and Controls Performance Assurance Program is intended for use by Public School Facilities Authority Regional Managers, project design teams, and individual School Districts and is therefore meant to be clear, concise, and user-friendly. It is expandable to incorporate other building systems in the future, scalable to various-sized projects, and has the potential for incorporation in future efforts by the PSFA with regard to high performance school building programs.



1.3 Assurance Program vs. Commissioning

1.3.1 Performance Assurance Activities

While the HVAC and Controls Performance Assurance Program contains several elements normally found in the building systems commissioning process, the full services of a commissioning agent are not anticipated by the PSFA nor should they be proposed by the PAC for the performance assurance activities in the Program. The performance assurance services provided under this Program are specifically those described within this Program Manual for the following:

- Heating, Ventilating and Air Conditioning (HVAC) equipment and systems and auxiliary components.
- Control Systems including Direct Digital Controls (DDC) and Building Management Systems (BMS), connectivity, and communication of alarms and events from ancillary building subsystems to those systems when required for the Project.

To avoid confusion, HVAC and Controls Performance Assurance Program activities shall not be referred to as “commissioning”. The term “commissioning” relates to additional activities on projects beyond the scope of this Program that are discussed in section 1.3.2 below and shall not be acceptable in the HVAC and Controls Performance Assurance context.

Table 1-1 below illustrates the systems and major activities included with the program and performed by the PAC.

Performance Assurance Systems	Design Stage Performance Assurance Activities							Construction Stage Performance Assurance Activities										
	(X) Included in PAC Scope of Work	Review & comments on Design pertaining to PAC prior to 60% Submittal (DD)	Create/Maintain Design Issues Log	Develop PAC Plan & Provide to Design Professional including Construction (Pre-Functional) Checklists	Review 95% Design (CD)	Review 100% Documents Prior to Bidding	Review Contractor Bids as Related to PAC Activities if requested by PSFA	Conduct PAC Coordination Meeting	Review "Filtered" RFIs & MCRs (Related to PAC Activities)	Perform Periodic Site Visits	Create/Maintain PAC Installation Issues Log	Maintain Design Issues Log	Distribute Construction (Pre-Functional) Checklists	Write detailed Functional Test Procedures	Perform Test & Balance	Manage & Document Functional Testing	Provide 11-month Correction Period Support	Develop and Submit Final PAC Report
HVAC and Controls	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 1-1 PAC Scope of Work



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

1.3.2 Additional Services Not Included in Program

Although many of the activities of the PAC under the HVAC and Controls Performance Assurance Program are similar to commissioning, the PAC's scope does not include activities, systems or components other than those described in this Program Manual.

The PAC may be contracted separately by a District to provide additional services when required by the District and these additional services will be paid for entirely by the District.

1.4 Process Summary

The HVAC and Controls Performance Assurance Program encompasses two distinct stages of a project: Design and Construction. Details of the processes, responsibilities and deliverables for each of these stages are contained in the appropriate sections within this Program Manual. The following provides a brief description of key elements.

The PACs are selected from a competitive Request for Proposals that is managed by the PSFA. This process results in execution of a PSFA Price Agreement(s) with one or more firms to provide PAC services on PSFA projects. These firms may be assigned to provide services in separate geographical areas in the state.

1.4.1 Design Stage

During the **Schematic Design Phase** it is expected that the PSFA RM will obtain a price proposal for Design Stage services from a PAC that holds a Price Agreement with the PSFA using the guidelines included in Appendix A of this Program Manual. The PSFA RM then arranges a Purchase Order with the PAC early in the **Design Development Phase** so that the PAC is engaged in time to provide review of system options and comment on the complexity and maintainability of proposed systems.

The PAC participates in reviews of designs and narratives prior to the Design Development Phase submittal, providing comments relative to HVAC and controls systems proposed based upon experience and specialized knowledge.

In the **Construction Documents Phase** the PAC participates in reviews of designs and specifications and provides comments related to serviceability, maintainability, clearances for operation and service, and the testing and verification process. Based upon these reviews the PAC creates and maintains a log of issues in the design that may have an impact on performance assurance activities during the Construction Phase. This **Design Issues Log** shall also indicate when identified issues are resolved and the action taken for resolution.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

The PAC also develops the initial test and verification plan and Project-specific Construction Checklists and assists the design team with incorporating the HVAC and Controls Performance Assurance Program requirements into the Contract Documents.

During this phase the PSFA RM requests and the PAC provides a Construction Stage price proposal using the guidelines included in Appendix A of this Program Manual.

1.4.2 Construction Stage

Performance Assurance activities during the **Construction Phase** provide verification that these systems operate as designed to assure that requirements of the contract are met and document system installation, start-up and testing, including Test and Balance (TAB) of air and water systems. The PSFA RM must ensure the execution of a Purchase Order with the PAC for Construction Stage services at the beginning of this Phase. A follow-on Purchase Order or amendment to the Design Stage services Purchase Order with the current PAC will generally be used for Construction Stage services.

The PAC will develop and maintain an Installation Issues Log capturing deficiencies noted during site visits that may have an impact on performance assurance activities, including a record of when deficiencies are resolved and the action taken for resolution. The PAC will also continue to maintain the Design Issues Log for items related to the design that may affect performance assurance for the HVAC and controls systems.

During the **11-Month Correction Period Phase** seasonal or follow up testing and verification is completed; systems are adjusted and optimized to meet specifications; and any remaining open Punch List including items from the PAC's Design and Installation Issues Logs, and any remaining performance problems, are resolved. The PSFA RM will request services from the PAC to assist with warranty issues that may arise, or provide other project-related services, as described in the PAC's Purchase Order.

1.5 Role of the PSFA Regional Manager

The role of the PSFA RM is critical to the successful implementation of the HVAC and Controls Performance Assurance Program on a school construction or renovation project. The PSFA RM helps to ensure completion of all related activities within the timeframes established in the Contract Documents. Due to the difficulties associated with attempting centralized management of the performance assurance process over many diversified projects statewide, the responsibility for driving the process and ensuring its successful completion rests with the PSFA RM for each project.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

Application of the Program's requirements needs to be consistent across the entire PSFA RM staff state-wide, therefore each PSFA RM shall become familiar with and execute the responsibilities described in this Program Manual. To assist with this, a checklist that identifies activities, deliverables and milestones for each phase of the Project is included in Appendix B. This checklist shall be used by the PSFA RM to verify completion of required elements before approval is granted for the next phase and prior to approval of payments.

The PSFA RM is responsible for timely engagement of the PAC in order for the Program's review and comment functions to be fully utilized. To facilitate review, the PSFA RM must ensure that designs, specifications and other materials are delivered to the PAC by the Design Team with adequate time for the PAC to provide a meaningful review.

The PSFA RM coordinates the distribution of the PAC's Design Issues Log, Installation Issues Log and any RFIs created by the PAC. The PSFA RM also shall identify and forward particular issues to the appropriate Design Team member(s) for resolution. Timely resolution of issues and deficiencies is crucial to maintaining the Project Schedule and the PSFA RM shall be responsible for follow up with the Design Team to ensure these are properly addressed.

To avoid potential for delays in Substantial Completion the PSFA RM must ensure that the PAC's milestones, critical paths and time requirements to complete Test and Balance and performance verification testing are included in the Project Schedule. The PSFA RM shall also monitor updates to the Project Schedule to ensure PAC and TAB activities are included and properly coordinated.

Finally, the PSFA RM should work with PSFA Maintenance to determine how best to utilize their input when appropriate for a Project.

1.6 Role of the Design Team

The HVAC and Controls Performance Assurance Program includes a number of tasks and deliverables for each phase of a school construction or renovation project that are the responsibility of the Design (Architect/Engineer) Team. The Scope of Work for each phase described in this Program Manual is required as part of the Basic Services to be provided by the Design Team and is included in the Owner's contract with the Design Professional.

A key element in avoiding delays in performance of the performance assurance requirements and completion of the project is prompt attention to, and resolution of deficiencies that impact performance assurance activities as identified by the PAC and recorded in the PACs' Design Issues Log and Installation Issues Log. It is the responsibility of the Design Professional to perform a weekly review of these Issues Logs and ensure deficiencies are corrected by the contractor and issues related to the design are



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

resolved. Resolution of issues and RFIs is a prerequisite for certifying Substantial Completion.

The PSFA's use of a PAC on any project does not relieve the Design Professional of responsibility for the design, engineering coordination and management of the construction project including site visits and observation reports associated with the Design Professional Contract.

1.7 Role of the Performance Assurance Contractor

The PAC is an independent firm that holds a Price Agreement with the PSFA. As part of the overall team for design and construction of school construction or renovation projects, the PAC is responsible for providing the specific performance assurance activities described in this Program Manual.

The PAC will create and maintain a **Design Issues Log** for items noted that may have an impact on the PAC's performance assurance activities with regard to HVAC and control systems. The PAC is not responsible for review, comment or recommendations on designs outside of those that impact PAC activities. It is the responsibility of the Design Professional to ensure issues related to the design are resolved.

During the Construction Stage the PAC will perform periodic site visits related to Performance Assurance on the equipment and systems and create and maintain an **Installation Issues Log** in order to address impacts construction deficiencies may have on the PAC's performance assurance activities. The PAC is not responsible for identifying or maintaining a log of deficiencies beyond those related to performance assurance. It is the responsibility of the Design Professional and the contractor to ensure construction deficiencies related to performance assurance are resolved.

On completion of all of the required performance assurance activities the PAC shall prepare and submit a Final PAC Report for the Project. This report shall be concise and relate only to the performance assurance requirements of the project. In order for reports to be consistent between the PAC's and across varied projects statewide to provide ready reference for review, the organization and content of the PAC Final Report shall be as follows:

- 1. Cover Page:** Date of report, Name and Address of Project.
- 2. Table of Contents.**
- 3. Executive Summary:** A summary of information at the project level including project background, contract dates, dates for construction, acceptance date, summary of performance assurance activities, recap of unresolved issues, project highlights and milestones, and changes in the project's scope that had an impact on performance assurance. A clear description of any issues that require follow up on the part of the Design Professional must also be included in this section.



Public School Facilities Authority HVAC and Controls Performance Assurance Program

4. **Performance Assurance Plan:** A brief description of the performance assurance plan implemented for the Project.
5. **Design Review:** Copies of comments previously provided for the review of the Design Development, 95% and 100% submittal reviews.
6. **Design Issues Log:** A final copy of the PAC's Design Issues Log shall be included in this section.
7. **Field Observation Reports:** Copies of PAC Field Observation Reports from site visits related to performance assurance activities.
8. **Construction Checklists:** Copies of the completed Construction (Pre-functional) Checklists submitted by the Contractor.
9. **Installation Issues Log:** A copy of the final version of this log including all issues identified, date resolved, and actions taken for resolution. Unresolved Installation Issues Log items shall be highlighted with details provided.
10. **Functional Performance Test Results:** Copies of test procedures actually performed and the results of those tests. Functional Performance Tests shall document the expected and actual results of the test and what was done to correct failures and discrepancies.
11. **Controls Sequences of Operation:** The final verified sequences of operations for HVAC equipment controls and programming of Building Management Systems. This shall also include verification of connectivity and communication of alarms and events from ancillary building subsystems when required for the Project.
12. **Final Test and Balance Report:** Include any updates from seasonal or follow up testing.
13. **Test and Balance Floor Plans:** Electronic copies in pdf format.

The Final PAC Report shall be submitted to the PSFA RM in a three-ring loose leaf binder with tabs for each of the sections above. In addition an electronic (pdf) copy shall be provided on disk and the Report shall be uploaded to the PSFA's CIMS.

The Final PAC Report shall contain information on only those HVAC and Controls Performance Assurance Program activities performed and reference to these activities as "commissioning" shall not be acceptable. In cases where the PAC was issued a Purchase Order by the District for additional services such as a commissioning effort, the resultant "commissioning report" may be included in the same binder as the Final PAC Report; however it shall be clearly segregated with regard those additional activities on projects beyond the scope of this Program.

The PAC shall meet with the PSFA RM to review final PAC Report in person to the maximum extent possible to ensure report is understood and any questions or need for clarifications are resolved.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

1.8 Role of the Project Contractor

There are several responsibilities of the contractor for the HVAC and Controls Performance Assurance Program that are described in this Program Manual and required as part of the contract documents. The following paragraphs summarize some of the responsibilities that are of critical importance for completing all of the requirements of the contract.

Completion of TAB is a prerequisite for certifying Substantial Completion of the project and Construction Phase payment to the contractor for that milestone. To avoid potential for delays in Substantial Completion and payment and the possibility of assessment of liquidated damages the contractor must consult with the PAC to determine milestones, critical paths and time requirements to complete Test and Balance and performance verification testing prior to Owner's occupancy. These PAC and TAB activities shall then be inserted in the Project Schedule.

It is also the contractor's responsibility to ensure that appropriate Construction Checklists are accurately completed, and that the equipment is actually ready for TAB, prior to submitting the Construction Checklists. The contractor shall coordinate test, balance and other performance assurance activities with PAC to ensure completion according to contract documents and schedule and direct subcontractors to execute their test and verification responsibilities.

1.9 Communications Protocols

The PSFA's HVAC and Controls Performance Assurance Program is intended to increase and improve communication between all parties in a school construction or renovation project. In the Design Stage the PAC will begin to communicate with the Design Team with regard to the design and will identify issues from the performance assurance perspective. This communication continues through the Construction Stage and 11-Month Correction Period where with the contractor and subcontractors such as the Mechanical and Controls Contractors are added.

The PSFA RM is required to coordinate communication and ensure appropriate parties are engaged or included. For the HVAC and Controls Performance Assurance Program this is especially important with regard to the Design Issues Log, Requests for Information, the Project Schedule and any impacts on it, the Installation Issues Log, and the completion of performance assurance activities. All of these shall be routed through the PSFA RM so the responsible party can be identified and the issue(s) can be forwarded for that party to address or correct issues.

The PSFA's CIMS is an important tool for ensuring communication throughout the design and construction process. Issues logs along with updates, the Project Schedule with changes, Requests for Information and responses, Change Order Requests and approvals, and all relevant correspondence shall be uploaded to the CIMS on a regular



Public School Facilities Authority **HVAC and Controls Performance Assurance Program**

and continuing basis. The notification feature in the CIMS shall be used to alert appropriate parties that the information has been uploaded. All parties are expected to review and take appropriate action in areas for which they are responsible.

The PAC firm shall utilize the PSFA-CIMS for project management during development of the Contract Documents and for project administration during construction of a Project. For PSFA-CIMS information or installation and use of the PSFA-CIMS or for scheduling training contact PSFA-Training at (505) 468-0311 or e-mail questions to training@nmpsfa.org and include PSFA-CIMS Support in the subject line.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

2.0 DEFINITIONS

Throughout this Program Manual a number of terms and abbreviations are commonly used. For consistency throughout the HVAC and Controls Performance Assurance Program, the following terms and abbreviations along with their definitions shall be used.

Building Subsystems:	Ancillary systems for which communication of alarms and events to the Building Management System is required.
CIMS:	The PSFA's Construction Information Management System.
Common System Interface:	The ability of ancillary Building Subsystems to communicate messages to the Building Management System via the BACnet [®] protocol.
Contract:	Any agreement for the procurement of items of tangible personal property, services or construction.
Contractor:	The contractor responsible for constructing the individual project and/or subcontractors working under the Contractor.
Control Systems:	All devices and systems (pneumatic, electric, electronic, Direct Digital Control, etc.) associated with control of HVAC equipment and systems from simple unit controls to sophisticated Building Management Systems.
Design Issues Log:	A log created and maintained by the PAC of issues noted in the design that may have an impact on performance assurance activities, including record of when identified issues are resolved and the action taken for resolution.
Design Professional:	The Project's architect or engineer
Design Team:	The team selected by the owner responsible for providing Professional Services for project design and implementation, generally consisting of Architects, Engineers, and other professionals as required.
District/Owner:	The individual School District involved in a particular project. This may also include a charter school residing in a particular District, or a charter school that is funded directly by the state of NM.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

HVAC:	Heating, Ventilating, and Air Conditioning equipment and systems including all major components and auxiliary equipment.
Installation Issues Log:	A log created and maintained by the PAC capturing construction deficiencies that have an impact on performance assurance activities including record of when deficiencies are resolved and the action taken for resolution.
Lighting Controls:	All devices and systems associated with electronic control of lighting systems that may be integrated with a Building Management System.
MACC:	The maximum allowable construction cost as defined by the Public School Facilities Authority.
PAC:	Performance Assurance Contractor: The independent third-party agency that holds a Price Agreement with the PSFA to provide services under this program including the HVAC and control system testing, adjusting, and balancing required for individual projects.
Price Agreement:	A definite quantity contract or indefinite quantity contract which requires the contractor to furnish items of tangible personal property, services or construction to a state agency or a local public body which issues a purchase order, if the purchase order is within the limitations of the contract. See also “ Contract ”.
Project Requirements	Guidance for the project Design Team, developed by the Project Team, for HVAC and control systems that form the basis for all decisions made with respect to design, construction, and operation.
Project Team:	The Owner’s team responsible for project development and implementation, generally consisting of PSFA and School District personnel.
PSFA:	The State of New Mexico Public School Facilities Authority is the agency, under the Public School Capital Outlay Council (PSCOC) charged with responsibility for overseeing projects and shall serve as the owner’s representative for work performed under this.
PSFA RM:	The Public School Facilities Authority Regional Manager is the PSFA project representative who monitors PAC activities and ensures that they are included in the project and completed prior to



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

final payment to PAC, General Contractor, and Design Professional.

RASC: The Request for Approval of School Construction form required by the PSFA for construction or renovation projects.

RFI: A Request for Information submitted by the PAC to the Design Professional through the PSFA RM for questions and comments related to the design of the HVAC and Control systems other than those that affect performance assurance activities.

TAB Agency: The agency performing HVAC and control system testing, adjusting, and balancing required for individual projects. TAB Agency services are provided through the PAC under the Performance Assurance Program.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

3.0 RELATED DOCUMENTS

In addition to the Appendices provided with this Program Manual, there are a number of standard contract documents used in the PSFA contracting and construction processes that address or mention the HVAC and Controls Performance Assurance Program. Examples of these documents are available on the PSFA web site (www.nmpsfa.org). The latest versions, as modified for the specific Project, shall be used.



4.0 PROGRAM STATEMENT PHASE

4.1 Description

The Program Statement Phase is the first phase in the PSFA Request for Authorization of School Construction (RASC) process for school construction or renovation projects. The Program Statement submitted affirms the overall project budget and establishes the goals, facts, regulations, conditions, and concepts that bound the project; clearly stating how the project serves the needs of the district. These requirements are defined in the RASC process.

Primary objectives for this phase are to develop the Project Requirements and establish the HVAC and Controls Performance Assurance Program as part of overall delivery process.

4.2 Responsibilities, and Deliverables

The Program Statement is generally completed by the individual District and the Design Professional with the support and assistance of the PSFA. Project Requirements are to be defined in this phase. The PSFA Design Guidelines for HVAC and Controls should be reviewed in developing the Program Statement. The Project Requirements will provide guidance for the project Design Team and will form the basis from which all decisions are made with respect to design, construction, and operation.

The PSFA, District, and the Design Team must work in collaboration to ensure that the resultant schematic designs and narratives are consistent with requirements. To achieve the goals of the HVAC and Controls Performance Assurance Program, it is also necessary to develop the Project Requirements for HVAC and control systems early in this phase

The PAC that will be responsible for performance assurance activities will generally not be engaged at this point in the process.

For the purposes of integrating the HVAC and Controls Performance Assurance Program specific responsibilities and deliverables for individual team members include, but are not necessarily limited, to those described in the paragraphs that follow.

4.2.1 PSFA Regional Manager

- a. Conduct a Project Kickoff Meeting to discuss Project Requirements, roles of team members, integration of the HVAC and Controls Performance Assurance Program into the project, expectations for submittals, etc.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- b. Review the PSFA Design Guidelines for HVAC and Controls and ensure they are utilized as required in developing the Program Statement.
- c. Verify performance assurance requirements have been met in the Program Statement Phase RASC submittal to the PSFA.

4.2.2 Design Team

- a. Participate in the Project Kickoff Meeting.
- b. Incorporate the HVAC and Controls Performance Assurance Program into the overall delivery process for the project.
- c. Review the PSFA Design Guidelines for HVAC and Controls and utilize as required in developing the Program Statement.
- d. Develop initial overall project budget.
- e. Assist the District with verifying that RASC requirements have been met in Program Statement submittal to the PSFA.

Table 4-1 lists the interactions, responsibilities and deliverables for this phase. They are designated “**L**ead” for the entity with primary responsibility for the activity; “**A**pprove” to indicate the entity with final approval authority where appropriate; “**S**upport” for other team members who are to provide technical and other assistance to the lead team member; and “**P**articipate” for others who are part of the process and participate in the activity.

KEY: L = Lead; A = Approve; S = Support; P = Participate

	Task/Deliverable	PSFA RM	District	Design Team	PAC
1	Conduct Project Kickoff Meeting.	S	S	L	
2	Review/Incorporate Design Guidelines for HVAC/ Controls.	A	S	L	
3	Develop initial overall project budget.	A	S	L	
4	Verify RASC requirements have been met in Program Statement submittal to PSFA.	A	S	L	

Table 4-1 Program Statement Phase Responsibilities



5.0 SCHEMATIC PHASE

5.1 Description

This phase follows the Program Statement phase in the PSFA process for school construction and renovation. Primary objectives for this phase are to develop the initial schematic design, include the HVAC and Controls Performance Assurance Program as part of the overall delivery process, and initiate the process for issuing a Purchase Order to the PAC.

The Project Requirements for HVAC and control systems are further developed in this phase. The PSFA Design Guidelines for HVAC and Controls should be reviewed and considered as required.

As decisions are made during subsequent phases, the Project Requirements may evolve based upon budgetary or other considerations. While these ideally should be minor, any impact on the performance assurance process caused by changes from initial development will need to be addressed.

This phase of the project continues the collaborative team effort between the District, the PSFA, and the Design Team. Design Stage pricing shall be requested from the PAC by the PSFA Regional Manager and the process for issuing a Purchase Order to the PAC shall begin in this phase.

5.2 Responsibilities, and Deliverables

For the purposes of integrating the HVAC and Controls Performance Assurance Program specific responsibilities and deliverables for individual team members include, but are not necessarily limited to, those described in the paragraphs that follow.

5.2.1 PSFA Regional Manager

- a. Request Design Stage pricing from the PAC(s) using the guidelines included in Appendix A of this Program Manual.
- b. Refine Project Requirements with respect to HVAC and Control Systems.
- c. Review Basis of Design, Design Narrative, and Schematic designs.
- d. Verify performance assurance requirements have been met in Schematic Phase RASC submittal to PSFA.

5.2.2 Design Team

- a. Assist with refinement of Project Requirements.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- b. Incorporate PSFA Design Guidelines for HVAC and Controls as required in the Schematic Design.
- c. Develop Basis of Design and Design Narrative with Life Cycle Cost Analysis (LCCA).
- d. Develop Schematic designs.
- e. Refine initial Construction Phase cost estimate.
- f. Verify performance assurance requirements have been met in Schematic Phase RASC submittal to PSFA.

5.2.3 Performance Assurance Contractor

- a. Prepare and submit Design Stage Price Proposal in accordance with Appendix A of this Program Manual when requested by the PSFA RM.

Table 5-1 lists the interactions, responsibilities and deliverables for this phase. Some of these responsibilities are part of the normal PSFA process and they are listed here due to their relevance to performance assurance. Responsibilities are designated “**L**ead” for the entity with primary responsibility for the activity; “**A**pprove” to indicate the entity with final approval authority where appropriate; “**S**upport” for other team members who are to provide technical and other assistance to the lead team member; and “**P**articipate” for others who are part of the process and participate in the activity.

KEY: L = Lead; A = Approve; S = Support; P = Participate

	Task/Deliverable	PSFA RM	District	Design Team	PAC
1	Refine project requirements.	A	L	S	
2	Request Design Stage price proposal from PAC.	L			P
3	Develop Basis of Design and Design Narrative with LCCA.			L	
4	Review Basis of Design and Design Narrative.	A	L	S	
5	Develop initial Construction cost estimate.	A	A	L	
6	Verify performance assurance requirements have been met and included in RASC Schematic Phase submittal to PSFA.	A	S	L	

Table 5-1 Schematic Phase Responsibilities



6.0 DESIGN DEVELOPMENT PHASE

6.1 Description

Following the Schematic Phase, the Design Development Phase creates documents that begin to finalize and describe the size, scope, and character of the entire project. Included in this phase are development of the Project Manual and specifications/drawings for the HVAC and control systems. At the end of this phase it is anticipated that the project design should be approximately 60% complete, although requirements may vary by individual project as defined during the Program Statement Phase Kickoff Meeting described under that phase.

From the performance assurance perspective, this phase requires good communication and interaction between all parties to ensure designs are consistent with the Project Requirements and potential issues are addressed in Design Development documents. The PAC participates in reviews of designs and narratives prior to the Design Development Phase submittal, providing comments relative to HVAC and controls systems proposed based upon its experience and specialized knowledge.

In this phase, the project PAC participates in reviews of system options and provides comments on the complexity and maintainability of proposed systems when the Design Narrative is complete. **Therefore the Purchase Order with the selected PAC for Design Stage Services must be executed early in this phase.**

6.2 Responsibilities, and Deliverables

For the purposes of integrating the HVAC and Control Systems Performance Assurance Program specific responsibilities and deliverables for individual team members include, but are not necessarily limited to, those described in the paragraphs that follow.

6.2.1 PSFA Regional Manager

- a. Arrange Purchase Order with PAC for Design Stage Services.
- b. Coordinate Owner and PAC review of designs prior to Design Development Phase submittal (60% or as otherwise defined in the Project Requirements).
- c. Ensure questions, comments and recommendations of PAC during design reviews are addressed by the Design Team.
- d. Verify HVAC and Controls Performance Assurance Program requirements have been met in Design Development Phase RASC submittal to PSFA.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

6.2.2 Design Team

- a. Develop and update designs and design narrative with Life Cycle Cost Analysis (LCCA).
- b. Provide updated designs and design narrative to PAC in advance as part of the Owner Design Development Phase review.
- c. Respond to questions and comments related to the design of the HVAC and Control systems submitted by the PAC.
- d. Address comments and recommendations of PAC from design reviews.
- e. Develop project budget.
- f. Verify HVAC and Controls Performance Assurance Program requirements have been met in Design Development Phase RASC submittal to PSFA.

6.2.3 Performance Assurance Contractor

- a. Review HVAC & Control Systems Design Narrative and provide comments on the complexity and maintainability of proposed HVAC systems and required controls as part of Owner review prior to Design Development RASC submittal.
- b. Submit questions and comments related to the design of the HVAC and Control systems through the PSFA RM.

Table 6-1 lists the interactions, responsibilities and deliverables for this phase. Some of these responsibilities are part of the normal PSFA process and they are listed here due to their relevance to performance assurance. Responsibilities are designated “**L**ead” for the entity with primary responsibility for the activity; “**A**pprove” to indicate the entity with final approval authority where appropriate; “**S**upport” for other team members who are to provide technical and other assistance to the lead team member; and “**P**articipate” for others who are part of the process and participate in the activity.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

KEY: L = Lead; A = Approve; S = Support; P = Participate

	Task/Deliverable	PSFA RM	District	Design Team	PAC
1	Arrange Purchase Order with PAC for Design Stage Services.	L	P		P
2	Develop and update designs and design narrative with LCCA.			L	
3	Review designs prior to RASC DD submittal (60% or as otherwise prescribed for project). Set expectations for the next phase.	A	L	S	P
4	Address questions, comments and recommendations of PAC from design reviews.	S	S	L	
5	Develop project budget.	A	A	L	
6	Verify performance assurance requirements have been met in Design Development Phase and included in RASC submittal to PSFA.	A	S	L	

Table 6-1 Design Development Phase Responsibilities



7.0 CONSTRUCTION DOCUMENTS PHASE

7.1 Description

Following Design Development, the Construction Documents Phase creates final documents for Approval of School Construction and Permit Review. Construction Documents are finalized by the Design Team including, but not limited to, plans, specifications, drawings, and any other State or local government forms and information as required by the PSFA. The HVAC and Controls Performance Assurance Program requirements specific to the project are also finalized in this phase.

A high level of communication and interaction is needed between all parties to assure project requirements are accurately reflected in contract documents. The Design Team is responsible for incorporating performance assurance requirements into the contract documents and for communication of the performance assurance requirements to contractors submitting bids for the project. This includes the contractor's responsibilities, the PSFA's Test, Adjust, and Balance Guide Specification Section 23 0593, project-specific Construction Checklists prepared by the PAC and other information that is appropriate for a particular project.

The PAC participates in reviews of HVAC and control systems designs, specifications, drawings and equipment/systems, providing comments related to serviceability, maintainability, clearances for operation and service, and the testing and verification process. The PAC also assists the Design Professional with incorporating the HVAC and Controls Performance Assurance Program requirements into the Contract Documents and, if appropriate, with the review of contractor bids on items relative to performance assurance.

This phase includes a review by the PAC when the design is developed to the point that the PAC can see the design and orientation of piping and air distribution systems with, at a minimum, main duct and pipe sizing; balancing dampers and valves; an indication of where diffusers are located; the mechanical equipment schedule; and the control sequences of operation.

Periodic meetings between the PAC and the Mechanical Engineer may continue with the purpose of incorporating the PAC's comments prior to the 95% Construction Document Phase submittal.

The PAC will provide a review of the 95% Construction Document package and submit comments with regard to balanceability, maintainability, clearances for operation and service, and the testing and verification process. The PAC will also perform a review of the 100% Construction Documents prior to them being issued for contractor bids.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

Based upon these reviews the PAC shall create and maintain a log of issues noted in the design that may have an impact on performance assurance activities during the Construction Phase. This Design Issues Log shall also indicate when identified issues are resolved and the action taken for resolution. For questions and comments related to the design of the HVAC and Control systems beyond those that affect performance assurance activities, the PAC shall create and submit Requests for Information (RFI) through the PSFA's established process.

The PAC shall route the Design Issues Log and updates along with Requests for Information through the PSFA RM and upload them to the CIMS. The PSFA RM shall identify and forward particular issues to the appropriate Design Team member(s) for resolution. It is the responsibility of the Design Professional to ensure that issues related to the design are resolved prior to the 95% submittal.

The PAC shall prepare an initial test and verification plan including a list of the equipment and systems to be tested, the process to be followed; communications and documentation protocols; and the estimated schedule with milestones. Project-specific Construction Checklists shall also be developed by the PAC for inclusion in the package provided to contractors bidding the project.

Examples of typical Construction Checklists are provided in the PSFA's Test, Adjust, and Balance Guide Specification Section 23 0593. The PAC may use its own format for checklists, however they must be specific to the project and the equipment or systems specified for installation and contain the requirements of the typical Construction Checklists in Section 23 0593 at a minimum.

A sampling process may be used when developing and implementing the performance assurance plan for components or systems that are repetitive or duplicated. The sampling process and percentage shall be reviewed and approved by the PSFA RM during this phase once system types are known.

During this phase the PSFA RM shall request and the PAC shall provide Construction Stage pricing using the guidelines included in Appendix A of this Program Manual.

During the bid process the PAC may be asked to attend the Pre-Bid conference to address any questions relative to the HVAC and Controls Performance Assurance Program.

7.2 Responsibilities, and Deliverables

For the purposes of integrating the HVAC and Controls Performance Assurance Program, specific responsibilities and deliverables for individual team members include, but are not necessarily limited to, those described in the paragraphs that follow.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

7.2.1 PSFA Regional Manager

- a. Coordinate review of designs at 95% Construction Document Phase submittal and final review of 100% Construction Document Phase submittal prior to publication for contractor bidding.
- b. Review the PAC's Initial Construction Phase test and verification plan, test procedure requirements, performance verification documentation, and performance assurance specifications.
- c. Follow-up on Design Issues Log items and Requests for Information submitted by the PAC to ensure resolution by the Design Team.
- d. Verify that the HVAC and Controls Performance Assurance Program requirements, including the PSFA's Test, Adjust, and Balance Guide Specification Section 23 0593, project-specific Construction Checklists prepared by the PAC and other information for the project are incorporated into the Contract Documents.
- e. Ensure performance assurance requirements are communicated at pre-bid conference.
- f. Verify HVAC and Controls Performance Assurance Program requirements have been met in the Construction Documents Phase RASC submittal to PSFA including verification the PAC has performed final review and PAC's comments have been incorporated.
- g. Request Construction Stage pricing from the PAC using the guidelines included in Appendix A of this Program Manual.
- h. Review contractor bids on items relative to performance assurance.

7.2.2 Design Team

- a. Meet periodically with the PAC on a mutually determined schedule to discuss and address PAC's comments and recommendations prior to the 95% Construction Document Phase submittal. This is a responsibility of the Mechanical Engineer.
- b. Provide a set of 95% Construction Document submittal to the PAC with a minimum of three (3) weeks time allowed for review and comment on constructability, balanceability, maintainability, and the testing and verification process.
- c. Respond to questions and comments related to the design of the HVAC and Control systems submitted by the PAC through the PSFA's established process for Requests for Information (RFI).
- d. Resolve Design Issues Log items identified by the PAC.
- e. Finalize designs, specifications and other project documentation.
- f. Incorporate the HVAC and Controls Performance Assurance Program requirements, including the Test, Adjust, and Balance Guide Specification Section 23 0593, and project-specific Construction Checklists for the project into the Contract Documents.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- g. Coordinate Specifications to ensure support from contractors in other Divisions is defined as related to functional performance testing of HVAC and Controls.
- h. Develop overall project budget.
- i. Provide a set of 100% Construction Document submittal to the PAC for final review before they are issued for bidding.
- j. Communicate performance assurance requirements, especially the need to include PAC and TAB activities, milestones, critical paths and time requirements to complete Test and Balance and performance verification testing in the Project Schedule at pre-bid conference.
- k. Review contractor bids on items relative to performance assurance.

7.2.3 Performance Assurance Contractor

- a. Create and maintain a Design Issues Log capturing items noted in the design that may have an impact on performance assurance activities, when those issues are resolved and the action taken for resolution.
- b. Meet periodically with the Mechanical Engineer on a mutually determined schedule to discuss and address comments and recommendations prior to the 95% Construction Document Phase submittal. Track any unresolved issues in the Design Issues Log.
- c. Create and submit Requests for Information (RFI) through the PSFA's established process for questions and comments related to the design of the HVAC and Control systems beyond those that affect performance assurance activities.
- d. Route the Design Issues Log and updates along with Requests for Information through the PSFA RM and upload them to the CIMS.
- e. Develop initial test and verification plan to list specific equipment/systems; process to be followed; communications and documentation protocols; and estimated schedule.
- f. Prepare project-specific Construction Checklists for inclusion in the Construction Documents.
- g. Assist with incorporating the HVAC and Controls Performance Assurance Program requirements, including TAB Guide Specification and Construction Checklists into the Contract Documents.
- h. Assist with coordination of project specifications to ensure support from contractors in other Divisions is defined as related to functional performance testing of HVAC and Controls.
- i. Review HVAC and controls designs prior to the 95% Construction Document Phase submittal and provide comments related to serviceability, maintainability, clearances for operation and service, and the testing and verification process.
- j. Provide final review of 100% Bid Documents related to HVAC and controls before they are issued for bids to ensure comments and issues noted in the 95% review have been addressed.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- k. Prepare and submit Construction Stage Price Proposal in accordance with Appendix A of this Program Manual when requested by the PSFA RM.
- l. Review contractor bids on items relative to performance assurance if requested by PSFA.

Table 7-1 lists the interactions, responsibilities and deliverables for this phase. Some of these responsibilities are part of the normal PSFA process and they are listed here due to their relevance to performance assurance. Responsibilities are designated “**L**ead” for the entity with primary responsibility for the activity; “**A**pprove” to indicate the entity with final approval authority where appropriate; “**S**upport” for other team members who are to provide technical and other assistance to the lead team member; and “**P**articipate” for others who are part of the process and participate in the activity.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

KEY: L = Lead; A = Approve; S = Support; P = Participate

	Task/Deliverable	PSFA RM	District	Design Team	PAC
1	Periodic meetings between PAC & Mechanical Engineer prior to 95% CD submittal.			L	L
2	Create & maintain Design Issues Log including resolutions.				L
3	Develop test and verification plan.	A			L
4	Prepare project-specific Construction Checklists.	A			L
5	Finalize designs, specifications and other project documentation including project-specific Construction Checklists.			L	
6	Develop overall project budget.	A	A	L	
8	Resolve Design Issues Log items & respond to PAC RFIs.	L		L	
9	Coordinate Specifications to ensure support from contractors in other Divisions is defined as related to functional performance testing of HVAC and Controls.	A	S	L	S
10	Review designs at 95% Construction Document Phase submittal.	A	L	S	S
11	Address comments by PAC from Design Review.	L		L	S
12	Review designs at 100% Construction Document Phase submittal.	A	L	S	S
13	Develop performance assurance price proposal for Construction Stage.	A			L
14	Verify performance assurance requirements have been met in Construction Documents and included in RASC submittal.	A	S	L	S
15	Communicate performance assurance requirements at pre-bid conference.	S	S	L	P
16	Review contractor bids on items relative to performance assurance.	A	P	L	P

Table 7-1 Construction Documents Phase Responsibilities



8.0 CONSTRUCTION PHASE

8.1 Description

The overall goal of the HVAC and Controls Performance Assurance Program during the Construction Phase is that test, balance and performance verification activities of the PAC are integrated into the construction process and schedule to document that the HVAC and control systems are installed and operating properly and that they fulfill the functional and performance requirements of the design intent prior to certifying Substantial Completion of the Project.

Performance Assurance activities during this phase provide verification that these systems perform as designed to assure that requirements of the contract are met, and document system installation, start-up and testing including Test and Balance (TAB) of air and water systems. The Purchase Order with the PAC for Construction Phase services shall be arranged by the PSFA RM and executed with the PAC no later than the date of contract execution with the construction contractor.

Of critical importance during this phase is ensuring that the work to be performed by the PAC, including TAB, is included in the project schedule. Completion of TAB is a prerequisite for certifying Substantial Completion of the project and Construction Phase payment to the contractor for that milestone. To avoid potential for delays in Substantial Completion and payment and the possibility of assessment of liquidated damages the contractor must consult with the PAC to determine milestones, critical paths and time requirements to complete Test and Balance and performance verification testing prior to Owner's occupancy. These PAC and TAB activities shall then be inserted in the Project Schedule.

This scheduling activity should begin with the contractor providing a copy of the initial draft of the Project Schedule prior to submittal to the Design Professional for approval. The PAC will then insert PAC and TAB activities, due dates for Construction Checklists, performance assurance meetings, and site visits as line items. The PSFA RM shall ensure that this step is completed and that the approved Project Schedule is uploaded to the PSFA CIMS by the responsible party. **The PSFA RM shall also verify that subsequent revisions to the Project Schedule are uploaded to the PSFA CIMS with notification to the PAC and the PAC shall review revisions on a continuing basis.**

The PAC will perform periodic site visits and provide observation reports related to Performance Assurance on the equipment, systems and activities covered under the contract. The PAC shall make a site visit when the first equipment is installed. This is particularly important in the case of components or systems that are repetitive or duplicated to identify and advise the Design Professional of any issues that impact installation of the balance of those components or systems. These site visits shall not relieve the Design Team of responsibility for site visits, observation reports or other



Public School Facilities Authority HVAC and Controls Performance Assurance Program

requirements contained in the General Conditions of the PSFA Design Professional Contract.

The PAC will develop and maintain an Installation Issues Log capturing issues noted during site visits that may have an impact on performance assurance activities. This log will also include when issues are resolved and the action taken for resolution. For questions and comments related to the design of the HVAC and Control systems, the PAC will submit Requests for Information (RFI) through the PSFA's established process.

The PAC's Installation Issues Log and any RFIs will be submitted by the PAC to the PSFA RM and uploaded by the PAC to the CIMS. The PAC will continue to maintain the Design Issues Log for items related to the design that may affect performance assurance for the HVAC and controls systems.

A key element in avoiding delays in performance of the performance assurance requirements and completion of the project is prompt attention to, and resolution of deficiencies that impact performance assurance activities as identified by the PAC and recorded in the PACs' Design and Installation Issues Logs.

The PSFA RM shall identify and forward particular issues to the appropriate Design Team member(s) for resolution. It is the responsibility of the Design Professional to ensure deficiencies are corrected by the contractor and issues related to the design are resolved. PSFA Maintenance shall review the PAC's Installation Issues Log and verify that corrections have been made for each item listed prior to the PAC closing out that item in the log. Resolution of deficiencies and RFIs is a prerequisite for certifying Substantial Completion.

The Test and Balance (TAB) work performed by the PAC requires that systems are installed, complete and operable before the commencement of TAB work. The contractor shall verify systems are ready for TAB by submitting completed Project-specific Construction Checklist forms to the PSFA RM via the responsible Design Professional. **The actual Construction Checklist forms used for a project shall be those that were developed by the PAC during the Construction Documents Phase and provided to contractors bidding the project.**

It is the contractor's responsibility to ensure that appropriate Construction Checklists are accurately completed, and that the equipment is actually ready for TAB, prior to submitting these Construction Checklists. The Contractor shall have personnel with direct knowledge complete the individual checklists to verify that systems are installed, complete and operable prior to the commencement of TAB work. These checklists do not replace any manufacturer-recommended procedures. PAC costs incurred due to equipment or systems that are not ready as stated in the Construction Checklists shall be the responsibility of the contractor.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

The PAC shall develop detailed mechanical and control systems Functional Performance Test (FPT) procedures and provide copies to the PSFA RM for distribution to the Design team and contractor. FPTs shall document the expected and actual results of the test and what was done to correct failures and discrepancies.

The PAC shall perform and document test and balance of systems and manage and document functional performance verification. The contractor shall coordinate test, balance and other performance assurance activities with the PAC to ensure completion according to contract documents and schedule and direct subcontractors to execute their test and verification responsibilities.

8.2 Responsibilities, and Deliverables

The construction process will include all those elements and responsibilities normally associated with building or renovating school facilities. Further, construction will be consistent with requirements already established by the PSFA and published elsewhere. For the purposes of integrating the HVAC and Controls Performance Assurance Program specific responsibilities and deliverables for individual team members include, but are not necessarily limited to, those described in the paragraphs that follow.

8.2.1 PSFA Regional Manager

- a. Arrange Purchase Order with PAC for Construction Stage Services.
- b. Review updated Construction Phase test and verification plan.
- c. Ensure Performance Assurance requirements are communicated at pre-bid conference.
- d. Ensure Performance Assurance requirements, schedule, time estimates and milestones provided by the PAC are included in the master Project Schedule are uploaded to the PSFA CIMS.
- e. Verify that subsequent revisions to the Project Schedule are uploaded to the PSFA CIMS with notification to the PAC.
- f. Work with Design Team and contractor to alleviate potential impacts on PAC due to changes in the Project Schedule.
- g. Ensure PAC receives all Submittals, RFIs, Change Orders, and other project documentation that may affect test, balance, and performance.
- h. Follow-up on PAC's Design and Installation Issues Logs items and Requests for Information submitted by the PAC to ensure resolution by the Design Team and contractor.
- i. Provide PSFA Maintenance with the PAC's Installation Issues Log to review and verify that corrections have been made for each item listed.
- j. Arrange for Owner operating personnel to participate in performance assurance activities with the PAC.
- k. Document initial acceptance of system operation.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

1. Verify HVAC and Controls Performance Assurance Program requirements have been met for this phase.

8.2.2 Design Team

- a. Schedule, coordinate and conduct a pre-construction conference ensuring PAC is present.
- b. Ensure Performance Assurance requirements, schedule, time estimates and milestones provided by the PAC are included in the master Project Schedule.
- c. Work with PSFA RM and contractor to alleviate potential impacts on PAC due to changes in the Project Schedule.
- d. Review updated Construction Phase test and verification plan, construction checklists, test procedure requirements, and performance verification documentation provided by the PAC.
- e. Provide copies of Change Orders critical to testing, balancing, and the performance assurance process to the PAC for review and comments as appropriate.
- f. Provide copies of those contractor submittals that are critical to the performance verification process to the PAC for review and comment.
- g. Attend test and verification meetings as needed.
- h. Review construction checklists submitted by Contractor and verify equipment is ready for testing.
- i. Ensure items in the PAC's Installation Issues Log are corrected and issues related to the design are resolved prior to substantial completion.
- j. Verify performance assurance program requirements have been met.

8.2.3 Performance Assurance Contractor

- a. Update initial Construction Phase test and verification plan, construction checklists, test procedure requirements, and performance verification documentation as required for actual project conditions and distribute to Design Team and contractor through the PSFA RM.
- b. Upload the updated plan, etc. to the PSFA's CIMS.
- c. Organize and conduct a PAC Coordination Meeting with the contractor and applicable subcontractors to review Performance Assurance requirements, schedule, time estimates and milestones.
- d. Provide line items for PAC and TAB activities, due dates for Construction Checklists, performance assurance meetings, and



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- site visits to the contractor for insertion into the Project Schedule.
- e. Review revisions to the Project Schedule on a regular continuing basis for potential impacts on PAC activities and communicate with PSFA RM to mitigate.
 - f. Perform periodic site visits and provide observation reports related to equipment, systems and activities that might affect serviceability, maintainability, clearances for operation and service, and test, balance and performance verification activities.
 - g. Perform required site visit when the first equipment is installed.
 - h. Create and maintain an Installation Issues Log capturing issues noted during site visits that may have an impact on performance assurance activities, when issues are resolved, and the action taken for resolution.
 - i. Maintain the Design Issues Log for items related to the design that may affect performance assurance for the HVAC and controls systems including when issues are resolved, and the action taken for resolution.
 - j. Submit Requests for Information (RFI) through the PSFA's established process for questions and comments related to the design of the HVAC and Control systems.
 - k. Route the Design and Installation Issues Logs and updates along with Requests for Information through the PSFA RM and upload them to the CIMS.
 - l. Review those contractor submittals that are critical to the performance verification process with special attention to substitutions or proposed deviations.
 - m. Review any Change Order Requests that may impact the performance verification process and testing/balancing and provide comments as appropriate.
 - n. Review any factory start-up procedures; equipment performance data and control drawings.
 - o. Provide Construction (Pre-Functional) Checklists to the contractor and develop any specialized checklists for the contractor to complete.
 - p. Attend construction meetings as needed.
 - q. Write detailed mechanical and control systems functional performance test (FPT) procedures.
 - r. Perform and document test and balance of systems in accordance with the Specifications.
 - s. Manage and document functional performance verification.
 - t. Engage Owner maintenance personnel in testing and verification activities to assist with training.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

8.2.4 Contractor

- a. Ensure performance assurance activities including Test and Balance and the time required to perform them are included in the Project Schedule for completion prior to Substantial Completion of the Project.
- b. Provide copies of construction documents related to performance assurance to PAC.
- c. Correct items on the PAC's Installation Issues Log
- d. Submit completed Construction Checklists when equipment and systems are installed and operational, with Pre-functional tests complete and deficiency log items corrected, certifying readiness for test, balance and other performance assurance activities.
- e. Coordinate test, balance and other performance assurance activities with PAC and complete according to contract documents and schedule.
- f. Ensure subcontractors execute their test and verification responsibilities.
- g. Attend test and verification meetings when scheduled.
- h. Prepare and submit O&M Manuals and equipment inventory in format specified by the PSFA.

Table 8-1 summarizes the interactions, responsibilities and deliverables for this phase. Many of these responsibilities are part of the normal PSFA construction process; Responsibilities are designated "Lead" for the entity with primary responsibility for the activity; "Approve" to indicate the entity with final approval authority where appropriate; "Support" for other team members who are to provide technical and other assistance to the lead team member; and "Participate" for others who are part of the process and participate in the activity.

KEY: L = Lead; A = Approve; S = Support; P = Participate



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

	Task/Deliverable	PSFA RM	District	Design Team	PAC	Contractor
1	Arrange Purchase Order with PAC for Construction Stage Services.	L	P		P	
2	Schedule, coordinate and conduct a pre-construction conference ensuring PAC is present.	S	S	L	P	P
3	Include performance assurance activities and time to perform in Project Schedule.	A		A	S	L
4	Update Construction Phase test and verification plan, test procedure requirements, checklists, and performance verification documentation as required.	A			L	
5	Conduct PAC Coordination Meeting with contractor, subs, etc.	P	P	P	L	P
6	Provide Change Modification Requests that may impact the performance verification process and testing/balancing to PAC for review.	S	S	L		
7	Review Change Modification Requests that may impact the performance verification process and testing/balancing.				L	
8	Perform periodic site visits to note conditions that might affect test, balance and performance verification & provide observation reports.				L	
9	Maintain Design Issues Log for HVAC & Controls.				L	
10	Create & Maintain Installation Issues Log for HVAC & Controls.				L	
11	Resolve issues in Design and Installation Issues Logs.	S	S	L	S	L
12	Review any factory start-up procedures, equipment performance data and control drawings.				L	
13	Write detailed mechanical & control systems functional test procedures.				L	
14	Complete and submit construction checklists for installed equipment.					L
15	Review construction checklists to verify equipment ready for verification testing.			A		
16	Perform TAB Functional performance tests and verification.	S	S		L	S
17	Verify performance assurance requirements have been met.	A	S	L		
18	Confirm Owner acceptance of system operation.	S	A	L	S	

Table 8-1 – Construction Phase Responsibilities



9.0 11-MONTH CORRECTION PERIOD PHASE

9.1 Description

The major objectives of the HVAC and Controls Performance Assurance Program during the 11-Month Correction Period Phase are to complete seasonal or follow up testing and verification; adjust and optimize systems to meet specifications; and resolve any remaining open Punch List items, which shall include the PAC's Design and Installation Issues Logs. In addition, the PAC will be requested by the PSFA RM to assist with resolving any remaining performance problems, help address warranty issues that may arise, or provide other project-related services.

It is the responsibility of the Design Professional to ensure deficiencies are corrected by the contractor and that open items in the PAC's Design Issues Log and Installation Issues Log, the 11-Month Correction Punch List, and any warranty or performance problems are resolved.

PSFA Maintenance shall review the PAC's Installation Issues Log and verify that corrections have been made for each item listed prior to the PAC closing out that item in the log. Resolution of the PAC's Design Issues Log, open items in the PAC's Installation Issues Log and the 11-Month Correction Punch Lists, along with any warranty or performance problems is a prerequisite for certifying Project Completion and final payment.

Pricing for performance assurance activities that may be carried over from the Construction Phase, including test and balance, seasonal or follow up testing or verification, adjusting systems to meet specifications, and resolving any remaining performance problems, shall be included in the PAC's Construction Stage price. Other services will be requested by the PSFA RM during this period on an "as-needed" basis with the PAC Purchase Order adjusted accordingly in advance of such work being performed. The hourly rate and allowable expense items included in the PAC's price proposal and for performing other work during this period may be used for pre-authorized additional services.

9.2 Responsibilities, and Deliverables

The 11-Month Correction Period Phase will include all those elements and responsibilities normally associated with the 11-month correction period following construction or renovation of school facilities and will be consistent with requirements that may have already been established by the PSFA and published elsewhere. For the purposes of integrating the HVAC and Controls Performance Assurance Program specific responsibilities and deliverables for individual team members include, but are not necessarily limited to, those described in the paragraphs that follow.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

9.2.1 PSFA Regional Manager

- a. Ensure deficiencies identified in the 11-Month Correction Period Punch List, including the PAC's Design and Installation Issues Logs, warranty issues and performance problems are resolved by the contractor and design team and documented in the PSFA CIMS.
- b. Support deferred or follow-up seasonal testing and verification.
- c. Participate in near end-of-correction period review.
- d. Verify HVAC and Controls Performance Assurance Program requirements have been met for this phase.
- e. Review and approve Final PAC Report.
- f. Distribute Final PAC Report to appropriate parties.

9.2.2 Design Team

- a. Ensure issues listed in the PAC's Design and Installation Issues Logs and the 11-Month Correction Punch List, warranty issues and performance problems are resolved and document resolutions in the PSFA CIMS.
- b. Request, through the PSFA RM, the assistance of the PAC with resolving issues or performance problems related to the HVAC and control systems installed.
- c. Perform near end-of-correction period review as part of 11-month walkthrough by Architect.
- d. Review and approve Final PAC Report.

9.2.3 Performance Assurance Contractor

- a. Supervise and document seasonal or follow-up testing.
- b. Participate in 11-month walkthrough with Design Professional.
- c. Assist in resolving outstanding 11-Month Correction Period Punch List items, warranty issues, or performance problems when requested by the PSFA RM.
- d. Prepare Final PAC Report conforming to the specific requirements for format, organization and content described in the HVAC and Controls Performance Assurance Program Manual and submit to the PSFA RM
- e. Meet with the PSFA RM to review the Final PAC Report.

9.2.4 Contractor

- a. Execute seasonal or follow-up testing.
- b. Correct issues listed in the PAC's Installation Issues Log and included in the 11-Month Correction Punch List.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- c. Provide “As-operated” sequence from controls contractor.
- d. Make adjustments to O&M Manuals as-built drawings, etc. to document system modifications or component replacement, changes to operating procedures, updated equipment data, calibration, and other revisions.
- e. Assist with near end-of-correction period review.

Table 9-1 summarizes the interactions, responsibilities and deliverables for this phase. Many of these responsibilities are part of the normal PSFA post-construction and warranty period requirements; however, they are listed here due to their relevance to performance assurance.

Responsibilities are designated “**L**ead” for the entity with primary responsibility for the activity; “**A**pprove” to indicate the entity with final approval authority where appropriate; “**S**upport” for other team members who are to provide technical and other assistance to the lead team member; and “**P**articipate” for others who are part of the process and participate in the activity.

KEY: L = Lead; A = Approve; S = Support; P = Participate

	Task/Deliverable	PSFA RM	District	Design Team	PAC	Contractor
1	Correct operational deficiencies identified by Owner.	A	S	P	S	L
2	Complete any seasonal or follow-up testing and verification.	S	S		L	S
3	Resolve open issues in PAC’s Design and Installation Issues Logs.	A	S	L	P	S
4	Resolve outstanding 11-Month Correction Period Punch List items, warranty issues, or performance problems.	A	S	L	S	L
4	Record system modifications, component replacement, changes to operating procedures, updated equipment data, calibration, and other revisions.			A		L
5	Provide “As-operated” sequence from controls contractor.			A		L
6	Perform near end-of correction period review to identify performance problems or warranty issues as part of 11-month walkthrough.	S	S	L	P	P
7	Prepare and deliver final PAC Report.				L	
8	Review/Approve final PAC Report.	L	S	S		

Table 9-1 11-Month Correction Period Phase Responsibilities

State of New Mexico Public School Facilities Authority

HVAC & Controls Performance Assurance Program



APPENDIX A Performance Assurance Contractor (PAC) Project Pricing Revised November 1, 2013

Prepared by:



E/S3 Consultants, Inc.
PO Box 4595
Englewood, CO 80155-4595
TEL: 303-478-3729 FAX: 303-850-7281



PERFORMANCE ASSURANCE CONTRACTOR PROJECT PRICING

1.0 OVERVIEW

The New Mexico Public School Facilities Authority (PSFA) HVAC and Controls Performance Assurance Program is designed to be integrated into all phases of a school construction project and shall be included in all school construction or renovation projects per PSFA policy unless an exception is specifically requested with justification by the responsible Regional Manager and approved by PSFA management.

The Program utilizes the services of an independent third-party **HVAC and Controls Performance Assurance Contractor (PAC)** that holds a Price Agreement with the PSFA. The PAC is employed to provide the Performance Assurance functions described for the program including the testing, adjusting, and balancing required for individual projects.

The services and allowable costs of the PAC are divided into distinct Design and Construction Stages. In the **Design Stage** the PAC's services will generally begin in the Design Development Phase. Therefore during the Schematic Design Phase the PSFA RM shall obtain a price proposal for Design Stage services from the PAC using the guidelines included in this Appendix to enable execution of a Purchase Order with the PAC in a timely manner. The PAC's Design Stage services continue through the Construction Documents Phase.

In the **Construction Stage** the PAC provides services through the Construction Phase and the 11-Month Correction Period. Generally near the end of the **Design Stage** the PSFA RM shall request a price proposal from the PAC and shall arrange for a Purchase Order for the **Construction Stage** of the project.

2.0 PAC PRICE PROPOSAL

2.1. General Requirements

The PAC's price proposal(s) shall represent the work that the Owner and PSFA have agreed upon and shall be developed using the latest version of the PSFA PAC Pricing Matrix. PAC price proposal(s) shall be based upon the anticipated level of effort for each project including all labor hours, materials, expenses, and other costs to provide the services. Flat-fixed pricing or pricing based on a building square footage basis shall not be acceptable. An example of the PSFA PAC Pricing Matrix is included in this Appendix.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

Costs shall be presented in accordance with the PAC RFP Pricing Matrix included in this Appendix. The PAC Cost Total for each task shall include all personnel involved in a particular task using the individual hourly rates in the PAC Hourly Rates by Classification Form incorporated in the Price Agreement and the methodology shall be explained for review by the PSFA. Note that PSFA does not pay hourly rates for travel time.

The PSFA RM shall review the proposal and, if approved, arrange for a purchase order to proceed with the work. Projects assigned to the PAC may be wholly or partially funded by PSCOC. The PAC proposal may be required to be broken down by the percentages of participation by the Owner/District and by PSFA.

If the Owner/District is participating in the award, and the PSFA RM determines that a breakdown in the proposal reflecting those percentages is required, the PAC will receive a Purchase Order from the PSFA for their portion of the work, and a Purchase Order from the Owner/District for their portion of the work, and invoices shall be submitted reflecting each entity's portion accordingly.

PAC invoicing shall reflect only the actual services provided, hours used and documented expenses for the line items in the Pricing Matrix. In aggregate the PAC's invoicing shall not exceed the maximum price in the contract for each stage of the project unless approved in advance by the PSFA through the established change order process.

2.2. Design Stage Price Proposal

Prior to the end of the Schematic Design Phase the PSFA RM shall request a price proposal for Design Stage services from the PAC. The PAC Design Stage Scope of Work included in this Appendix, modified to delete items as needed for specific projects, shall be used as the basis for the PAC's price proposal. This work is summarized in the Design Stage Performance Assurance Activities Matrix in Figure A-1 below which shall be included in the request for the PAC's price proposal with the PSFA RM inserting marks (X) indicating the activities included.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

Performance Assurance Systems	Design Stage Performance Assurance Activities						
	(X) Included in PAC Scope of Work	Review & comments on Design pertaining to PAC prior to 60% Submittal (DD)	Create/Maintain Design Issues Log	Develop PAC Plan & Provide to Design Professional including Construction (Pre-Functional) Checklists	Review 95% Design (CD)	Review 100% Documents Prior to Bidding	Review Contractor Bids as Related to PAC Activities if requested by PSFA
HVAC and Controls	X	X	X	X	X	X	X

Figure A-1 PAC Design Stage Services

The PSFA PAC Pricing Matrix includes a line item for TAB Services. Since the project HVAC and control systems and requirements may be undetermined at the time of the PAC’s Design Stage proposal, a “good faith” estimate for TAB Services shall be included in the PAC’s project pricing when requested by the PSFA RM for the PSFA’s budget purposes.

The PAC’s Design Stage Pricing shall be the basis for executing a contract for the PAC’s Design Stage services.

2.3. Construction Stage Proposal

During the Construction Documents Phase, once the types of HVAC and Controls systems are finalized, the PSFA RM shall request a price proposal for Construction Stage services from the PAC. Pricing shall be for services related to the PAC Construction Stage Scope of Work described in this Appendix, modified to delete items as needed for specific projects. A copy of the Construction Stage Performance Assurance Activities Matrix in Figure A-2 below with the PSFA RM inserting marks (X) indicating the activities included shall be included in the request for the PAC’s price proposal.



Performance Assurance Systems	Construction Stage Performance Assurance Activities										
	Conduct PAC Coordination Meeting	Review "Filtered" RFIs & MCRs (Related to PAC Activities)	Perform Periodic Site Visits	Create/Maintain PAC Installation Issues Log	Maintain Design Issues Log	Distribute Construction (Pre-Functional) Checklists	Write detailed Functional Test Procedures	Perform Test & Balance	Manage & Document Functional Testing	Provide 11-month Correction Period Support	Develop and Submit Final PAC Report
HVAC and Controls	X	X	X	X	X	X	X	X	X	X	X

Figure A-2 PAC Construction Stage Services

Once the system parameters are established during the Construction Documents Phase, the PAC shall solicit quotes from a minimum of three (3) Test, Adjust, and Balance companies for the project based on the system specified and any other pertinent information the PAC deems necessary to provide to the TAB firms, as the design/construction schedule requires. Upon approval by PSFA and the Owner, the PAC shall proceed with the TAB services.

If the assigned TAB firm’s actual work billed is less than the “good faith” estimate stated in the initial proposal, the difference in the estimated amount and the actual amount shall revert back to the project budget. If the actual amount of the accepted quote for TAB services is more than the “good faith” estimate, the Purchase Order shall be amended accordingly.

2.4. 11-Month Correction Period Pricing

Pricing for performance assurance activities carried over from the Construction Phase, including test and balance, seasonal or follow up testing and verification, or adjusting and optimizing systems to meet project specifications shall be included in the Construction Stage Price above.

2.5. Additional Services

Other services may be needed for a particular project, therefore, when requested by the PSFA RM, the PAC shall also provide as part of its price proposal costs for performing other such work identified by the PSFA RM on the PAC Pricing Matrix.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

SCOPE OF SERVICES:

I. Performance Assurance Services:

A. General

1. The New Mexico Public School Facilities Authority (PSFA) HVAC and Controls Performance Assurance Program provides a defined process for assurance and documented verification that the HVAC and control systems for a school facility meet PSFA standards for acceptability, are installed and operating properly, and fulfill the functional and performance requirements of the design intent.
2. The Program utilizes the services of an independent third-party HVAC and Controls Performance Assurance Contractor (PAC) that holds a Price Agreement with the PSFA. The PAC is employed to provide the Performance Assurance functions described for the program.
3. While the HVAC and Controls Performance Assurance Program contains several elements normally found in the building systems commissioning process, the full services of a commissioning agent are not anticipated by the PSFA nor should they be proposed by the PAC for the performance assurance activities in the Program. The performance assurance services provided under this Program are specifically those described within this Scope of Services and detailed in the PSFA HVAC and Controls Performance Assurance Program Manual which shall be incorporated by reference in Contract(s) with the PAC.
4. The services and allowable costs of the PAC are divided into distinct Design and Construction Stages. Services provided shall be as defined in the sections that follow.
5. The PAC's price proposal(s) shall represent the work that the Owner and PSFA have agreed upon and shall be developed using the latest version of PSFA PAC Pricing Matrix. PAC price proposal(s) shall be based upon the anticipated level of effort for each project including all labor hours, materials, expenses, and other costs to provide the services. Flat-fixed pricing or pricing on a building square footage basis shall not be acceptable. An example of the PSFA PAC Pricing Matrix is included in Appendix A of the PSFA HVAC and Controls Performance Assurance Program Manual.
6. The PAC shall integrate the systems listed in the attached matrix into the performance assurance process.
7. Costs shall be presented in accordance with the PAC RFP Pricing Matrix included in Appendix A of the PSFA HVAC and Controls Performance Assurance Program Manual. The PAC Cost Total for each task shall include all personnel involved in a particular task using the individual hourly rates in the PAC Hourly Rates by Classification Form incorporated in the Price Agreement and the methodology shall be explained for review by the PSFA. An example of the PSFA PAC Pricing Matrix is also included Appendix A. Note that PSFA does not pay hourly rates for travel time.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

8. The PSFA PAC Pricing Matrix includes a line item for TAB Services. Since the project HVAC and control systems and requirements may be undetermined at the time of the PAC's Design Stage proposal, a "good faith" estimate for TAB Services shall be included in the PAC's project pricing for the PSFA's budget purposes. Once the system parameters are established during the Construction Documents Phase, the PAC firm shall solicit quotes from a minimum of three (3) Test, Adjust, and Balance companies for the project based on the system specified and any other pertinent information the PAC firm deems necessary to provide to the TAB firms, as the design/construction schedule requires.

B. Design Stage Services

1. Design Development Phase

In this phase, the PAC provides its experience and knowledge for review and comments on the designs related to the complexity and maintainability of the HVAC and controls systems proposed. At the end of this phase, it is anticipated that the project design should be approximately 60% complete, although requirements may vary by individual project as defined during the schematic phase initial coordination meeting. Design Development Phase responsibilities for the PAC include:

- a. Review HVAC & control Systems Design Narrative and provide comments on the complexity and maintainability of the proposed HVAC systems and required controls as part of Owner review prior to Design Development RASC submittal.
- b. Submit questions and comments related to the design of the HVAC and Control systems through the PSFA RM.

3. Construction Documents Phase

- a. The Construction Document Phase creates final documents for approval of school construction and permit review. This phase requires a high level of communication and interaction between all parties to assure project requirements are adequately defined and accurately reflected in contract documents.
- b. The PAC participates in reviews of designs, specifications, drawings and equipment/systems related to HVAC and controls, providing comments related to serviceability, maintainability, clearances for operation and service, and the testing and verification process. The PAC also assists the Design Professional with incorporating the HVAC and Controls Performance Assurance Program requirements into the Construction Documents and, if appropriate, with the review of contractor bids on items relative to performance assurance.
- c. This phase includes a review by the PAC when the design is developed to the point that the PAC can see the design and orientation of piping and air distribution systems with, at a minimum, main duct and pipe sizing; balancing dampers and valves; an indication of where diffusers are located; the mechanical equipment schedule; and the control sequences of operation.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- d. The PAC will provide a review of the 95% Construction Document package and submit comments on serviceability, maintainability, clearances for operation and service, and the testing and verification process with regard to HVAC and controls. The PAC will also perform a review of the 100% Construction Documents prior to publication for contractor bids.
- e. Specific responsibilities of the PAC in the Construction Documents Phase include:
 - i. Create and maintain a Design Issues Log capturing items noted in the design that may have an impact on performance assurance activities, when those issues are resolved and the action taken for resolution.
 - ii. Meet periodically with the Mechanical Engineer on a mutually determined schedule to discuss and address comments and recommendations prior to the 95% Construction Document Phase submittal. Track any unresolved issues in the Design Issues Log.
 - iii. Submit Requests for Information (RFI) through the PSFA's established process for questions and comments related to the design of the HVAC and Control systems beyond those that affect performance assurance activities.
 - iv. Route the Design Issues Log and updates along with Requests for Information through the PSFA Regional Manager and upload them to the PSFA CIMS.
 - v. Develop initial Construction Phase Performance Assurance Plan to list specific equipment/systems, processes to be followed, communications and documentation protocols, and estimated schedule.
 - vi. Prepare project-specific Construction (Pre-functional) Checklists for inclusion in the Construction Documents.
 - vii. Assist with incorporating the HVAC and Controls Performance Assurance program requirements, including the Model TAB Guide and Construction Checklists, into the Construction Documents.
 - viii. Assist with coordination of the Specifications to ensure support from contractors in other divisions is defined as related to functional performance testing of HVAC and controls.
 - ix. Review HVAC and controls designs prior to the 95% Construction Document Phase submittal and provide comments related to serviceability, maintainability, clearances for operation and service, and the testing and verification process.
 - x. Provide final review of 100% Construction Documents related to HVAC and controls before they are issued for bids to ensure comments and issues noted in the 95% review have been addressed.
 - xi. Review contractor bids on items relative to performance assurance if requested by PSFA.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

C. Construction Stage Services

1. Construction Phase

- a. The overall goal of the HVAC and Controls Performance Assurance Program during the Construction Phase is that test, balance and performance verification activities of the PAC are integrated into the construction process and schedule to document that the HVAC and control systems are installed and operating properly and that they fulfill the functional and performance requirements of the design intent prior to certifying Substantial Completion of the Project.
- b. Performance Assurance activities during this phase provide verification that these systems perform as designed to assure that requirements of the contract are met, and to document system installation, start-up and testing including Test and Balance (TAB) of air and water systems. Specific responsibilities include:
 - i. Update initial Construction Phase Performance Assurance Plan, construction checklists, test procedure requirements, and performance verification documentation as required for actual project conditions and distribute to Design Team and contractor through the PSFA Regional Manager.
 - ii. Upload the updated plan, etc. to the PSFA's CIMS.
 - iii. Organize and conduct a PAC Coordination Meeting with the contractor and applicable subcontractors to review Performance Assurance requirements, schedule, time estimates and milestones.
 - iv. Provide line items for PAC and TAB activities, due dates for Construction Checklists, performance assurance meetings, and site visits to the contractor for insertion into the Project Schedule.
 - v. Review revisions to the Project Schedule on a regular continuing basis for potential impacts on PAC activities and communicate with PSFA RM to mitigate.
 - vi. Perform periodic site visits and provide observation reports related to equipment, systems that might affect serviceability, maintainability, clearances for operation and service, and test, balance and performance verification activities.
 - vii. Perform required site visit when the first equipment is installed.
 - viii. Create and maintain an Installation Issues Log capturing issues noted during site visits that may have an impact on performance assurance activities, when issues are resolved, and the action taken for resolution. Include issues noted during TAB.
 - ix. Continue to maintain the Design Issues Log for items related to the design that may affect performance assurance for the HVAC and controls systems including when issues are resolved, and the action taken for resolution.
 - x. Submit Requests for Information (RFI) through the PSFA's established process for questions and comments related to the design of the HVAC and Control systems.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- xi. Route the Installation Issues Log and updates along with Requests for Information through the PSFA Regional Manager and upload them to the CIMS.
- xii. Review those contractor submittals that are critical to the performance verification process with special attention to substitutions or proposed deviations.
- xiii. Review any Change Order Requests that may impact the performance verification process and testing/balancing and provide comments as appropriate.
- xiv. Review any factory start-up procedures; equipment performance data and control drawings.
- xv. Provide Construction (Pre-Functional) Checklists to the contractor and develop any specialized construction checklists for contractor to complete.
- xvi. Attend construction meetings as needed.
- xvii. Write detailed mechanical and control systems functional performance test (FPT) procedures.
- xviii. Perform and document test and balance (TAB) of systems in accordance with the Specifications.
- xix. Manage and document functional performance testing and verification to include at a minimum:
 1. Equipment and system installation verification.
 2. Completed construction checklists.
 3. Control system point to point, connectivity, and critical alarms and events communicated from building ancillary systems to Building Management System via BACnet[®] verified by the controls contractor.
 4. Start-up.
 5. Capacity modulation.
 6. Shutdown.
 7. Emergency and failure modes.
 8. Alarms.
 9. Interlocks with associated equipment.
 10. Documentation shall include the expected and actual results of each test and what was done to correct failures and discrepancies.
- xx. Engage Owner maintenance personnel in testing and verification activities to assist with training.

2. 11-Month Correction Period Phase

The major objectives of the HVAC and Controls Performance Assurance Program during the 11-Month Correction Period Phase are to complete seasonal or follow up testing and verification, adjust and optimize systems to meet specifications, and resolve any remaining open Punch List and PAC Installation Issues Log items or any remaining performance problems. In addition, the PAC may be requested by the PSFA Regional Manager to assist with resolving, address warranty issues that may



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

arise, or provide other project-related services. During the 11-month correction period phase specific responsibilities of the PAC include:

- a. Supervise and document seasonal or follow-up testing.
- b. Participate in 11-Month Walkthrough by Design Professional.
- c. Assist as needed in resolving outstanding 11-Month Correction Period Punch List items, warranty issues, or performance problems when requested by the PSFA RM.
- d. Prepare Final PAC Report conforming to the specific requirements for format, organization and content described in the HVAC and Controls Performance Assurance Program Manual and submit to the PSFA RM.
- e. Meet with the PSFA RM to review the Final PAC Report.

3. Final PAC Report Requirements

On completion of all of the required performance assurance activities the PAC shall prepare and submit a Final PAC Report for the Project. This report shall be concise and contain information on only those HVAC and Controls Performance Assurance Program activities performed related to the requirements of the project. In order for reports to be consistent between the PAC's and across varied projects statewide to provide ready reference for review, the organization and content of the PAC Final Report shall be as follows:

- a. **Cover Page:** Date of report, Name and Address of Project.
- b. **Table of Contents.**
- c. **Executive Summary:** A summary of information at the project level including project background, contract dates, dates for construction, acceptance date, summary of performance assurance activities, recap of unresolved issues, project highlights and milestones, and changes in the project's scope that had an impact on performance assurance. A clear description of any issues that require follow up on the part of the Design Professionals must also be included in this section.
- d. **Performance Assurance Plan:** A brief description of the performance assurance plan implemented for the Project.
- e. **Design Review:** Copies of comments previously provided for the review of the Design Development, 95% and 100% submittal reviews.
- f. **Design Issues Log:** A final copy of the PAC's Design Issues Log shall be included in this section.
- g. **Field Observation Reports:** Copies of PAC Field Observation Reports from site visits related to performance assurance activities.
- h. **Construction Checklists:** Copies of the Construction (Pre-functional) Checklists completed and submitted by the contractor.
- i. **Installation Issues Log:** A copy of the final version of the Log including all issues identified, date resolved, and actions taken for resolution. Unresolved Installation Issues Log items shall be highlighted with details provided.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

- j. Functional Performance Test Results:** Copies of test procedures actually performed and the results of those tests. Functional Performance Tests shall document the expected and actual results of the test and what was done to correct failures and discrepancies.
- k. Controls Sequences of Operation:** The final verified sequences of operations for HVAC equipment controls and programming of Building Management Systems. Include verification of connectivity and communication of critical alarms and events communicated from building ancillary systems to Building Management System via BACnet[®] when required for the Project.
- l. Final Test and Balance Report:** Include any updates from seasonal or follow up testing.
- m. Test and Balance Floor Plans:** Electronic copies in pdf format.

Submit the Final PAC Report the PSFA RM in a three-ring loose leaf binder with tabs for each of the sections above. In addition an electronic (pdf) copy shall be provided on disk and the Report shall be uploaded to the PSFA's CIMS. In cases where the PAC was contracted by a District for an additional separate commissioning effort, the resultant "commissioning report" may be included in the same binder as the Final PAC Report; however it shall be clearly segregated with regard those additional activities on projects beyond the scope of this Program.



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

PAC Project Pricing Matrix

Project:	
Location:	
Sq Feet	
MACC	



DESIGN STAGE		% of PAC Total	PAC Cost Total
			\$ -
Design Development Phase			
Task			
1	Review HVAC & Controls Systems Designs prior to Design Development Phase (60%) submittal		
2	Provide comments relative to systems proposed		
Construction Documents Phase			
Task			
1	Conduct periodic meetings/discussions with Mechanical Engineer		
2	Create & maintain Design Issues Log related to HVAC & Controls		
3	Develop initial Construction Phase Performance Assurance Plan and project-specific Construction Checklists		
4	Assist with incorporating program requirements into Contract documents		
5	Review HVAC & Controls Systems Designs prior to Construction Documents Phase 95% submittal		
6	Perform Final review of 100% HVAC & Controls Systems Designs prior issuing for bids		
7	Review contractor bids related to HVAC & Controls Systems performance assurance		
DESIGN STAGE TOTAL:			\$ -
CONSTRUCTION STAGE		% of PAC Total	PAC Cost Total
			\$ -
Construction Phase			
Task			
1	Update Initial Performance Assurance Plan & Upload to CIMS		
2	Provide line items for PAC activities (including TAB) to Contractor for insertion into Project Schedule		
3	Attend Pre-construction conference		
4	Conduct PAC Coordination Meeting		
5	Create & maintain Installation Issues Log related to HVAC & Controls		
6	Continue to Maintain PAC Design Issues Log		
7	Perform Site visits/attend construction meetings		
8	Develop/update documents (Construction Checklists, Functional Performance Tests, etc.) related to HVAC & Controls		
9	Review applicable RFIs, submittals, start-up info		
10	Obtain & submit quotes for TAB services		
11	Provide & document Test and Balance Services		
12	Perform and document Functional Performance Tests		
11-Month Correction Period			
Task			
1	Perform seasonal/follow-up testing		
2	Participate in Architect's 11-Month Walkthrough		
3	Assist in resolving performance problems, outstanding 11-Month Correction Period Punch List items or warranty issues		
4	Prepare & Deliver Final PAC Report		
PAC Construction Stage Subtotal:			\$ -
TAB Services Subtotal:			
Travel & Reimbursables:			
CONSTRUCTION STAGE TOTAL:			\$ -
Other Services (as requested by RM)			
Task	Description		PAC Cost
			PAC Cost Total:
NOTES:		Project Total:	\$ -
1. The PAC shall enter a Cost Total for each task in the PAC Cost Total column. Totals, etc. are calculated automatically.		\$/SF:	
2. The PAC Cost Total for each task shall include all personnel involved in a particular task using the individual hourly rates in the PAC Hourly Rates by Classification Form included in the PAC Price Agreement.		% of MACC:	
3. The methodology used for determining the PAC Cost Total and proportional involvement of PAC personnel shall be available for review and approval by the PSFA RM.			
4. Reference Performance Assurance Program Manual Appendix A for additional details			



Public School Facilities Authority
HVAC and Controls Performance Assurance Program

HOURLY RATES FOR PERFORMANCE ASSURANCE CONTRACTOR

Name of Firm _____

JOB CLASSIFICATION		RATE	All REGIONS
1	CONSULTANT - Senior	Hourly	
2	CONSULTANT - Project Engineer	Hourly	
3	CONSULTANT - Project Manager	Hourly	
4	CONSULTANT - Staff Observation	Hourly	
	CONSULTANT - Field Specialist	Hrly	
5	OTHER		
	(Provide a description of services)	Hourly	
6	REIMBURSABLES - % of PROPOSAL COSTS	%	
	Printing		
	Photographs/Reports		
	Telephone		
7	TRAVEL		
	Per Diem	\$/Day	
	Mileage	\$/Mi	
	Air Fare		
	Car Rental		
	Hotel		

State of New Mexico Public School Facilities Authority

HVAC & Controls Performance Assurance Program



APPENDIX B PSFA Regional Manager Checklist November 1, 2013

Prepared by:



E/S3 Consultants, Inc.
PO Box 4595
Englewood, CO 80155-4595
TEL: 303-478-3729 FAX: 303-850-7281



Public School Facilities Authority

HVAC and Controls Performance Assurance Program

PAC Checklist - Checked by RM and support for each PAC, Contractor or Design Professional invoice.				
Project Name:		Project #:		
PAC:				
RM:				
PROJECT PHASE	Task / Deliverable (see PAC Manual for more information)	Resp.	Date Task Completed	Date Submitted to ABQ Office
DESIGN STAGE				
Program Statement Phase	Establish HVAC & Controls Performance Assurance Program as part of the overall delivery process	RM		
Schematic Design Phase	Request Design Stage Pricing from PAC	RM		
	Submit PAC Design Stage Proposal to RM (for PO)	PAC		
	Arrange Design Stage Purchase Order with PAC	RM		
Design Development Phase	PAC Comments prior to Design Development (60%) submittal - HVAC & control systems	PAC		
Construction Documents Phase	Create/Maintain PAC Design Issues Log	PAC		
	Initial Construction Phase test and verification plan listing specific equipment/systems; Construction Checklists, process to be followed; communications and documentation protocols; and estimated schedule	PAC		
	Request Construction Stage Pricing from PAC	RM		
	TAB quotes submitted for RM review	PAC		
	RM approval for revised TAB cost	RM		
	PAC comments on 95% contract document review	PAC		
	Design Issues Log resolved	DP		
	PAC comments verifying that HVAC & Controls Performance Assurance Program requirements, including TAB Spec, are incorporated and coordinated within the 100% Contract Documents and that PAC input has been considered and addressed PRIOR TO BID	PAC		
	Arrange Construction Stage Purchase Order with PAC	RM		
CONSTRUCTION STAGE				
Construction Phase	Updated Construction Phase test and verification plan listing specific equipment/systems; process to be followed; communications and documentation protocols; and estimated schedule	PAC		
	Provide Lline items for PAC & TAB activities for insertion in the Project Schedule	PAC		
	Pre-construction Meeting with PAC present	DP		
	PAC Coordination Meeting	PAC		
	Review comments as appropriate on contractor submittals & Change Orders critical to testing, balancing, and the performance assurance process	PAC		
	Create/Maintain PAC Installation Issues Log	PAC		
	Provide updated list of specialized construction checklists for Contractor to complete	PAC		
	Provide updated copies of reports on construction meetings	PAC		
	Provide detailed HVAC & control systems functional test procedures	PAC		
	Make periodic site visits and provide reports	PAC		
	TAB complete and latest documentation of TAB, functional testing, performance verification and balancing activities	PAC		
	Installation Issues Log items included in Punch List and resolved	DP/Contractor		
11-Month Correction Period Phase	Reports on the supervision and documentation of deferred/seasonal testing	PAC		
	Deliver final PAC Report	PAC		
	Report on the near end-of-correction period review	PAC		
	Report on resolving outstanding Design or Installation Log items, warranty or performance problems	DP		
COMMENTS:				