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1. **Introduction**

1.1 **Scope of Work**

The scope of work for Construction Services Group – Building Commissioning for this project included the following:

1. Development of the Specifications for Commission of Davenport Middle and Elementary Schools.
2. Development of the Installation Checklists and Functional Performance Tests (FPT's) for the Project.
3. Verification during Construction that equipment and systems were installed per plans and specifications.
4. Review submittals related to the Mechanical systems of the facility.
5. Review Operations and Maintenance manuals for completeness and adequate information.
6. Oversee training of Electrical and Mechanical system.
7. Document and track deficiencies and issues until corrected related to commissioned items.
8. Verify that installation and startup of equipment and systems was completed.
9. Verify completeness of bleachers, and specialty systems.
10. Perform Functional Performance Tests on equipment and systems.
11. Retest deficient equipment and systems after corrections were made to verify functionality.
12. Prepare reports, field observations and test results for final report to the School Board for acceptance of the project.

1.2 **Equipment / Systems Commissioned**

The following is a list of equipment and systems that were commissioned:

1. Plumbing equipment – installation, functionality, quantity, training, O&M manuals, related mechanical water heaters, circulation pumps, water temperatures, and motion sensor function.
2. Electrical equipment – installation, functionality, quantity, lighting, training, O&M manuals, related mechanical motors, and occupancy sensor function, and ground fault circuit function.
3. Mechanical equipment – installation, functionality, training, O&M manuals, related mechanical systems, building automation system, (BAS), seismic and vibration isolation, labeling, and other related mechanical requirements.
1.3  **Deliverables from the Contractor**

The following is a list of deliverables specified in the construction documents and required before Functional Testing can start:

Before Functional Performance Testing can begin, the following items must be complete:

1. Completed installation checklists to be reviewed on site.
2. A list of all outstanding Arch/Mech/Elec punch list items for equipment and systems to be commissioned.
3. Copy of Factory/Contractor start up reports for all equipment being commissioned to be reviewed on site.
4. Preliminary balance report received and approved by the Design Team and CSG
5. Copy of Controls point to point check sheets.
6. Copy of Controls calibration check sheets.
7. Complete O&M manuals approved by Design Team & CSG are on-site.
8. List of all outstanding training and schedule for completion.
9. A copy of the “Declaration of Completion” signed by the General Contractor and received by CSG.
10. In preparation for Functional Performance Testing, the GC, mechanical and controls subcontractors and the Design Team review and approve the Functional Performance Tests that will be used on-site. This will allow testing to proceed as quickly as possible.

*Figure 2: Drop-off and Middle School Front Entry*
2. The Commissioning Process

2.1 Background and Definition

Owners have had increasing significant problems in getting buildings that meet their needs despite the fact that they hire highly qualified Architects, Engineers, and Contractors. The problem is not the people that they hire, but rather the traditional processes have become outdated for the complexities of today’s buildings.

Technological advances over the past years have changed building structures and systems, but the long-established roles of the professionals involved in the procurement process have not. There is no single project team member who is responsible for insuring the proper integration of all modern building systems and the in-depth training required for operating and maintenance personnel. The inevitable result has been an ever-increasing difficulty in attaining high quality, functional buildings that achieve the full potential of their original designs.

Experience has shown that a building that is not commissioned will cost 8 to 20 percent more to operate then a commissioned building. A 2004 report\(^1\) showed that, on average, the cost of performing commissioning was paid back in 4.8 years from energy savings alone. When other benefits were accounted for (from improved equipment lifetimes, reduced change orders due to early detection of problems, prevention of premature equipment breakdown by timely correction of problems, reduced operation and maintenance costs, and improved indoor environment), they essentially offset the entire cost of new-building commissioning.

In addition, the Washington State Energy Codes for non-residential buildings require systems commissioning for mechanical and lighting systems (see sections 1416 and 1513.7). For lighting and simple HVAC systems, the requirements are limited to controls\(^2\). The code states that drawing notes specify commissioning, that specifications and plans identify the equipment to be tested and the procedures to be used, that systems be tested to ensure they operate in accord with approved plans, and that a commissioning report be submitted to the owner. For complex mechanical systems, a preliminary commissioning report is to be completed prior to the building official issuing a final certificate of occupancy.

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\(^2\) ASHRAE Standard 90.1-2004, the model for energy codes in many states, including a minimum level of systems commissioning as part of the completion requirements (6.7.2) for mechanical systems that is less detailed than the Washington Energy Codes.
Work on the commissioning process began formally in 1982 when the American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE) formed a committee to develop a better process for ensuring functional buildings were turned over to building owners.

ASHRAE knew that an increasing number of building owners were complaining about troublesome HVAC systems, poor comfort, having facilities that were too expensive to operate, and building operations staff who did not understand how to maintain or operate their new buildings.

Since its inception, the ASHRAE guideline committee has published the original standard (1989) and updated version (1996). The basis for the ASHRAE commissioning process was the outcome from industry and high technology projects that required all systems to work from day one.

Today, the commissioning process includes other systems and components that have become complex and require special attention at installation, or require special training and maintenance.

### 2.1.1 Definitions

The following are definitions of key terms used in this document.

**Commissioning (Cx)** – a quality process beginning during the design phase and continuing through the life of the building. The purpose behind the Cx process is to assure the School District that all building systems are installed and operating as designed.

**Commissioning Manual** – a guidebook that documents the design, construction, operation, and maintenance of a building. The manual is a living document, which will be added to throughout the life of the building.

**Design Intent** – a design goal that clearly defines the School District’s criteria that must be met to have a successful project. This includes all areas of design, construction, and operation ranging from material selection to system efficiency.

**High Quality** – the work is expected to be accomplished on time, have a high value for the cost, is completed right the first time, has low failure rates, and meets the School District’s design intent.

**TAB** – Testing, Adjusting, and Balancing occurs after the systems in the facility have been started-up. HVAC systems are checked for sound and vibration. TAB is done by a qualified agency specializing in TAB.
2.2 Team Data

The key to an effective project is to ensure that there are well-defined lines of communication between all parties involved in the project. Communication is maintained throughout the project by a conscious effort of the various Team Members.

2.2.1 Party Definitions:

Commissioning Authority (CA) – an independent authority not otherwise associated with the A/E team members or the Contractor. The CA coordinates the commissioning during construction. The CA reports directly to the School District during design.

Project Manager (PM) – the managing authority for the School District over the design and/or construction of the project.

Contractor (GC) – the general contractor for the project.

Architect / Engineer (A/E) – the prime consultant (architect) and sub consultants who comprise the design team dealing with mechanical and electrical systems, including theatre, kitchen, and sound consultants as required.

Owner: School District – Representative established by resolution of the School Board to act for the School District and sign forms, generally the Superintendent.

To aid in improved communication, each contractor must assign one person responsible for coordination and design intent issues.

Figure 3: Corridor
3. **Design Phase**

The design phase of a project is the most critical. During this phase the owner determines what is desired for the building and what determines a successful project. It is critical that close attention be paid to the coordination among the different designers and that all assumptions made are clearly documented. If expectations and directions are not clearly and thoroughly documented, problems will occur during construction due to ambiguity and misunderstandings.

3.1 **Steps of Commissioning During Design**

The key Cx steps accomplished during the design phase are:

1. Develop and provide appropriate Cx specifications
2. Consolidation of available documentation
3. Develop and provide appropriate Cx Plan and Cx checklists

4. **Construction**

Diligence must be maintained throughout the construction process to ensure the School District’s design intent that has been integrated into the construction documents is actually constructed by the contractors. To ensure quality construction is achieved, the proper tools must be provided to the contractors and continuous sampling of components is required. This includes contractor development and continuous maintenance of a detailed construction schedule, and immediate completion of installation checklists.

![Figure 4: Restroom Entrance](image-url)
4.1 Construction Verification

The key steps accomplished during the construction phase are:

1. Pre-construction Meeting
2. Commissioning Scoping Meeting
3. Construction Scheduling
4. Submittal Process
6. Continuous Quality Implementation

4.2 Cx Scoping Meeting

Near the beginning of the project, the Commissioning Authority called for a Commissioning Scoping Meeting. The purpose of this meeting was to give instructions to the contractor on the importance of Installation checklists and how they will be used throughout the project. The need to have the checklists in place when work starts will be stressed. The Cx process was explained in detail, including startup procedures, O & M manuals, training, and closeout procedures.

Figure 5: Stage off of Gym
4.3 Submittals

Submittals are submitted to the A/E has per the specifications listed in the Project Manual. After review and approval by the A/E, the CA reviews the submittals for quality and to look for issues related to commissioning. If quality problems occur, submittals will be returned to the A/E with notes on the problems and direction for re-submittal.

4.4 Development of O & M Manual

To complete the O&M manual in an orderly fashion, and not wait until the end of the project to throw something together, the O&M manual is due within 45 days of submittal acceptance by the designer. Since each specification section is a different O&M manual section, the O&M manual can be completed and submitted one section at a time.

The benefit of early O&M manual completion is that it can be used throughout construction for training O&M staff and to aid in identifying system problems before they become problems. Warranty documents can be added at the conclusion of the project, when they come into force. Section 7 has more details on O&M manuals.

4.5 Continuous Quality Implementation

The Commissioning Authority continuously monitored the work to ensure the process set forth during the design phase of the project was still being implemented. This was through random, statistical checking of the installation checklists, RFI’s change orders, record drawings and schedules.

For quality to be achieved, the individual workers understood their part in the project and were willing to provide the level of quality required. Installation Checklists were used to inform and document installation of the equipment and systems in the building. This is discussed in detail in the next section.

![Figure 6: Gym](image-url)
5.0 Verification, Start-up, and Pre-functional Testing

Construction activities of the Commissioning Authority include oversight of the installation, verification of make and models, provided coordination of trades, and witnessing the startup of the equipment by the Manufacturer’s representative. Prior to startup of some systems, the Contractor will perform pre-functional testing. These are witnessed by the Commissioning Authority. Irrigation Systems are a good example of pre-functional tests that occur prior to coving the pipe. Lines are pressured and checked for leakage.

5.1 On-site Verification

During construction the Contractor used installation checklists to ensure that the equipment was installed correctly. CSG visited the site periodically throughout construction and reported on the installation. Ductwork, piping, and other hidden components were checked prior to cover. Coordination of the various trades is always a concern. Pre-installation conferences were held to discuss the need to share tight spaces and work together to make electrical, plumbing, fire sprinklers, HVAC ductwork, and low voltage data, phone, CCTV, and security systems could all be arranged in the spaces above ceilings and in walls and not interfere with the other trades working in the same areas. The Issues Log was started to report on deficiencies and corrections needed.

5.2 Start-up Activities

When the equipment was ready to be started for the first time, a field representative from the manufacturer comes to the site and goes through a checklist to start the equipment. This process ensures the School District that the warranty will be in-force and valid. The Commissioning Authority witnesses the startup and looks for a well-structured review of the equipment by the representative.

As often as possible, the School District staff is asked to attend. This gives them an opportunity to visit with the manufactures representative and starts a relationship that will be beneficial should the time come when the staff needs to call about a problem. The representative also gives out tips that are not found in the company brochures and can give insight to maintenance techniques that will profit the District’s staff.
5.3 **Pre-functional Tests**

Some systems require testing prior to start-up or during start-up. These tests look for leaks; determine if the systems can hold pressure, check for proper rotation of motors, and generally make sure that the equipment is ready to be started. If the equipment has been started, the tests may be to determine if the equipment is producing the desired output, temperature, or flow and pressure.

The Commissioning Authority witnesses some of these tests or gets the reports from the Architect or Engineer that witnessed the test.

6. **Functional Performance test**

1. Functional Performance Tests were conducted on the mechanical systems at Davenport Middle and Elementary Schools. Russ Chambers and Rick Alexander with CSG Building Commissioning, along with additional staff, performed the tests.

   The tests were developed to check various conditions, situations, and events that the mechanical systems will perform during the year. The test was developed to be run on maintenance schedule and can verify that the systems are working as designed originally. The use of statistical sampling is again used to verify that the systems are working correctly. Whenever the test is performed, different units can be selected and alternated to check all equipment over time.
6.1 Other System Tests

Other systems were checked as part of the Building Occupancy requirements. These tests were performed by local jurisdictional officials and verified by the Commissioning Authority. Those tests included:

- Fire Alarm system and fire suppression system (Fire Marshall)
- Fire Doors (Fire Marshall)
- General Building Code compliance (Building Officials)

6.2 Results of Testing

Over the past year, Functional Performance Tests were conducted on the equipment and systems of the building. As deficiencies were discovered they were placed on the issues log until corrected. All tests need a rate of 90% to pass. The equipment and systems are then retested once the corrections are made to ensure that they work as designed.

Because the Contractor can only be held responsible for work provided under the construction documents, the tests are designed to check performance based on the specifications and drawings. If there are issues with the design of the system, these are addressed to the design team for correction. This work falls outside of the Contractor's work and is dealt with separately. The Functional Testing Reports are found in Appendix A.

7. Operations and Maintenance

During the Acceptance Phase of the project, training sessions were held for Davenport School District staff. O & M manuals were completed and approved and kept on site for use during the sessions. The O&M manuals are checked for completeness and organization so that information is easily obtained. Some sections were missing and the Contractor was required to add these sections before the manuals were approved.

Probably the biggest single factor making training more important than ever before is the explosive increase in the use of microprocessors and “PCs” in modern building construction. This technology is developing so fast that vendors are barely able to understand it. Design engineers and O&M staffs are guaranteed to not understand it unless good training is provided.
7.1 **Areas of Training**

The Davenport School District staff was trained on the following systems:

- Plumbing Systems
  - Location of clean-outs, back-flow preventors, and equipment
  - “As - Built” Drawings
- Packaged roof Top Units
- Make-up Air Unit
- Heating and Ventilation Units
- Domestic Water Heating system and pumps
- Digital Control Equipment
- Electrical Systems

Additional training can be requested for the digital control system.

7.2 **First Year of Operation**

Some additional items have been identified during the early months of occupancy, before final completion. And some other items will come up during the one-year warranty period. Overall, the building provides the working environment required for the occupants and the O&M staff can concentrate on establishing an effective preventative maintenance program that should work for the life of the building.
The Commissioning Authority will continue to check with the staff periodically with informal consultations throughout the first year warranty period. Warranty issues will be addressed and corrected before the warranty runs out. If the Contractor is notified of the issues prior to the end of the warranty, he is responsible to make the corrections, because the issues were identified, the school district’s warranty is still in force for those items.

8. **Summary**

The commissioning process made a significant positive impact on the Davenport Middle and Elementary Schools project. The systems have been corrected to work properly per plans and specifications, or “as designed”. The staff has the proper tools and knowledge to maintain the building and technical systems that are critical for the operation of the facility.

*Figure 9: Front Lobby and Floor*
Appendix A – Field & Commissioning Issues Log Reports

Figure 10: Computer Lab
DAVENPORT K-8 SCHOOL

Date: August 9 – August 10, 2011
Site: Davenport K-8 School, Davenport School District
Weather: Clear, Mid 90s

Activities: HVAC Functional Testing and Commissioning Room Surveys

A team of Russ Chambers and Rick Alexander visited Davenport Elementary School on August 9 – August 10 to perform Commissioning activities in preparation for Phase I occupancy.

Summary:

The primary focus of this commissioning visit was to perform HVAC functional performance Testing, room surveys, interior lighting survey and exterior building survey. A review of DDC controls and HVAC performance was performed. All identified issues detected during this visit are recorded in the following and attached documents.

Specific Observation and Comment:

The school was not ready for functional performance testing and room survey. The facility was not in a condition ready for occupancy. Examples; final cleaning was just beginning, none of the Roof top Units were operational, TAB was not complete,
Kitchen was not complete, Ducting from RTU to Commons HVAC distribution was not complete. Given the existing commissioning schedule and time constraints of the Commissioning Agent, the Commissioning Team decided to perform surveys and testing to the extent that equipment and spaces were available. The Commissioning Agent will return during the week of August 22, 2011 to follow up on areas not surveyed and perform back checks of issues corrected to that date. Further visits will require a two week notice and request of the General Contractor and will be scheduled as Commissioning Agent time is available.

General HVAC Observation:

The appearance and workmanship of the HVAC installation is very good. All filters were clean and as specified with exception of HP-32 as noted below.

HVAC Details:

Heat Pumps

- Heat pumps HP-24, HP-25, HP-26, HP-27, HP-28, HP-29, HP-30, HP-32, HP-36, HP-37 were tested for function and communication with corresponding thermostat. If a heat pump is not listed below it passed all tests.
  - HP-25 – Thermostat not communicating – Issue corrected by controls technician – OK
  - HP-32 – has non-standard filters installed in top portion of filter holder. The filter in lace has been cut from a standard filter and is two 11” X 24” filters taped together. Air can bypass the filter. There appears to be adequate space for a standard 12” X 24” filter. Need to install and supply standard filters.
Roof Top Units
- Roof Top Units were not functioning and not ready to be tested.

Heat Recovery Units
- HRU-1 was operational and function was observed. The unit has a self contained controller and is enabled only by the DDC system. Technician is working on communication connectivity to enable full functional testing.

Unit Heaters
- UH-1 was tested and is functional

Makeup Air Unit
- MAU-1 was not functional and not tested

Exhaust Fans
- Kitchen was not complete, kitchen work was in progress. Kitchen exhaust fans were not tested. No other fans in this phase.

Cooling Tower
- Cooling tower temperature control loop was tested and functioned correctly.

HP Hydronic Loop Pumps
- Pumps were tested for lead/lag operation on pump failure - passed

DDC Controls:
- DDC programming and connection is in progress. Further testing will be performed as a later date and as additional equipment is installed.
- Cooling Tower chemical and blow down controls have not been installed.
- Tested Cooling Tower water level control. Level control functioned properly. However cooling tower refilled with hot water. See issue in Plumbing/Mechanical below.

Electrical:
- Panel Schedules not complete
- Panel labels not complete
- Disconnect labels not complete
- Main and Sub distribution breaker labels not complete
- Boiler emergency shutdown buttons not finished
- Science room gas emergency shutdown not finished
- Some rooms did not have power to wall receptacles.
- Areas of wiring still in progress
- Occupancy sensors were not tested due to constant activity in building.
- Room 318 – missing screw in light switch plate
Commissioning
Field Report

- Lighting
  - Several fixtures have lamps or ballasts out. Electrician aware and waiting for parts
  - Several fixtures have various debris in diffuser which is visible from floor level. All fixture need to be checked and cleaned as appropriate.
  - Tested daylight harvesting in all available rooms
    - Room 314 – East fixture in inside row does not dim in response to light input

Plumbing:
- Domestic hot water temperature to classrooms was measured at 135°F. The water temperature must not exceed 120°F. TMV needs to be set.
- The Project Specification Section 23 21 23 Paragraph 3.2.D requires the pump base to be filled with non-shrink non-metallic grout after alignment. This has not been done.
- When testing Cooling Tower sump level control, the tower fill water was hot. Traced the line and it appears to be properly connected to the cold water supply. It appears that hot water was back feeding into the cold water supply through the thermostatic mixing valve.
- Men’s toilet room 304 urinal flush valves have vibrating water hammer when closing.
- All toilet rooms – WC & urinal flush sensors were not ready to test
- Valve Tag Schedule has not been posted
- WH-4 has condensate leak form flexible tubing – plumber working on it
- Room 308 – Emergency eyewash/shower, no water to device, could not test

Mechanical:
- Return air grills and ducts are very noisy in several rooms. Rooms 308 & 316 are particularly bad. TAB has not been done, noise may be better after TAB.

General Construction:
- Roof over locker rooms has debris – nails, screws and snipped tin, the debris can easily puncture the roof membrane, debris also in roof and overflow drains. Debris needs to be cleaned up before a roof puncture of drain plug occurs.
- Room 312 – door tight in jamb
- Kitchen 218 – low spot in floor, water collects

- Room 317 – chip in drywall texture east end of north wall

- Hall HL31 – base mold not adhered in Northwest corner
• Hall HL31 - Floor cleanouts need to have tile insert installed

• MAU-1 – roof flashing not complete or not adequate. Needs to be fully installed to prevent moisture penetration.
Additional comments:

Commissioning Issues Log will be used to track identified deficiencies through the end of the project and is attached at the end of this document.

Each item must have a response before being closed. Please refer to the instruction sheet at the end of the issues log.

Please feel free to contact me with questions or requests for clarification.

Commissioning Agent will visit Davenport for further testing and room surveys on August 24, 25 & 26. Back checks will be done on above issues presented as corrected.

Russ Chambers, CEM, CEA, CBCP, LEED AP
Retro-Commissioning & Energy Manager
DAVENPORT K-8 SCHOOL

Date: August 24, 2011
Site: Davenport K-8 School, Davenport School District
Weather: Clear, Mid 90s

Activities: HVAC Functional Testing and Commissioning Room Surveys

A team of Russ Chambers and Rick Alexander visited Davenport Elementary School on August 24, 2011 to perform Commissioning activities in preparation for Phase I occupancy.

Summary:

The primary focus of this commissioning visit was to perform HVAC functional performance Testing, room surveys, interior lighting survey and exterior building survey. A review of DDC controls and HVAC performance was performed. All identified issues detected during this visit are recorded in the following and attached documents.

Specific Observation and Comment:

There are continuing issues with connectivity between the Allerton DDC System and the installed HVAC internal control equipment. RTU-1 is still waiting for the BacNet module and the Controls Technician is waiting for interface mapping information to
determine is more progress can be made in allowing more system control through the DDC. The Commissioning Agent will return during the week of September 12, 2011 to follow up on areas not surveyed and perform back checks of issues corrected to that date. Further visits will require a two week notice and request of the General Contractor and will be scheduled as Commissioning Agent time is available.

General HVAC Observation:

The appearance and workmanship of the HVAC installation is very good.

HVAC Details:

Heat Pumps

- All heat pump units – the DDC system has limited functionality in the interface with the Heat Pumps. The individual units can be enabled/disabled, set in occupied/unoccupied and room temperature setpoint can be set. However the room thermostat will can override the DDC system setpoint. The current operation does not meet the specification and design intent.

Roof Top Units

- RTU-1
  - Does not have connectivity to the DDC system. The unit was tested for function using the manufacturer installed microprocessor controls in a manual function. The unit was then tested for heat cool function by cooling and heating the thermostat.
  - CO₂ monitor has not been installed. To ensure adequate ventilation air the outside air damper was set to a minimum position of 20%.
  - Cover for duct smoke detector needs to be installed.
- RTU-2
  - DDC system monitoring unit. The DDC system has limited functionality in the interface with the Heat Pumps. The individual units can be enabled/ disabled, set in occupied/unoccupied room temperature setpoint cannot be set from the DDC.
  - CO₂ monitor has not been installed
  - Outside air economizing is locked out at temperatures above 68°. Sequence of operation specifies OSA economizing whenever the outside air temperature is less than the return air temperature.
  - Exhaust fan will not control. It is either on or off. Does not comply with sequence of operation. The sequence of operation specifies the exhaust fan to energize at 50% damper opening. The unit as delivered is set up to control the exhaust fan operation based on building pressure. No differential pressure transmitter has been installed. The
fan has been disabled in unit controls and the outside air damper minimum position has been set at 20%.
- Cover for duct smoke detector needs to be installed
- Guards need to be installed under condenser coils to protect compressors.
- RTU-3
  - Unit was operational and limited function was observed. The unit has a self contained controller and is only enabled/disabled by the DDC system. Technician is working on communication connectivity to enable full functional testing. Without the ability to manipulate setpoints, inputs and outputs, there is no way to effectively test the full function of this unit in relation to the sequence of operation. Functional performance testing will need to be done by observing the performance using historical trend graphs.
  - Heat and cool tested OK.

Heat Recovery Units
- HRU-1
  - Unit was operational and limited function was observed. The unit has a self contained controller and is only enabled/disabled by the DDC system. Technician is working on communication connectivity to enable full functional testing. Without the ability to manipulate setpoints, inputs and outputs, there is no way to effectively test the full function of this unit in relation to the sequence of operation. Functional performance testing will need to be done by observing the performance using historical trend graphs.

Makeup Air Unit
- MAU-1 was not functional and not tested. At this time the MAU is functional as a fan only. It is not interlocked with the kitchen exhaust fans and cannot provide cooling or heating.

Exhaust Fans
- Kitchen was not complete, kitchen work was in progress. Kitchen exhaust fans were not tested. No other fans in this phase.

Cooling Tower
- Cooling tower temperature control loop was observed and found not functioning. Controls Technician fixed issue. Functioning properly at this time.
Commissioning
Field Report

DDC Controls:
- DDC programming and connection is in progress. At this time the DDC system is unable to control the HVAC equipment to comply with the published sequence of operation and does not meet the design intent.
- Cooling Tower chemical and blow down controls have not been installed.

Electrical:
- Panel Schedules not complete
- Panel labels not complete
- Disconnect labels not complete
- Main and Sub distribution breaker labels not complete
- Lighting
  - Tested daylight harvesting in all available rooms
    - Room 314 – East fixture in inside row only ½ the fixture dims in response to light input

Plumbing:
- There is a cross feed between the hot and cold water. All sinks and lavatories in facility have hot water coming out of the cold water faucet. The water is also too hot. 135° should be 120° maximum. This is the second time the Commissioning Team has witnessed this issue. (reference 8/9/2011 report Cooling Tower fill) This is potentially a serious safety issue. The water temperature needs to be turned down immediately and the cross feed issue needs to be corrected ASAP
- The Thermostatic Mixing Valve is set to 135°F. The water temperature must not exceed 120°F. TMV needs to be set appropriately to prevent scalding of elementary students.
- Men’s toilet room 304 urinal flush valves have vibrating water hammer when closing.
- All toilet rooms – WC & urinal flush sensors do not work consistently. Do not appear to have been adjusted.
- Valve Tag Schedule has not been posted

Mechanical:
General Construction:

- Roof over locker rooms has debris – nails, screws and snipped tin, the debris can easily puncture the roof membrane, debris also in roof and overflow drains. Debris needs to be cleaned up before a roof puncture or drain plugging occurs.

- Composition roof areas have a lot of nails and screws laying around. These areas need to be cleaned up for safety and to prevent roof damage.
• Kitchen 218 – low spot in floor, water collects

• Hall HL31 - Floor cleanouts need to have tile insert installed

• Kitchen Refrigerator & Freezer Condensers – roof flashing not complete or not adequate. Needs to be fully installed to prevent moisture penetration.

• Wrinkle in wall covering outside room 310
• Suspended ceiling wall angle has multiple short piece splice in hall both North and South sides outside room 310

Additional comments:

Commissioning Issues Log will be used to track identified deficiencies through the end of the project and is attached at the end of this document.

Each item must have a response before being closed. Please refer to the instruction sheet at the end of the issues log.

Please feel free to contact me with questions or requests for clarification.

Commissioning Agent will visit Davenport for further testing and room surveys on September 13, 2011. Back checks will be done on above issues presented as corrected.

________________________________
Russ Chambers, CEM, CEA, CBCP, LEED AP
Retro-Commissioning & Energy Manager

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DAVENPORT K-8 SCHOOL

Date: November 29, 2011
Site: Davenport K-8 School, Davenport School District
Weather: Overcast, high 30s

Activities: HVAC Functional Testing and Commissioning Back Checks

A team of Russ Chambers and Rick Alexander visited Davenport Elementary School on August 24, 2011 to perform Commissioning activities in preparation for Phase I occupancy.

Summary:

The primary focus of this commissioning visit was to perform HVAC functional Performance Testing and back checks of previously identified issues. A review of DDC controls and HVAC performance was performed. All identified issues detected during this visit are recorded in the following and attached documents.
Specific Observation and Comment:

There are continuing issues with connectivity between the Allerton DDC System and the installed HVAC internal control equipment. Please refer to items 44, 45, and 46 in the issues log.

General HVAC Observation:

The appearance and workmanship of the HVAC installation is very good.

HVAC Details:

Heat Pumps

Roof Top Units

- RTU-1
  - At this time RTU-1 has some limited connectivity to the DDC controls. The following issues were found:
    - No return air temperature at DDC
    - No mixed air temperature at DDC
    - Supply temperature not available to DDC while unit is in heating mode.
    - Economizing cooling is not available at temperatures below 0°F and above 65°F. This does not comply with the sequence of operations in the project documents
    - Attempted to call for economizing cooling with 40°F OSA temperature. Outside air damper would not open apparently due to an internal mixed air temperature limit within RTU-1

- RTU-2
  - DDC system monitoring unit.
  - CO2 monitors have been installed, however the monitor communication with the DDC failed just prior to Commissioning Agent arrival. Unit would not respond to CO2 manipulation.
  - Turing testing the unit stopped responding to DDC, no apparent reason.
  - Outside air economizing is locked out at temperatures above 68°F. Sequence of operation specifies OSA economizing whenever the outside air temperature is less than the return air temperature.
  - Exhaust fan is control through space pressure.
  - Guards need to be installed under condenser coils to protect compressors.
RTU-3
  o Unit was operational and limited function was observed. The unit has a self contained controller and is only enabled/disabled by the DDC system. Technician is working on communication connectivity to enable full functional testing. Without the ability to manipulate setpoints, inputs and outputs, there is no way to effectively test the full function of this unit in relation to the sequence of operation. Functional performance testing will need to be done by observing the performance using historical trend graphs.

Heat Recovery Units
  • HRU-4
    o Unit was operational and limited function was observed. The unit has a self contained controller and is only enabled/disabled and heat wheel start/stop by the DDC system. Without the ability to manipulate setpoints, inputs and outputs, there is no way to effectively test the full function of this unit in relation to the sequence of operation. Functional performance testing will need to be done by observing the performance using historical trend graphs.

Makeup Air Unit
  • MAU-1 was tested. At this time the MAU is functional in heating mode only. Cooling is not yet operational.

Exhaust Fans
  • Kitchen exhaust fans were tested and are functioning. No other fans in this phase.

DDC Controls:
  • DDC programming and connection is in progress. At this time the DDC system remains unable to control the HVAC equipment to comply with the published sequence of operation and does not meet the design intent.
  • Cooling Tower chemical and blow down controls have not been installed.
  • Point trending has not been enabled. Commissioning Agent will supply a list of desired trend points to DDC technician.

Electrical:
  • Panel Schedules not complete
  • Panel labels not complete
  • Disconnect labels not complete
  • Main and Sub distribution breaker labels not complete
  • Lighting Control Panels need relay/circuit schedule
Commissioning
Field Report

General Construction:

• Composition roof areas have a lot of nails and screws lying around. These areas need to be cleaned up for safety and to prevent roof damage.

• Kitchen 218 – low spot in floor, water collects

• Kitchen Refrigerator & Freezer Condensers – roof flashing not complete or not adequate. Needs to be fully installed to prevent moisture penetration.

• Wrinkle in wall covering outside room 310
• Suspended ceiling wall angle has multiple short piece splice in hall both North and South sides outside room 310

• Area of roof ridge cap missing near press box

• MAU-1 electrical not complete, receptacle cover not installed, receptacle covered with plastic bag and cover loose on roof.

• MAU-1 roof area cleanup not done

• Floor tile have been replaced in hallway, different shade or die lot
Additional comments:

Commissioning Issues Log will be used to track identified deficiencies through the end of the project and is attached at the end of this document.

Each item must have a response before being closed. Please refer to the instruction sheet at the end of the issues log.

Please feel free to contact me with questions or requests for clarification.

Commissioning Agent will visit Davenport for further testing and room surveys on September 13, 2011. Back checks will be done on above issues presented as corrected.

________________________________
Russ Chambers, CEM, CEA, CBCP, LEED AP
Retro-Commissioning & Energy Manager

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Commissioning Field Report

DAVENPORT K-8 SCHOOL

Date: March 22, 2012
Site: Davenport K-8 School, Davenport School District
Weather: snow, low 30s

Activities: HVAC Functional Testing and Commissioning Back Checks

Commissioning Agent Russ Chambers visited Davenport Elementary School on March 22, 2012 to perform as part of periodic site visits.

Summary:
Construction is going well with few issues observed.

Specific Observation and Comment:
Phase II Building Commissioning and functional Testing has been tentatively scheduled for the week of May 7, 2012

General Construction:
No other issues to report.
**Additional comments:**

Commissioning Issues Log will be used to track identified deficiencies through the end of the project and is attached at the end of this document.

Each item must have a response before being closed. Please refer to the instruction sheet at the end of the issues log.

Please feel free to contact me with questions or requests for clarification.

________________________________________

Russ Chambers, CEM, CEA, CBCP, LEED AP
Retro-Commissioning & Energy Manager

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Educational Service District 112  Form A-9