

## **Recipe for Success: A Commissioning Savvy Owner and Third-Party Commissioning Provider**

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### **Synopsis**

Wake County Public School System (WCPSS) has a unique approach to teaming with the Third-Party Commissioning Provider. Having commissioned their own projects for many years, they understand the goals of commissioning and have developed relationships with Construction Managers and building and system Contractors who support the process. When a \$1B bond for school construction passed in 2006, WCPSS quickly realized they would need the help of the Third-Party Commissioning Provider.

This paper will explore how combining their experienced commissioning team with a third party provider has made the commissioning program at WCPSS a success.

### **About the Authors**

Gretchen Coleman is owner of Gretchen Coleman Commissioning Group, LLC (GCCxG), a commissioning provider firm located in Roanoke, VA. Gretchen has been commissioning buildings and the systems that serve them since 1992. She is privileged to have worked on what is acknowledged as the first third-party commissioned project in the United States – Phase 1 of Fred Hutchinson Cancer Research Center in Seattle, WA. Gretchen was a founding member of the Building Commissioning Association (BCA) and was recognized with the President's Award in 2007. Gretchen was among the first 10 people in the association to obtain the Certified Commissioning Professional designation and currently serves as Vice President of the Building Commissioning Certification Board as well as Chapter President for the National Capital Chapter based in Washington, DC.

Don Knepper worked for thirty years with Carolina Power and Light / Progress Energy in engineering design and construction for nuclear and coal fired power plants; he was the HVAC Systems and Test Engineer at the Harris Nuclear Power Plant responsible for all HVAC systems. He is the Quality Control supervisor for Wake County Public School System Facility Design & Construction charged with developing and implementing the commissioning program for the new school (and major renovation) construction program.

## Introduction

Wake County, NC is 864 square miles and includes the cities of Raleigh, Cary, Apex, Wendell, Fuquay-Varina, Garner, Knightdale, Rolesville, Wake Forest, Holly Springs, Morrisville and Zebulon. Wake County Public School System enrolled 137,706 students for the 2008-2009 school year; is the largest school system in the state of North Carolina and is the 18<sup>th</sup> largest school system in the nation. WCPSS is comprised of 156 schools including 99 elementary, 30 middle, 23 high, and 4 special/optional schools.

According to the US Census, Wake County is the 7<sup>th</sup> fastest growing county in the United States. Since 2000, the county population has grown 32.7%. Over that time period the growth rate of K-12 age children has been 3-5% per year. With projections showing a continued increase, WCPSS, was under the gun to build new educational facilities. In 2006, the citizens of Wake County passed a \$970 million bond to help pay for \$1.056 billion school construction plan. The construction program includes 17 new schools scheduled to open between 2008 and 2011, land and design start-up costs for another 13 schools, major renovations to 13 existing schools, and life-cycle replacements (air conditioning systems, roofs, etc.) at nearly 100 schools. It includes the conversion of 19 elementary schools and three middle schools to the multi-track year-round calendar beginning in 2007-08. And...it included commissioning in the budget for each school!

All of a sudden, the Quality Control Department of WCPSS's Facility Design & Construction was short on manpower! Prior to this point, the QC department conducted commissioning activities themselves. But the savvy staff of four was not going to be able to keep up with the dramatic increase in projects. It was time to bring in the Third-Party Commissioning Provider.

## Shopping List

### ***Ingredient 1 – a Cx Savvy Owner***

WCPSS has been self-commissioning their schools for many years. How have they been effective at this task?

- They formed a department within the Facility Design and Construction Department to just do Quality Control (QC) tasks. Early attempts to tap the Operations and Maintenance (O&M) Department for assistance showed they needed their own staff for this department, recognizing O&M would always be too busy for QC work.
- They hired and cultivated a staff experienced in HVAC, BMS Controls, Systems Design and Construction. The staff has an average of 20 years experience in these areas.
- QC developed their own Commissioning Specifications which detailed the expectations and requirements of the contractors.
- They developed “Prototype Inspections” and Commissioning Milestone activities. The goal here was to make it as simple as possible for the construction team to understand. We, as commissioning providers, can all tell stories of a project where commissioning

was a first for the contractor and how difficult it was to even define what “done” means. WCPSS ran into the same issues.

- A Prototype Inspection means, when the contractor has completely installed the first piece of equipment for each equipment type (AHU, VAV box, etc.), WCPSS will do an inspection. They will approve or disapprove and make comments, on that installation. Corrections are made and then that installation is repeated for the remaining like equipment.



**Figure A: Prototype Inspection for VAV Box w/Reheat**

- A sample of the Commissioning Milestone document developed for use with the contractor can be found in Appendix A. This document will later be modified for use with a Third-Party Commissioning Provider.
- WCPSS used to bid all projects. In the last few years they have gone to Construction Manager (CM) at Risk, hired based on qualifications. The CM has a financial incentive for making Substantial Completion and Final Completion dates. It is in the requirements of Substantial Completion that the Test and Balance (TAB) be complete. It is in the requirements of Final Completion that Functional Testing be complete. There is no preclusion for starting functional testing prior to substantial completion.
  - Bidders are prequalified for each bid package.
  - Test and Balance contracts directly with CM.
  - Building Management System (BMS) contracts directly with CM.
- Request for Qualifications (RFQ) are sent out every 18 months for both the CM and major contractors. This allows new contractors the opportunity to work for WCPSS and keeps the pencils of existing contractors sharp.

## ***Ingredient 2 – a Third-Party Commissioning Provider***

When WCPSS realized their QC department was not going to be able to keep up with the construction plan, they turned to the Third-Party Commissioning Provider (CxA). Hiring a CxA would allow them to hit their peaks and provide them with an education on how others accomplish the process.

They used much the same process of procurement as they did for CM at Risk; they sent out an RFQ. The qualities they looked for in a CxA included:

- Experience in commissioning K-12 schools
- Experience in commissioning additions, while areas of the building remained occupied
- Strong field experience, with knowledge in HVAC, plumbing and controls
- Willingness to provide a reduced scope of work and team with the owner

WCPSS hired several Cx firms with term contracts and then asked them for proposals for certain projects. Based on their own experience, they developed a Cx budget and then negotiated with the individual firms. They do not require Cx firms to bid against each other.

The scope of work for the CxA initially included what we as providers would consider the “normal” number of site visits during the installation and startup period. We witnessed duct and pipe pressure tests and equipment startup. Additionally, we were involved in overhead inspections. We reviewed the TAB report, conducted TAB back check and functional testing, and then produced the final report. (WCPSS, as of yet, has not pursued LEED or involved commissioning during the design phase.)

## **Mix it Together**

After a year or two of learning the Cx firms and how they conducted work and worked with the contracting team, they began assigning Cx firms to certain CMs and/or to similar schools (in some instances, they use the same basic design with modifications for location). Additionally, the QC department scaled back the Cx scope during the installation and startup phases and took that on themselves. It was easier for them to be available on a shorter notice than their CxAs. These two decisions have further made it more economical for WCPSS to hire the Third Party CxA.

Now, if one refers back to the task list in Appendix A, the tasks before the functional testing phase were generally conducted by WCPSS and those after by the Third Party CxA. Of course, some activity took place by the CxA in the pre-functional testing phase, and WCPSS was involved during the functional testing phase. Further, due to their own experience, the owner was a huge advocate of the CxA. They understand issues and their relative importance. They understand the sequence of activities and do not allow the contractor to do tasks out of order.

They are not afraid to bring it all to a grinding halt if the contractors truly are not ready for functional testing.

This combined strategy accomplished the goals of the QC department. They were able to meet their peak construction schedules, they learned from the Third Party CxA on how commissioning was accomplished as an industry (and we definitely learned from them as well), and they were kept involved and able to understand issues after the commissioning and construction teams left the site.

## **Conclusion**

In conclusion, for this recipe to work, there are two primary ingredients:

- the owner has to have a qualified staff that understands commissioning AND has the technical background in HVAC and Building Automation Systems
- the third-party commissioning agent must be willing to work with the owner to make this arrangement work; they have to be willing to show the owner how they perform work and be willing to work with a reduced scope of work

Mix that together with a stable of construction managers and contractors with commissioning experience, keeping well working teams working together, and you have a Recipe for Success.

## Appendix A

The following is a summary of the commissioning milestones for this project:  
 Commissioning Authority – WCPSS Quality Control

<b>Construction Phase</b>		
<i>Construction phase inspections are as outlined below. Notify Commissioning Authority (CA) as noted with 1 week notice for inspections.</i>		
	<b>Description</b>	<b>Comments</b>
<input type="checkbox"/>	Obtain half size dwg set and project specs including Addenda	WCPSS QC to request through PM/AE
<input type="checkbox"/>	Request submittals related to Cx Scope	WCPSS QC to send scope of submittals needed to GC/CM
<input type="checkbox"/>	Commissioning kick-off meeting	Schedule when all subs have been hired
<input type="checkbox"/>	Review submittals	WCPSS QC to review submittals; comments directly to Engineer; WCPSS utilize submittals for test development
<input type="checkbox"/>	Construction General Inspections	Routine inspection performed periodically by WCPSS QC
<input type="checkbox"/>	Setting of major equipment, AHUs, Boilers, Chillers – inspections by WCPSS QC	Call WCPSS QC when setting
<input type="checkbox"/>	VAV Prototype Inspections by WCPSS QC	Call WCPSS QC for inspection
<input type="checkbox"/>	AHU Prototype Inspections by WCPSS QC	Call WCPSS QC for inspection
<input type="checkbox"/>	WCPSS QC to witness flushing of hydronic piping	Call WCPSS QC when flushing in progress
<input type="checkbox"/>	Overhead Inspections performed jointly with lead by Engineer accompanied by WCPSS QC	Call when ready; performed with Engineer
<input type="checkbox"/>	WCPSS QC to witness Duct leakage testing	Call WCPSS QC when ready for first section
<input type="checkbox"/>	Pre-Test and Balance Meeting with WCPSS QC	Before TAB contractor starts work
<input type="checkbox"/>	Engineer accompanied by WCPSS performs substantial completion punch-list inspections for mechanical rooms, boilers rooms and chiller court	Call for engineer and WCPSS QC to perform SC inspections
<b>Functional Testing Phase (including TAB Verification)</b>		
<i>Functional testing to start at substantial completion. The pre-requisites for the start of functional testing are (1) receipt of the final TAB report and (2) the BAS should be fully functional from the site with all programming provisions to fully support the system testing in place and checked by the contractor for proper operation</i>		
	<b>Description</b>	<b>Comments</b>
<input type="checkbox"/>	Pre-requisite: Receipt of final TAB report	Transmit final TAB report to WCPSS
<input type="checkbox"/>	Pre-requisite: BAS fully functional and programmed to support system testing	Control Contractor should verify BAS is ready to support all testing
<input type="checkbox"/>	FT6 TAB VAV Airflow Verifications	WCPSS
<input type="checkbox"/>	FT5 TAB AHU Airflow Verifications	WCPSS
<input type="checkbox"/>	FT8 TAB Hydronic Verifications	WCPSS
<input type="checkbox"/>	FT7 – VAV Valve Test	WCPSS
<input type="checkbox"/>	FT1- VAV AHU CP & Sequences	WCPSS
<input type="checkbox"/>	FT3- Heating Plant CP & Sequences	WCPSS
<input type="checkbox"/>	FT4 – Cooling Plant CP & Sequences	WCPSS
<input type="checkbox"/>	Graphics Review and Validation	WCPSS
<input type="checkbox"/>	<b>Owner Training</b> <i>Owner training should be scheduled once commissioning testing is completed verifying operation of the equipment per plans and specs</i>	