

# Final Commissioning Report For Eastmont High School

October 2015



*Figure 1. Eastmont High School*



*Specialists in School Buildings*

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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 Eastmont High School.
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 systems.
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: Daylighting



## 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 than a commissioned building. A 2004 report<sup>1</sup> 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<sup>2</sup>. 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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<sup>1</sup> *The Cost-Effectiveness of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States*, Report Number 56637, Lawrence Berkeley National Laboratory, Portland Energy Conservation Inc., Texas A&M University Energy Systems Laboratory, December 2004.

<sup>2</sup> 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: Serving Area / Kitchen



### 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: Computer Lab



## 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
5. Development of O & M Manual
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: Auxiliary 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: Mechanical Room*



## **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.





Figure 7: Commons

### 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 Tests

Functional Performance Tests were conducted on the mechanical systems at Eastmont High School. Steven Nunez and Geert Aerts 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 two years, 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 Eastmont 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.





Figure 8: Southwest Entrance

## 7.1 Areas of Training

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

- Plumbing Systems
  - Location of clean-outs, back-flow preventers, and equipment
  - “As - Built” Drawings
- Rooftop Heat Recovery and Air Handling Units
- Make-up Air and Ventilating Units
- Chilled Water and Heating Water Plant
- 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 Eastmont High School 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: Eastmont High School*



# Appendix A – Field & Commissioning Issues Reports



Figure 10: Roof Top AHU



Specialists in School Buildings

## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
1	M-01	08.26.13	Air Flow Measuring Station	AHU-15 air flow measuring stations are not functioning. They are presently not reporting airflow quantities used for proper control of the AHU.	Bruce	Closed
2	M-02	08.26.13	Air Flow Measuring Station	AHU-18 air flow measuring stations are not functioning. They are presently not reporting airflow quantities used for proper control of the AHU.	Bruce	Closed
3	M-03	08.26.13	AHU-14 DDC control	DDC system only identifies a single supply fan although AHU-14 physically has two. An RFI has been generated.	SPH&C	Closed
4	M-04	08.26.13	Unoccupied Sequence of OPS-VAV's	System hunts for static pressure set point. The start up sequence of operations / programming requires adjustments.	SPH&C	Closed
5	M-05	08.26.13	EF-1 ductwork	100 Area-Existing ductwork has a large opening in the main duct--excessive leakage.	MSI/ALSC	Closed
6	M-06	08.26.13	Exhaust / Supply ductwork	100 Area-Drawings and installation reflect exhaust grilles being tied into the supply mains.	MSI/Bruce	Closed
7	M-07	08.26.13	AHU-14 T-stat	T-stat was reporting space temp 1.3°F lower than actual in the Wrestling room.	SPH&C	Closed
8	M-08	08.26.13	AHU-12 T-stat	T-stat was reporting space temp 1.3°F lower than actual in the Main Gym.	SPH&C	Closed
9	M-09	08.26.13	AHU-15 VAV Graphics	Operational graphics were incomplete for some VAV's serving the Area 100 basement	SPH&C	Closed
10	M-10	08.26.13	AHU-15 Graphics	Operational graphics were incomplete for the heat recovery unit.	SPH&C	Closed

Please view the narrative sheets for a detailed account of each issue.



Specialists in School Buildings

## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
11	M-11	08.26.13	Low Supply Airflow	VAV 15-10 airflow is below design.	MSI/Riley/Bruce	Closed
12	M-12	08.26.13	EF-1 Graphics	The graphics are incomplete for EF-1.	SPH&C	Closed
13	M-13	08.26.13	Main Graphics Tree	The main graphics screen equipment tree does not list equipment in an intuitive manner.	SPH&C	Closed
14	M-14	08.26.13	General graphics	Initial equipment graphics screen is missing a label for the area served on the display.	SPH&C	Closed
15	M-15	08.26.13	AHU-14 Air Flow Stations	The airflow stations may not be calibrated correctly. There is a discrepancy between the OSA intake and the Supply fan.	Bruce	Closed
16	M-16	08.26.13	TAB report	Data for AHU-15 was not included in the latest TAB report	Riley	Closed
17	M-17	08.26.13	800/900 EAV's	Exhaust air valves in the LAB's have been installed backwards and were unable to test.	Bruce	Closed
18	M-18	08.26.13	AHU-19 Static pressure sensor	There is no means to control supply fan speeds until the next phase of work is complete.	MSI/SPH&C	Closed
19	M-19	08.26.13	Fume Hoods	Flow sensors and alarm modules have no evidence of being field calibrated for safety.	Bruce/Riley	Closed
20	M-20	08.26.13	AHU-23	The Welding shop make up air unit was not operating and awaiting installation of control modules and valves.	Bruce / SPH&C	Closed

Please view the narrative sheets for a detailed account of each issue.



Specialists in School Buildings

## Commissioning Issues Report

### Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
<b>Mechanical Issues</b>						
21	M-21	08.26.13	VAV19-28	The transformer blew and this VAV was non operational at the time of our initial Cx site visit.	Bruce/TCE	Closed
22	M-22	08.26.13	Wood Shop HVAC	The Wood shop was in the process of being painted while we were on site. No systems were operable for FPT's	Petra	Closed
23	M-23	08.26.13	AHU-14 Filters	The pre-filters were missing from the filter rack and allowing the more expensive final filters to become fouled.	Bruce	Closed
<b>Plumbing Issues</b>						
24	P-24	08.26.13	Area 100- Roof Drains	Many roof drains were missing basket strainers and areas surrounding them were filled with debris.	Petra/JRT	Closed
25	P-25	08.26.13	Area 100- Leaking Toilet	Located in the Coaches 103, the toilet leaks.	JRT	Closed
26	P-26	08.26.13	Area 100- Running Toilet	There is a toilet in the Girls Locker room that flushes all by itself. This was noted throughout the course of the day.	JRT	Closed
27	P-27	08.26.13	Area 100- Sink-no water	The Girls Locker room right sink had no water running at the time of testing	JRT	Closed
28	P-28	08.26.13	Area 100- Drains plugged	The drains in the Girls Locker room showers were plugged. Showers were not tested.	JRT	Closed
29	P-29	08.26.13	Area 100- Open Piping	In the Girls Locker room shower, there was a pipe that was open. What is to become of this?	JRT	Closed

Please view the narrative sheets for a detailed account of each issue.



Specialists in School Buildings

## Commissioning Issues Report

### Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Plumbing Issues						
30	P-30	08.26.13	Area 100- Showers Water Temps	In the Boy's Locker room shower, the middle of 5 and the adjacent showers both only had lukewarm water.	JRT	Closed
31	P-31	08.26.13	Area 100- Hot Water Flow	The Coach's bathroom 107 shower had very poor hot water flow	JRT	Closed
32	P-32	08.26.13	Area 100- Leak above Ceiling	In Hall 135 basement of the gym, there was a severely stained ceiling tile--leaking piping above? Sprinkler/plumbing possible	JRT / Petra	Closed
33	P-33	08.26.13	Area 800- Acid Neutralization piping	Classroom 832 had a single acid neutralization assembly that was incomplete.	JRT	Closed
34	P-34	08.26.13	Area 100-Leaking Toilet	Located in the Coach's 107, the toilet leaks.	JRT	Closed
Electrical Issues						
35	E-35	08.26.13	Area 100- Light Switch	The switch located in the in Coach's bathroom 107 was not yet installed and lights were not tested.	TCE	Closed
36	E-36	08.26.13	Area 100- Bad GFCI	The GFI located in the Boy's Locker room has an open ground.	TCE	Closed
37	E-37	08.26.13	Area 100- Light Switch	The orientation of the switch duties is not uniform in the Coach's Office107.	TCE	Closed
38	E-38	08.26.13	All LV Control Panels	With the LV schedule been provided by the ESD, we have found the LV system in general has not been properly programmed.	TCE	Closed

Please view the narrative sheets for a detailed account of each issue.



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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues						
39	E-39	08.26.13	Area 100- Light Switch	The orientation of the switch duties is not uniform in the Coach's Office 118 .	TCE	Closed
40	E-40	08.26.13	Area 100- Bad GFCI	The GFI located in the Girl's Locker room has an open ground.	TCE	Closed
41	E-41	08.26.13	Girls Hand Dryers	Girls Locker hand dryers were not operational at the time of our site visit.	TCE	Closed
42	E-42	08.26.13	Uncovered Electrical Boxes	The Girls Locker room had several uncovered electrical boxes in throughout it.	TCE	Closed
43	E-43	08.26.13	Uncovered Electrical Boxes	The Sports Med classroom 127 had several uncovered electrical boxes in throughout it.	TCE	Closed
44	E-44	08.26.13	Uncovered Electrical Boxes	The Gym and Adjacent Storage rooms had several uncovered electrical boxes in throughout it.	TCE	Closed
45	E-45	08.26.13	Gym Lighting	We noted 8 fixtures with burned out bulbs	TCE	Closed
46	E-46	08.26.13	Gym Water Fountain	There was no power to the water fountain at the time of our site visit and could not b tested.	TCE	Closed
47	E-47	08.26.13	Areas 700/800-- Light Switch duties	Many switches were found to not be wired correctly according to the floor plans or details # 1 and 2 on sheet E-500.	TCE	Closed
48	E-48	08.26.13	Down lights	There are several down lights not working throughout the 700 and 800 Areas.	TCE	Closed

Please view the narrative sheets for a detailed account of each issue.



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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues						
49	E-49	08.26.13	Classroom Lighting	Classroom 745--Half of center window fixture lamps are burned out.	TCE	Closed
50	E-50	08.26.13	Classroom Lighting	Classroom 831--Center window fixture lamp does not work.	TCE	Closed
51	E-51	08.26.14	Classroom Lighting	Classroom 832--Center window fixture lamp does not work.	TCE	Closed
52	E-52	08.26.15	Electrical Receptacle	Classroom 831-- the mini fridge plug has no power to it.	TCE	Closed
Mechanical Issues						
53	M-53	11.20.13	DDC-VAV Controls	There are various VAV boxes operating off the incorrect design airflow set points.	SPH&C	Closed
54	M-54	11.20.13	Upper Classrooms Building Envelope	The hallway space temps are well below the WAC requirements for occupied schools	Petra	Closed
55	M-55	11.20.13	DDC Graphics	The Fume Hood FEF's 3 & 4 displays do not include identifying information such as the fan number or VAV box its tied to.	SPH&C	Closed
56	M-56	11.20.13	Optimum Start Stop Programming	There are several areas that are not up to design space temps by the time occupied hours begin. Is it working?	SPH&C	Closed
57	M-57	11.20.13	Fume Hood/VAV integration	The Fume Hood FEF's are indexing the wrong VAV boxes for make up air to the Science Prep rooms.	SPH&C / MSI	Closed

Please view the narrative sheets for a detailed account of each issue.



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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
58	M-58	11.20.13	VAV 7-1 Heater	The electric resistance heater is not working normally. At 100% command, discharge air temperature was only 67.7°F	Bruce	Closed
59	M-59	11.25.13	AHU-5 Heater	The electric resistance heater is not working normally. At 100% command, discharge air temperature was only 54.4°F	Bruce	Closed
60	M-60	11.25.13	VAV 19-28 Heater	The electric resistance heater is not working normally. At 100% command, discharge air temperature was only 63°F	Bruce	Closed
61	M-61	11.20.13	AHU-23	The Welding Shop Make up air fan, AHU-23 did not cycle on via the Hand-Off-Auto wall mounted switch. TAB incomplete.	Bruce / Riley	Closed
62	M-62	11.20.13	Paint Booth Exhaust Fan	The exhaust fan for the welding shop paint booth was not running. All electrical in the paint booth itself appears to incomplete.	Bruce	Closed
63	M-63	11.20.13	AHU-16	The Woods Shop Make Up Air fan, AHU-16 was not working nor were there any manual switches in the space to control it from.	Bruce	Closed
64	M-64	11.20.13	EF-18	The Woods Exhaust air fan, EF-18 was not operable nor were there any switches in the space to control it from.	Bruce	Closed
65	M-65	11.20.13	AHU-5 Night low Limit Sequence of Ops	The exhaust fan cycles On during the night low level sequence when it should remain Off.	SPH&C	Closed
66	M-66	11.20.13	AHU-6 Night low Limit Sequence of Ops	The exhaust fan cycles On during the night low level sequence when it should remain Off.	SPH&C	Closed
67	M-67	11.20.13	AHU-7 Night low Limit Sequence of Ops	The logic programmed into AHU-7 requires there to be ">3" VAV's in a call for night heating before cycling the AHU on. There are only 2 VAV boxes for the entire system.	SPH&C	Closed

Please view the narrative sheets for a detailed account of each issue.



Specialists in School Buildings

## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
68	M-68	11.20.13	AHU-24 Night low Limit Sequence of Ops	The exhaust fan cycles On during the night low level sequence when it should remain Off.	SPH&C	Closed
69	M-69	11.20.13	AHU-24 Static Pressure sensor	The supply fan pressure sensor reads 1.3" of static while the fan is Off in Unoccupied mode.	SPH&C / Bruce	Closed
70	M-70	11.20.13	DDC Graphics	Graphics could not be located for General shop exhaust fans SEF's 4 & 8 or the hose reel SEF 9 located in the CTE area.	SPH&C	Closed
71	M-71	11.20.13	EDH-18	The Girls restroom in the Gym space temp = 65°F, with a 100% command on the duct heater, the status remains Off.	SPH&C / Bruce	Closed
72	M-72	11.20.13	Airflow Monitoring Stations	In most all cases, they do not appear to be reading accurately and the volumes being displayed do not match the TAB report.	Bruce / SPH&C	Closed
73	M-73	11.20.13	AHU-15 Temp sensors	There are two temp sensors with no conditioning devices between them yet we note a 9°F between the two.	SPH&C	Closed
74	M-74	11.20.13	TAB--Sawdust Collector	TAB work was not completed and included in the latest version of the TAB report.	Riley	Closed
75	M-75	11.20.13	TAB OSA Mins	The Minimum Outside air volumes and minimum damper positions have not been completed for some fan systems.	Riley	Closed
76	M-76	11.20.13	GYM AHU's	The Gym is being served by two separate AHU's that have different operating parameters.	SPH&C / MSI	Closed
77	M-77	11.20.13	AHU-5 Graphics display	As this unit moves into Unoccupied mode and the fans stop, alarms appear for "Fan Failure" when they should not be.	SPH&C	Closed

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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
78	M-78	11.20.13	Area 700/800 Temps	The spaces remain very cold throughout the day with some never reaching set point. The VAV's are meeting their design supply air temperatures.	MSI	Closed
79	M-79	11.20.13	Trends	Trends need to be set up to maintain 3-4 weeks of data at a time.	SPH&C	Closed
Plumbing Issues						
80	P-80	11.20.13	Trap primer adjustment	The Lower Area 100 Boys coaches trap primer needs adjustment to keep the back splash down in the drain when toilet is flushed.	JRT	Closed
Electrical Issues						
81	E-81	11.20.13	Boy's Lockers	Roll up door switches in boys locker room missing cores and appears to not be wired.	TCE	Closed
82	E-82	11.20.13	Girl's Lockers	GFCI tripped for water cooler in Girls locker room.	TCE	Closed
83	E-83	11.20.13	Switch ID	The Agricultural Science Lab 610 has three wall switches not labeled or apparently controlling anything.	TCE	Closed
Mechanical Issues						
84	M-84	04.15.14	SEF-5	While reviewing operations, we noted SEF-5 was not running with a command to be on.	SPH&C / Bruce	Closed
85	M-85	04.15.14	AHU-16 ERH	The electric resistance heater was non operational at the time we performed FPT's.	Bruce	Closed
86	M-86	04.15.14	EAV 1-4	The sequence of operations was not correct. The exhaust air valve's CFM set point's were not shifting to meet space airflow requirements.	SPH&C	Closed

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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues						
87	E-87	04.15.14	Welding Shop Switches	The exhaust fan switch covers were only installed with one or two screws and are not securely fastened.	TCE	Closed
88	E-88	04.15.14	Welding shop lamps	There is 1 explosion-proof T-8 lamp burned out in the Welding area.	TCE	Closed
89	E-89	04.15.14	Small Engines shop lamps	There were 3 fixtures with burned out bulbs or ballasts.	TCE	Closed
90	E-90	04.15.14	Floral Shop lamps	There was 1 fixture with burned out bulbs or ballasts.	TCE	Closed
91	E-91	04.15.14	Wood Shop lamps	There were 2 fixtures with burned out bulbs or ballasts.	TCE	Closed
92	E-92	04.15.15	Wood Shop LV panel	The low voltage lighting panel did not seem to turn off or on the lighting in the shop area. What is controlling them?	TCE	Closed
93	E-93	04.15.16	Occupancy Sensors	All Occupancy sensors should be adjusted for a 10-15 minute delay for cycling off lights. Many are presently taking > 30 mins.	TCE	Closed
94	E-94	04.15.17	SEF-4	HOA fan switch not appropriate for systems removed from DDC integration.	MSI / ESD	Closed
Mechanical Issues						
95	M-95	08.06.14	DDC Graphics	The links for Areas 200 & 300 found on the Main Level graphics screen are not working.	SPH&C	Closed

Please view the narrative sheets for a detailed account of each issue.



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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
96	M-96	08.06.14	DDC Graphics	Graphical displays for both Chillers BACnet interfaces is not complete.	SPH&C	Closed
97	M-97	08.06.14	Mechanical Room Ventilation EF-18	The Mechanical Room ventilation fan graphics reflect the exhaust fan has failed. What is the cause?	Bruce / SPH&C	Closed
98	M-98	08.06.14	Cooling Tower	The cooling tower does not appear to be meeting it's performance design criteria. Provide the actual performance test data.	JRT	Closed
99	M-99	08.06.14	Low Chilled Water Temps	The Chilled Water loop is not meeting the loop temperature setpoint of 42°F.	SPH&C	Closed
100	M-100	08.06.14	CWP-1 in Alarm	The graphics for the chilled water loop reflects an alarm condition for CWP-1 VFD.	SPH&C	Closed
101	M-101	08.06.14	AHU-1--No Comm	This system is not yet operational according to the graphic display.	SPH&C	Closed
102	M-102	08.06.14	"Fail to Download; No Comm"	Several systems are not functioning or online. VAV's 1-8,3-26, 10-2, 19-9, EF-20, LEF's 2 & 3, EDH 9-1, EAV 1-1 etc.	TCE / Bruce / SPH&C	Closed
103	M-103	08.06.14	EF-16 not running	While reviewing operations, we noted EF-16 was not running with a command to be on.	Bruce / SPH&C	Closed
104	M-104	08.06.14	AHU-3 not running	AHU-3 is not running. There is an alarm that cannot be identified because the graphic does not scroll to the right in order to see it completely.	SPH&C	Closed
105	M-105	08.06.14	AHU-6 not running	AHU-6 is in alarm. The supply and return fans have been overridden OFF.	SPH&C	Closed

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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
106	M-106	08.06.14	AHU-8 not running	AHU-8 is in alarm. The supply and return fans have been overridden OFF.	SPH&C	Closed
107	M-107	08.06.14	AHU-11 in Alarm	Although this AHU is running, there is an alarm on the VFD	Bruce / SPH&C	Closed
108	M-108	08.06.14	AHU-19 in Alarm	AHU-19 is not running. There is an alarm that cannot be identified because the graphic does not scroll to the right in order to see it completely.	Bruce / SPH&C	Closed
109	M-109	08.06.14	AHU-20	This Electric heater is not yet functioning. But AHU-20 is now running.	Bruce / SPH&C	Closed
110	M-110	08.06.14	AHU-22	This system is not yet functioning.	Bruce / SPH&C	Closed
111	M-111	08.06.14	Bacnet Interfaces	There are several fan systems that require BACnet interface for VFD's that have not yet been completed.	SPH&C	Closed
112	M-112	08.06.14	EF-22 Not running	EF-22 is not running	Bruce / SPH&C	Closed
113	M-113	08.06.14	VAV 10-4 T stat	Space temperature is reportedly 45°F which is well below the WAC requirements for school buildings and classrooms.	SPH&C	Closed
114	M-114	08.06.14	VAV 11-2	The space thermostat is missing from the graphics display	SPH&C	Closed
115	M-115	08.06.14	VAV 17-1	This VAV box is not meeting it design CFM. Presently supplying 88% of design airflow.	Bruce / Riley	Closed

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## Commissioning Issues Report

### Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
116	M-116	08.06.14	VAV 17-3	This VAV box is not meeting it design CFM. Presently supplying 88% of design airflow.	Bruce / Riley	Closed
117	M-117	08.06.14	VAV 4-8	This VAV box is not meeting it design CFM. Presently supplying 53% of design airflow.	Bruce / Riley	Closed
118	M-118	08.06.14	VAV 24-1	This VAV box is not meeting it design CFM. Presently supplying 68% of design airflow.	Bruce / Riley	Closed
119	M-119	08.06.14	VAV 24-5	This VAV box is not meeting it design CFM. Presently supplying 58% of design airflow.	Bruce / Riley	Closed
120	M-120	08.26.14	Dirty Filters	There are several AHU's with dirty filter alarms. All filter should be relatively clean prior to final functional performance testing.	Bruce / ESD	Closed
121	M-121	08.26.14	AHU-1 air flow monitoring stations	Both the supply and return airflow sensor pickup tubes are cross connected and providing a negative readout.	SPH&C / Bruce	Closed
122	M-122	10.02.14	HRU Sequence of operations	Functional performance testing revealed there was no "Jogging routine" to limit the energy recovery wheel's static position.	SPH&C / Bruce	Closed
123	M-123	10.02.14	AHU 4	Some filter clips are missing and one filter has fallen out of rack and is laying on the floor.	Bruce	Closed
124	M-124	10.02.14	Kitchen Hood and Lights	The fan and lights randomly come on when the end user switch has been disabled to Off.	Petra	Closed
125	M-125	10.02.14	EF- Not running	Switched exhaust fan for teacher station doesn't turn on in Cooking Classroom 820	SPH&C / Bruce	Closed

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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
126	M-126	10.02.14	Mechanical Equipment Labeling	Most all Mechanical and HVAC equipment has not been properly labeled per specifications.	JRT / Bruce	Closed
127	M-127	10.02.14	AHU- 1	Openings/holes in cabinet are not sealed. Added dog house is not insulated. The AHU coil access door has been removed.	Bruce HVAC	Closed
128	M-128	10.02.14	AHU- 2	Coil opening penetrations need to be sealed and or re-worked so that they remain sealed.	Bruce HVAC	Closed
129	M-129	10.02.14	AHU- 12	Coil opening penetrations need to be sealed and or re-worked so that they remain sealed.	Bruce HVAC	Closed
130	M-130	10.02.14	AHU- 14	Coil opening penetrations need to be sealed and or re-worked so that they remain sealed.	Bruce HVAC	Closed
131	M-131	10.02.14	AHU- 3 Air Flow Station-exhaust fan	The airflows being displayed read 0 CFM although the fans were verified to be operating.	Bruce HVAC	Closed
132	M-132	10.02.14	AHU- 15 Air Flow Station-exhaust fan	The airflows being displayed read 0 CFM although the fans were verified to be operating.	Bruce HVAC	Closed
133	M-133	10.02.14	AHU- 19 Air Flow Station-exhaust fan	The airflows being displayed read 0 CFM although the fans were verified to be operating.	Bruce HVAC	Closed
134	M-134	10.02.14	EF-22 Modulating Relief Damper	The modulating damper for relief air fan EF-22 has not been installed per drawings and specifications, although it is being displayed on the graphics screen.	Bruce HVAC	Closed
135	M-135	10.02.14	Science EF's not weatherproofed.	Roof ductwork penetrations have not been sealed properly with flashing and caps but is temporarily protected with plastic.	Bruce HVAC	Closed

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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
<b>Mechanical Issues</b>						
136	M-136	10.02.14	Transfer grille location in Room 821	Installation does not match drawing. Allowing high air noise levels from AHU-2 main ductwork into space.	Bruce HVAC	Closed
137	M-137	10.02.14	Chilled Water Piping Noises in Room 817	High noise levels noticed within classroom. It appears to be related to possible air in the chilled water system. Not acceptable in a classroom setting.	JRT / MSI	Closed
138	M-138	10.02.14	AHU-8 Cabinet	There is a broken handle on an access panel that should be replaced.	Bruce HVAC	Closed
139	M-139	10.02.14	AHU / HRU Finishes	There are several rooftop units where the factory finish has failed and begun to peel away leaving the metal unprotected.	Bruce HVAC	Closed
140	M-140	10.02.14	AHU/ Fire Alarm Shutdown	The following AHU's failed to shut down during a Fire Alarm System event that took place on October 2nd.	Petra	Closed
141	M-141	10.02.14	Range Hoods-- Cooking Labs	The Range hood at Station # 1 does not run. Possible electrical issue as adjacent receptacle also not working.	TCE / Bruce	Closed
142	P-142	10.02.14	Domestic Hot Water system	Room 512 Fixture only measures 85F. Hand washes should typically be 100-110F.	JRT	Closed
<b>Plumbing Issues</b>						
143	P-143	10.02.14	Domestic Hot Water system	Room 517 Lavatory only measures 69°F. Changing Room Lav on 67°F after 10 mins running.	JRT	Closed
144	P-144	10.02.14	Domestic Hot Water system	700 area staff restroom lavatory only measures 71F after 5 mins running.	JRT	Closed

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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Plumbing Issues						
145	P-145	10.02.14	Domestic Hot Water system	800 area staff restroom lavatory near Room 801 only measures 68°F after 5 mins running.	JRT	Closed
146	P-146	10.02.14	Domestic Hot Water system	800 area staff restroom lavatory near Room 815 only measures 69°F after 5 mins running.	JRT	Closed
Electrical Issues						
147	E-147	10.02.14	AHU-19 Interior Light Fixtures	No fixtures appeared to be working. Bruce HVAC mentioned these were wired by the electrical contractor.	TCE	Closed
148	E-148	10.02.14	Room 517 lighting issues	Light switching duties do not match electrical drawings. Only 4 fixtures on one switch when drawing shows 6.	TCE	Closed
149	E-149	10.02.14	Room 517 lighting issues	No dimmers have been installed for the space.	TCE	Closed
150	E-150	10.02.14	Room 512 receptacles	Electrical receptacles located on both south and west walls have no power.	TCE	Closed
151	E-151	10.02.14	Room 411 receptacles	There are two electrical receptacles that have no power.	TCE	Closed
152	E-152	10.02.14	Room 736 receptacles	The receptacle closest to the entry door has no power.	TCE	Closed
153	E-153	10.02.14	Kitchen 316 floor receptacle	Kitchen worker claims to have seen an arc at the floor receptacle nearest the kitchen hood. Plug tester shows it is wired correctly.	TCE	Closed
154	E-154	10.02.14	Pipe chase receptacle not working	Located in the piping chase directly across from the mechanical room, there is a GFCI receptacle that tripped and doesn't reset.	TCE	Closed

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## Commissioning Issues Report

### Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues						
155	E-155	10.02.14	Room 715 receptacles	The receptacle has no power.	TCE	Closed
156	E-156	10.02.14	700 Area Data-Electrical room	The receptacle has no power.	TCE	Closed
157	E-157	10.02.14	Low Voltage Lighting Control Panel	The LV panel located in room 204 has not been labeled.	TCE	Closed
158	E-158	10.02.14	LV panel / light switch-Corridor	Located in the north corridor between the Commons and the Gyms, a recently installed switch is not controlling Commons lighting.	TCE	Closed
159	E-159	10.02.14	ADA Entry Door	The exterior push button switch does not open the ADA doors.	TCE	Closed
160	E-160	10.02.14	Classroom lighting controls-Rm 702	Room photocells have not been installed. No daylighting provided. Lamps have been left at 50% light levels continuously.	TCE	Closed
161	E-161	10.02.14	Classroom lighting controls-Rm 702	Daylighting zones have not been wired according to the electrical drawings. Zone 2 has one too many fixtures on it.	TCE	Closed
162	E-162	10.02.14	Classroom lighting - Rm 703	One fixture does not work	TCE	Closed
163	E-163	10.02.14	Classroom lighting controls-Rm 709	Room photocells have not been installed. No daylighting provided. Lamps have been left at 50% light levels continuously.	TCE	Closed
164	E-164	10.02.14	Classroom lighting controls-Rm 712	Room photocells have not been installed. No daylighting provided. Lamps have been left at 50% light levels continuously.	TCE	Closed

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## Commissioning Issues Report

### Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues						
165	E-165	10.02.14	Classroom lighting - Room 736	There are two fixtures that do not work.	TCE	Closed
166	E-166	10.02.14	Room 820-- Cooking Lab	Light bulbs have not been installed in every range hood in the classroom	TCE	Closed
167	E-167	10.02.14	Stage Lights	There is one blue foot light located on the rear stage wall that does not work.	TCE	Closed
168	E-168	10.02.14	Uncovered Exterior Junction Boxes	Located in several places around the entire exterior perimeter are several uncovered junction boxes.	TCE	Closed
169	E-169	10.02.14	209--Lighting controls / Switch duties	The switch duties are not working per the electrical drawings.	TCE	Closed
170	E-170	10.02.14	433--Lighting controls / Switch duties	Bi level lighting does not work. The switch duties are not working per the electrical drawings.	TCE	Closed
171	E-171	10.02.14	450--Lighting controls / Switch duties	Bi level lighting does not work. The switch duties are not working per the electrical drawings.	TCE	Closed
172	E-172	10.02.14	Occupancy Sensors	The Occupancy sensors failed to disable lighting after nearly an hour wait time in several rooms.	TCE	Closed
173	Gen-173	10.02.14	Thermostat display has been painted	Thermostat display has been painted over during construction in the lower level fitness room.	Petra	Closed
174	M-174	09.22.14	AHU-5 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 59°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed

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## Commissioning Issues Report

Project: Eastmont High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues						
175	M-175	09.22.14	AHU-6 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 59°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed
176	M-176	09.22.14	AHU-12 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 60.2°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed
177	M-177	09.22.14	AHU-14 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 59°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed
178	M-178	09.22.14	AHU-15 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 58.2°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed
179	M-179	09.22.14	AHU-20 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 58°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed
180	M-180	09.22.14	AHU-21 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 59.7°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed
181	M-181	09.22.14	AHU-22 CW Coil Performance	During maximum capacity testing, the discharge air temp only reached 58.4°F. This does not meet design criteria or match the manufacturer's submittal data.	Bruce / JRT	Closed
182	M-182	09.22.14	Duct cleaning	Contractors stated on 10.16.14 that documentation would be presented that it took place per plans and specs.	Bruce	Closed
183	E-183	01.06.05	Main Entry Can light	The second can light on the east side main entry is askew and should be re-installed and secured correctly.	TCE	Closed
184	M-184	01.06.05	TWP-2 Failures	The condensing loop pump sporadically fails, which can lead to a failure of the chillers and the entire chilled water system.	TCE / JRT	Closed

Please view the narrative sheets for a detailed account of each issue.



Specialists in School Buildings

## Commissioning Issues List

Project: Eastmont High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-01	<p><b>08.26.13--</b> During functional performance testing, CSG noted the air flow measuring station for the return fan of AHU-15 was non-operational and still required factory calibration. Bruce HVAC needs to provide documentation of the air flow measuring station calibration. If they came factory set, they need to engage a factory rep to visit the site to recalibrate them, and together with the TAB report, ensure all airflow documented and being reported are similar.</p>	<p>Bruce HVAC was in the process of scheduling the factory to calibrate them. We recommend they confer with the TAB contractor to ensure the flow stations are reading accurately and closely match the airflows the TAB contractor has measured. The flow station sampling tubes aren't always placed in a cross-sectional manner so that a better average of velocities are measured and we have noted on several occasions where they are simply not very accurate unless the TAB contractor is able to assist or the TAB report is referenced as well.</p>	<p>Although CSG has verified the outside air, supply air and exhaust air flow stations are indeed now providing a readout, we do not believe they are doing so accurately. Because this issue solely revolves around the sensors functionality, we have agreed to close it. However, an additional Issue ID has been created to track the corrective measures taken to ensure all data being reported is done so accurately and within design parameters.</p>	11.20.13
M-02	<p><b>08.26.13--</b> During functional performance testing, CSG noted the air flow measuring stations for both the exhaust and supply fans for AHU-18 were non-operational and still required factory calibration. Bruce HVAC needs to provide documentation of the air flow measuring station calibration. If they came factory set, they need to engage a factory rep to visit the site to recalibrate them, and together with the TAB report, ensure all airflow documented and being reported are similar.</p>	<p>Bruce HVAC was in the process of scheduling the factory to calibrate them. We recommend they confer with the TAB contractor to ensure the flow stations are reading accurately and closely match the airflows the TAB contractor has measured. The flow station sampling tubes aren't always placed in a cross-sectional manner so that a better average of velocities are measured and we have noted on several occasions where they are simply not very accurate unless the TAB contractor is able to assist or the TAB report is referenced as well.</p>	<p>Although CSG has verified the outside air, supply air and exhaust air flow stations are indeed now providing a readout, we do not believe they are doing so accurately. Because this issue revolves around the sensors functionality, we have agreed to close it. However, an additional Issue ID has been created to track the corrective measures taken to ensure all data being reported is done so accurately and within design parameters.</p>	11.20.13
M-03	<p><b>08.26.13--</b> During functional performance testing, CSG noted the DDC system does not display information for both supply fans and motors for AHU-14. Apparently, SPH&amp;C was unaware of the dual fan assembly and has issued an RFI regarding duplicating the reported information for both fan assemblies.</p>	<p>SPH&amp;C has submitted an RFI for this issue. CSG will await the formal response from the design team.</p>	<p>SPH&amp;C is now displaying operating data and commands for both supply fans and not necessarily a second fan graphic.. CSG finds this to be acceptable as the essential operating information of both fan motors is being displayed.</p>	11.20.13



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## Commissioning Issues List

Project: Eastmont High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-04	<p><b>08.26.13--</b> During functional performance testing, of the VAV system serving the 100 area basement, we noted AHU-15's supply fan continuously hunting upon morning start up while trying to attain the system static pressure setpoint. This occurred for over 30 minutes with the duct pressure set point never being met and the system never becoming stable. The approved sequence of operation for the VAV boxes states that during unoccupied hours, the primary air dampers for the VAV's all move to 100% closed positions. At issue is upon start up, the fan may reach that duct pressure setpoint quickly due to the fact the VAV dampers are all closed and the supply fan speed is reduced before actual design airflow quantities are reached. As some dampers open to achieve their desired airflow set points, the fan speed is adjusts once again and there becomes a tug of war between the VAV dampers opening and closing while trying to attain their desired CFM set points and the VFD speed adjustments to the motor. The result is a system that may run for hours while trying to stabilize itself but is not able to provide the spaces with the correct amount of conditioned or ventilation airflow in order to bring them up to temperature prior to occupancy. It also leads to wasted energy due to underperformance and longer run times to properly condition the occupied spaces.</p>	<p>SPH&amp;C may need to confer with MSI to alter the sequence of operations to mitigate the system from wildly hunting during morning warm up and any control sequence where the system is starting from being completely off such as Night Low Limit or after hours overrides. One recommendation is that the sequence includes a provision to open the VAV dampers 100% prior to starting the supply fan. This will allow the system to meet the duct static pressure setpoint with the entire ductwork system open, as the VAV dampers slowly moved to close to meet their supply air set points, so to will the fan VFD ramp down until the static pressure set point is met. it will do so in a more stable manner and allow for a better control over space temperature demands upon system start up.</p>	<p>CSG has re-tested the start up operations of this fan system serving the locker rooms and indeed witnessed more controlled starts. The fan speed adjustments being made in reaction to static pressure changes in the ductwork are now done so in a more controlled manner and in slower increments. This has allowed the system to operate in a more stable manner without continual overshooting of the set point and consequent over-adjustments the system had been making. Morning warm up will likely take shorter periods of time to reach occupied mode set points, saving the district energy dollars over the life of the system.</p> <p><b>11.20.13--</b> Because of the conflict with SHP&amp;C's WebCTRL DDC program and the district's version of Java on the server, we are unable to retrieve and view trends. Unfortunately, we were not able to determine whether this system consistently starts up in a reasonable manner. CSG will review trends as they become available to us.</p>	04.15.14
M-05	<p>100 Area-Existing EF-1 ductwork has a large opening in the main duct, causing excessive leakage.</p> <p><b>04.15.14--</b> CCA # 33, in response to RFI 732 has been issued with proper direction for sealing the ductwork as best as possible considering its location within an existing shaft that is to remain.</p> <p><b>08.26.13--</b> During balancing verification, the TAB contractor showed us why the airflow at EF-1 was only providing roughly 50% of design airflow. There is a large section of missing ductwork in the existing main that needs to be repaired and sealed. Without repair, there is no other way to ensure adequate ventilation is being provided to those spaces EF-1 serves.</p>	<p>ALSC and MSI should review the conditions of the existing section of ductwork to determine the best course of action in making sure the system as designed can perform adequately to serve the spaces ventilation requirements.</p>	<p>Brad Snow with MSI was asked for his opinion on the state of the laundry room exhaust system and stated he did not believe the lack of full volume of exhaust air from the laundry room would have a negative effect on the building. The airflows being reported are accepted as is.</p> <p><b>08.19.14-</b> Bruce has stated they have patched the ductwork per CCA #33. CSG verified airflow quantities have increased.</p> <p><b>11.20.13--</b> Presently, there is a change order out for review to repair or patch the existing ductwork. Access into the chase is severely limited and a final course of action has yet to be adopted by contractors or the designers.</p>	09.30.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-06	<p><b>08.26.13--</b> During balancing verification with the TAB contractor, we noted two exhaust grilles with supply air ducted to them. Reviewing the Mechanical drawing M-111, it looks as though 8x8 exhaust duct is shown tapping into the 16" rd supply main off AHU-15. This is obviously not correct and should be reviewed by both designer and contractor. Was an RFI ever written? Presently, the toilet room 123 does not meet code by not providing exhaust air. Also, Custodian 125 is the other space where the exhaust grille has supply air through it instead.</p>	<p>If the contractors haven't written an RFI yet, they should. MSI should review the drawings and make any corrections necessary so that the 8x8 exhaust duct serving those two space is routed and mated to the correct exhaust duct.</p>	<p><b>11.20.13--</b> Bruce HVAC has notified us the ductwork in question has been re-installed correctly. CSG verified airflow readings during our recent site visit to verify the TAB report. An updated TAB report identifies all grilles, registers and diffusers now have the correct type and volume of airflow present. MSI reviewed and issued adequate direction to the contractors for correction.</p>	<p>04.15.14</p>
M-07	<p><b>08.26.13--</b> During functional performance testing, we noted the thermostat located in the Wrestling Room was reporting space temps 1.3°F lower than what we measured.</p>		<p>Pat with SPH&amp;C was able to place an offset in the program to help calibrate the sensor and bring the reading more in line with what was actual.</p>	<p>08.26.13</p>
M-08	<p><b>08.26.13--1.)</b> During functional performance testing, we noted the thermostat located in the main gym for AHU-12 was reporting space temps 1.3°F lower than what we measured.  <b>2.)</b> Of even more concern was that the temperature measured just 8 feet from the sensor was nearly 4°F lower than what is being reported through the DDC system. examining the thermostat installation, we noted how close the padded material has been placed around it leaving no gap for air to pass through it. We wonder whether the padding is acting as insulation, driving up the temperature it is reporting by as much as 4°F beyond what is actually felt on the floor. The result could be the system being called into cooling mode even though actual space conditions don't necessarily require it. In turn, this will increase operational costs as well as well reduce the life span of equipment.</p>	<p>We feel ALSC and MSI should review the installation of both the padding placed on the wall as well as how it may be affecting the thermostats ability to read accurately. Placing the T-stats in a different location may be the most suitable choice and in the best interest of the district.</p>	<p>ALSC and MSI provided direction to the contractors to improve the sensing accuracy of the Gym thermostats. CSG noted some offsets have been placed between the wall and the thermostat in order to bring it to the forefront of the opening created by the wall's safety mat installation. We feel the thermostat is more closely reporting the actual space temperatures as opposed to those created in the pocket of space where the mat resides. Better reporting of actual space temperatures will help the space remain more comfortable while still providing the energy savings of the design.</p>	<p>11.20.13</p>
M-09	<p><b>08.26.13--</b> During functional performance testing of the HVAC system serving the locker rooms, we noted several of the VAV's did not have their graphics loaded on the DDC front end system.</p>	<p>SPH&amp;C needs to complete downloading their graphics package and was in the process of doing so while we were all on site.</p>	<p>While remotely looking in on the DDC system, we have noted all graphical displays for the VAV's being served by AHU15 had been completed.</p>	<p>09.18.13</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-10	<p><b>08.26.13--</b> During functional performance testing of the HVAC system serving the locker rooms, we noted AHU-15, the heat recovery unit did not have the graphics loaded on the DDC front end system.</p>	<p>SPH&amp;C needs to complete downloading their graphics package and was in the process of doing so while we were all on site.</p>	<p>While remotely looking in on the DDC system, we have noted all graphical displays for AHU15 had been completed. CSG verified temperature readouts at our next site visit.</p>	<p>09.18.13</p>
M-11	<p>VAV 15-10 airflow is below design.</p> <p><b>04.15.14--</b> As of our most recent site visit, nothing has been done regarding inadequate supply airflows from VAV 15-10. CSG will ask MSI to review and provide a comment regarding acceptance of the lower than design airflow capacity of this VAV box. This space remains quite warm during shoulder and summer seasons which will lead to energy waste.</p> <p><b>08.26.13--</b> During TAB verification, we noted the airflow though VAV 15-10 serving the Storage room 111 only operated at 76% of design airflow. This room is located adjacent to the Sports Med Classroom and contains a sink and large ice making machine which is putting quite a load in the space. Was this VAV sized to accommodate that heat load? With such low airflow, it is likely this VAV will always be in cooling, possibly driving the entire chiller plant to operate.</p>	<p>The inlet conditions should be inspected to ensure they meet the manufacturer's installation criteria. It is unknown whether this unit's supply fan is providing the designed airflow as the TAB report doesn't include AHU-15 in it. However, all other VAV's on this system met design airflow.</p>	<p><b>08.19.14-</b> The flex connection installation for the primary air to the ATU was left installed with a kink in it, creating excess static pressure, starving the space for airflow. CSG verified airflow has increased slightly. MSI Engineers has taken no exception with the airflows reported in the final Test and Balance report.</p> <p><b>11.25.13--</b> To date, none of the three identified responsible parties has commented on this issue.</p>	<p>08.22.14</p>
M-12	<p><b>08.26.13--</b> During functional performance testing of the HVAC system serving the locker rooms, we noted EF-1 did not have the graphics loaded on the DDC front end system.</p>	<p>SPH&amp;C needs to complete downloading their graphics package and was in the process of doing so while we were all on site.</p>	<p>During functional performance testing while on site, we have noted the graphics were completed for EF-1.</p>	<p>11.20.13</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-13	<p>The main graphics screen equipment tree does not list equipment in an intuitive manner.</p> <p><b>09.30.14</b>--CSG CM group held a meeting with Cx staff, Petra and the ESD facilities and capital projects staff to discuss this issue. We decided the maintenance staff would be reviewing the DDC displays over the next few weeks to determine whether the graphics equipment tree layout is acceptable to them. While performing additional FPT's with SPH&amp;C, we still determined the individual pieces of equipment should also include the areas they serve as well. Pat stated he will be working to complete this in the next week.</p> <p><b>08.26.13</b>-- During functional performance testing, we noted how counterintuitive the graphic tree appears in how it lists the equipment. SPH&amp;C has listed the equipment under the building it physically resides in as opposed to the area it is actually serving. For instance, AHU-15 physically resides on the roof of area 200 but the VAV's it serves reside in the Lower level of area 100. The graphics tree lists the VAV's under the main heading "Lower Level" --"100" (Sub heading). This is normal as the associated VAV's serve the area. However on the graphics tree, AHU-15 resides under the main heading of "Main Level"-- "Area 200" and is grouped with all other AHU's residing in that area. What would make more sense from an end user's standpoint would be if all of the equipment is listed under the heading in which it services. Likewise, for those AHU's with VAV boxes, the AHU should be a sub heading under the Area or building and then the VAV's should all be individual sub directories under the AHU that serves them. This will limit the constant hunting around for the equipment and pinpoint all the equipment that is associated together as a system in the same area, and under the same heading on the graphic tree.</p>	<p>SPH&amp;C and the ESD maintenance staff should confer for final layout of the equipment tree on the main DDC Display. It should be intuitive for the end user and laid out in such a way that one isn't required to go to different directories for equipment in the same system or serving the same areas.</p>	<p><b>12.09.30.14</b>-- Pat has added room numbers to the equipment tree and displays so that identification is more apparent.</p> <p><b>04.15.14</b>-- Pat has had a meeting with Randy of the ESD Maintenance dept to determine their requirements for the graphical tree and how it lists the equipment in the various areas of the building. Once the changes have been implemented, we will verify. The following suggestions were agreed upon by the two parties.</p> <p><b>1:</b> SPHC will merge area 200 &amp; 300 graphic.</p> <p><b>2:</b> We will add area numbers on the summary graphic.</p> <p><b>3:</b> Make sure our filter status/graphic is a direct representation of the location on the AHU graphics.</p> <p><b>11.25.13</b>-- SPH&amp;C has made some significant improvements to the graphics tree list view. CSG still feels there may be some opportunities for improvement not to mention performing our due diligence of the completed controls graphics package to ensure an intuitive layout has been provided for the district throughout the entire campus.</p>	<p>11.15.14</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-14	<p>Initial equipment graphics screen is missing a label for the area served on the display.</p> <p><b>04.16.14--</b> Most all graphics in the first two phases have been updated by SPH&amp;C with room numbers located on the equipment graphics screen. However, the newer systems recently brought on line still require the same changes. This issue will be ongoing throughout the rest of the project and listed as "Pending" through the completion of the project.</p> <p><b>08.26.13--</b> During functional performance testing we noted some graphics screens only had the heading of the equipment ID and not the actual room number being served. This should be included as well to make identification of systems and spaces served easier for the end user to recognize.</p>	<p>SPH&amp;C can add this information to the graphics display for easier identification for the district maintenance staff.</p>	<p>The Eastmont school district maintenance staff has signed off on the way building equipment has been displayed on the HVAC equipment tree.</p> <p><b>09.30.14--</b> Pat will be adding room numbers to the equipment tree and displays so that identification is seamless. As previously noted, all training with the maintenance staff has taken place and with Pat having had discussions with them, it has been determined the graphics meet their expectations.</p> <p><b>11.25.13--</b> Pat has made some significant improvements to the graphics tree list view. CSG still feels there may be some opportunities for improvement and will continue reviewing displays to ensure an intuitive layout has been provided for the district.</p>	11.15.14
M-15	<p><b>08.26.13--</b> During functional performance testing, we noted a discrepancy between the OSA and Supply air flow measuring stations on AHU-14. It is physically impossible for the supply fan to be drawing in roughly half the airflow than it is supplying, particularly so when the mixing damper from the accompanying exhaust fan is completely closed. How is it that the OSA flow measuring station can report 3800 CFM while the supply fan air flow measuring station is nearly twice that a 7900 CFM?</p>	<p>Bruce HVAC needs to provide documentation of the air flow measuring station calibration. If they came factory set, they need to engage a factory rep to visit the site to recalibrate them, and together with the TAB report, ensure all airflow documented and being reported are similar.</p>	<p>During recent testing, we determined the various airflows being displayed by the airflow measuring stations were closer in line with each other and appeared to be properly calibrated. The final Test and Balance report identifies measured airflows that corresponds to the manufacturer's equipment submittal data.</p>	04.15.14
M-16	<p><b>08.26.13--</b> During TAB verification, we noted the final unit data including final airflow reports were missing for AHU-15 (the HRU) from the TAB report. The associated VAV's serving the Area 100 basement were verified as being properly balanced.</p>	<p>Riley engineering needs to complete TAB work on AHU-15 and provide it in their final TAB report.</p>	<p>Riley engineering has resubmitted their latest TAB report and we have verified all operating data has been provided by them for AHU-15.</p>	11.20.13



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-17	<p><b>08.26.13--</b> During functional performance testing, we discovered the exhaust air valves had been installed backwards, although they were in per the drawings. The issue being the flow measuring device and modulating damper were installed downstream of the direction the air flows, severely limiting the ability to adequately measure and control airflow quantities. TAB work could not be completed while in this configuration either. CSG will complete functional performance testing on the EAV's on our next site visit where we will also verify air flows with the TAB contractor.</p>		<p>The contractors corrected the installation and notified us they were ready for testing. CSG verified the proper installation and operation of the exhaust air valves located within the Science Classrooms meets the intent of the design documents.</p>	11.20.13
M-18	<p><b>08.26.13--</b> During functional performance testing, we noted that because the ductwork system for AHU-19 was not to be completed as part of this phase 1 work, the system would not be able to function as a normally variable air volume system must in order to provide adequate space temperatures for those classrooms to be used in September 2013. The design calls for a static pressure sensor be installed 2/3 of the length down the main supply duct which places it on the lower level where construction is just under process. Without this sensor, the AHU's supply fan VFD is unable to adjust fan speeds to meet the system's demands for variable air volumes. As classroom's space temperature needs require different air volumes, the fan system must be able to react by changing fan speeds. The static pressure sensor provides a reference point from which this level of control can be had. Without it, the contractor's could only simply limit the VFD to one set point, essentially creating a constant volume system.</p>	<p>CSG suggests the contractors write an RFI regarding the placing of an additional static pressure sensor in the Upper level ductwork by which the system can measure duct static pressure and have a reference point for adjusting fan speeds through the automated control system. This was not addressed in the contract documents.</p>	<p><b>08.28.13--</b> Pat with SPH&amp;C has informed us they have placed a temporary sensor in the upper level ductwork to enable normal fan speed control for the system. During our most recent site visit, CSG verified the new static pressure control was working adequately for the first phase of work. MSI has stated this new placement may serve the entire system well enough once it has been built out. We are not certain this will be the case and will re-test the overall operation of the completed system when ready. We consider this issue closed and if needed, can open a new one if we find operational problems in the fully completed system serving the Science wing.</p>	11.20.13



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-19	<p><b>04.15.14--</b> During our most recent functional performance tests on the Lab fume hoods, we noted the alarm module was in "alarm" with the sashes adjusted to their normal working height of 18" which indicates less than desired face velocities across the sash. Even though fan CFM's may be within design parameters, if that doesn't translate to adequate face velocities at the hood, then the contractor needs to determine why this condition exists. There are several issues still present with the alarm module function.</p> <p><b>1.)</b> They are not wired to power correctly in that they are always active even when there is no power to the fume hood exhaust fan. This is incorrect and causes nuisance alarms every time the fan is turned off. The alarm module must be wired into the same switch that enables the exhaust fan to run. The alarm module should only be active when the fume hood EF is running and remain OFF as the fume hood EF is not running.</p> <p><b>2.)</b> There is no documentation provided regarding the face velocities present and the points at which these alarm modules have been calibrated to announce an alarm. At what face velocity are they enabled to signal an alarm?</p> <p><b>3.)</b> Why are there two alarm modules located on the fume hoods? Which is being used? Can the other be removed?</p> <p><b>4.)</b> How was adequate training performed when the alarm modules were not working normally? Only one module remains "safe" while all others remain in an alarm condition</p>	<p><b>Update: 02.13.14--</b> An email from Kevin with Sheldon Labs stated the following: <i>"Roger, Adam &amp; I had a conversation yesterday afternoon to discuss everything that is going on. The determination that Roger &amp; Adam came to is that even though the fume hood system is not VAV, it is behaving like one. Normally with VAV systems, fume hood alarms are not required due to the way the system operates and this is why the alarms are not calibrating. The bypass panels were not provided due to the fact an alarm was required, which I refer back to the previous statement. The solution that we came up with is to provide/install the bypass panels and Roger believes that there would a good chance this would allow the alarms to be calibrated. I will get with Adam today to have the (6) bypass panels shipped to the jobsite and coordinate with David to get them installed along with getting the alarms calibrated. I believe the hoods/blower system that was provided is sufficient for the specification" CSG has asked that all face velocities and operating parameters are documented and provided to the owner in the O&amp;M's.</i></p>	<p><b>10.02.14--</b> While on site for back checks and verification, we re-tested the fume hoods and associated alarms and found them to be working as intended by both the manufacturer and the school district.</p> <p><b>07.11.14--</b> Gary Holland, the owner of Holland Safety Equipment who supplied the alarm modules stated the following; 1. I believe Kevin confirmed that Tim has repeaters for the 500s in his office. We will use those once we get the 500's working correctly.</p> <p>2. I have been in steady communication with Dave and Kevin over the last week on what we will be looking for once Dave is onsite. Specifically,</p> <ul style="list-style-type: none"> <li>--checking current face velocities on the existing hoods</li> <li>--verifying that the hoods are acting like constant volume hoods, as far as change in velocities as the sashes go up &amp; down</li> <li>--the hoods are not on a VAV system, per the drawings</li> <li>--seeing how the monitors are working the day Dave arrives, and do troubleshooting as needed</li> <li>--we will be checking for airflow patterns that would be abnormal in a way that affect monitor performance</li> <li>--Dave will verify that there are no sash high switches installed at present</li> <li>--Dave will also verify that there has been no re-wiring of the monitor power to the fan switch</li> <li>--we will likely check the monitor's performance with the lab doors open and closed, to eliminate the possibility of pressure issues between prep rooms and class rooms</li> </ul>	<p>10.02.14</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-19 Cont'd	<p><b>The Lab Fume Hoods are not functioning as designed.</b></p> <p><b>08.26.13--</b> During functional performance testing, we noted several exhaust fume hoods located in the Science classrooms did not have their accompanying alarm modules calibrated as they still had the factory stickers on them. Typically, they must be field calibrated to alarm once the velocity drops below a prescribed volume of air across the sash opening. This allows an end user to access whether adequate airflow is present to continue using the fume hood safely. These modules cannot come factory calibrated as variables with airflows may exist in the field that cannot be duplicated at the factory such as fan speeds, ductwork configuration and leakage tolerances.</p>	<p><b>Continued:</b></p> <p><b>11.25.13--</b> Petra stated they were reviewing the specifications to determine whether the manufacturer is responsible for any wiring or calibration of the local audible alarm modules or whether they or their subs do. They will provide clarification.</p>	<p><b>Continued:</b></p> <p><b>06.26.14--</b> Gary Holland stated the following per email; "Steven--Our fume hood monitors can be wired such that they will power off when another switch they are connected to is also turned off. Typically this would be the hood's fan switch. If the 500's power is connected to an "on 24/7" outlet, the 500 would never be turned off and would go into alarm whenever the airflow goes below the alarm point."</p>	10.02.14
M-20	<p>The Welding shop make up air unit, AHU-3, was not operating and awaiting installation of control modules and valves.</p> <p><b>11.20.13--</b> Additional testing has revealed the make up air unit still does not function. Although it is receiving an enable command via the DDC system, and the local control switch is placed in either Auto or Hand, this fan will not start or provide make up ventilation conditioned air to the space as various exhaust fans are enabled in the welding shop.</p> <p><b>08.26.13--</b> During functional performance testing, we noted control modules and valves not yet installed on AHU-23 which his the MAU air unit in the Welding Shop. Both the Hasting Module, which is the thermostat and fan switch, and the sump drain solenoid valve had not been installed.</p>	<p>Bruce HVAC should complete installation of all control parts necessary to render the MAU unit fully operational. CSG will perform FPT's on a subsequent visit.</p>	<p>Further functional performance testing at our most recent site visit was concluded. The AHU-23 serving as make up air for the welding shop was working properly and the sequence of operations functioned per plans and specifications.</p>	04.15.14
M-21	<p><b>08.26.13--</b> During functional performance testing, we noted no power to VAV 19-28 rendered it non operational and not available for testing. Bruce HVAC mentioned a blown transformer was the cause.</p>		<p>CSG verified the VAV box was powered and functioning normally. The sequence of operations was tested and working per plans and specifications.</p>	11.20.13
M-22	<p><b>08.26.13--</b> During functional performance testing, the Woodshop was in the process of being painted with all HVAC openings and inlets covered for protection. No HVAC systems were operating at the time of our site visit. Systems will be tested at a subsequent visit.</p>		<p>CSG has verified the HVAC systems within the wood shop were operating and available for functional performance testing. Furthermore, test results determined the system is functioning per design and specifications.</p>	11.20.13



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M-23	<b>08.26.13--</b> During functional performance testing, we noted two pre-filters were missing from the bank within AHU-14. The result is prematurely loading the more expensive final filters and lowering the useful life of the filter, requiring change out sooner than most.	Bruce HVAC should ensure all final filters are in place and document all future changes as required in the specifications.	<b>10.16.13--</b> Bruce HVAC has notified us they have installed the missing filters. CSG verified they were installed during our November site visit.	11.20.13
P-24	<b>08.26.13--</b> Several roof drains did not yet have the basket strainers installed and several were filled with construction debris and garbage. If there are any clogged downspouts, this is likely a good reason.	Contractors should complete installation and clean up all surrounding debris before the rainy season begins.	<b>10.16.13--</b> JRT Mechanical has notified us the basket strainers have all been installed and are free from debris inhibiting flow. This was verified during our November site visit.	11.20.13
P-25	<b>08.26.13--</b> During functional performance testing in Area 100, we noted the toilet in the Coach's 103 bathroom leaked and had water pooled beneath it.		CSG inspected the toilet's operation and no further leaks were noted as of our November site visit.	11.20.13
P-26	<b>08.26.13--</b> During functional performance testing in the Area 100 Girls Locker room, the middle stall toilet would continually flush without anyone present and seemingly no motion of any kind.		JRT Mechanical has notified us they have completed this work. Adjustment of the automatic flush valve was necessary. This was verified during our November site visit.	11.20.13
P-27	<b>08.26.13--</b> During functional performance testing in Area 100, we noted no running water from the right sink located in the Girls Locker room.		JRT Mechanical has corrected this issue and it has been verified by CSG at a subsequent visit.	11.20.13
P-28	<b>08.26.13--</b> During functional performance testing in Area 100, the drains in the Girls Locker room shower were plugged with standing water. Showers were not tested while work was underway to discover the stoppage.		Once the drains were cleared by JRT, showers were tested for both adequate flow and temperatures. No additional issues were noted.'	11.20.13
P-29	<b>08.26.13--</b> During functional performance testing in Area 100 Girls Locker room, we noted a pipe running along the shower wall that was open. Is this to be demolished? What is to become of it?		JRT has completed this installation.	11.20.13
P-30	<b>08.26.13--</b> During functional performance testing in the Area 100 Boys Locker room, The middle of 5 showers and the one adjacent to it closest to the perimeter wall only had lukewarm at best from them. What has the temperature been set for these showers?		JRT Mechanical has corrected this issue and it has been verified by CSG at a subsequent visit.	11.20.13



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
P-31	<b>08.26.13--</b> During functional performance testing in the Boys Locker room, the coach's bathroom 107 had very poor hot water flow from it.		JRT Mechanical has made adjustments that resulted in better flow.	11.20.13
P-32	<b>08.26.13--</b> During functional performance testing in Area 100, we noticed a severely water stained ceiling tile in Hall 135. Located above in in the ceiling were sprinkler piping and plumbing.	JRT should investigate what the source of the water is.	Tile has been replaced although the source of the leak has never been relayed to us.	11.20.13
P-33	<b>08.26.13--</b> During functional performance testing, we noted the under sink acid neutralization assembly had not been completely installed with a bottle labeled "bad" was placed over the fixture.		JRT Mechanical has completed the installation and it has been verified by CSG at a subsequent visit.	11.20.13
P-34	<b>08.26.13--</b> During functional performance testing in Area 100, we noted the toilet in the Coach's 107 bathroom leaked and had water pooled beneath it.		No further leaks were noted as of our November site visit.	11.20.13
E-35	<b>08.26.13--</b> During functional performance testing in the Boy's Locker room, we noted the light switch for the Coach's 107 bathroom had not yet been installed and lights were not tested. CSG will verify at a subsequent visit.		During our November site visit, the light switches were tested and found to be working normally.	11.20.13
E-36	<b>08.26.13--</b> During functional performance testing in the Boy's Locker room, the GFI electrical receptacle in between sinks furthest from end of building has an open ground and doesn't trip when the test button on our plug tester is pushed. It does ,however, work when the receptacle's test button is pushed.		TCE stated there was a bad ground and the receptacle was replaced. CSG verified it was operating normally.	11.20.13
E-37	<b>08.26.13--</b> During functional performance testing in the Boy's Locker room Coach's Office 107, we noted the light switch orientation was such that for one pole, "ON" was in the up position and for the adjacent pole, "ON" was in the down position. No 3-way switch for this space.	TCE should ensure all light switching duties match the details in the E-drawings as well as maintain uniformity throughout the entire school.	During our November site visit, the light switches were tested and found to be working normally.	11.20.13



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-38	<p><b>While on site, it was generally noted the low voltage lighting controls system has not been programmed correctly.</b></p> <p><b>01.06.15--</b> While on site completing back checks on Cx issues, Linda Colasurdo, Matt Videen and I reviewed the general low voltage lighting throughout the campus. We determined the "ALL ON" buttons to be programmed on all LV panels located at entries were still not programmed to turn on all common corridor lighting as was agreed upon with the Eastmont School District. All exterior and parking lot lighting was off last night and this morning. It appears as though the timeclock or programming is not finished. Additional programming will need to be completed. Linda will remain the point of contact with the lighting vendor.</p> <p><b>09.30.14--</b> We noted all exterior perimeter lighting remained on during daylight hours while cycling off over night. We also noted the up lights inside the Atrium remained on during the day while natural light levels were high enough to no require them to be on. Locker room lights LV panels did not appear to control anything. Entry way LV Panels have not been programmed to cycle on all common area lighting. Staff does not know how to turn them on or off as needed. The parking lot lights dusk to dawn operation is not working normally.</p>	<p><b>10.20.14--</b>TCE stated they need to continue to observe and correct programing issues as they arise.</p>	<p><b>01.21.15--</b> The ESD has confirmed the new timer / clock has been delivered for TCE to install and complete the lighting controls. Linda C will provide final verification the remaining lighting control issues have been corrected.</p> <p><b>01.07.15--</b> Matt Videen stated the a new lighting controls clock / timer needed to be installed in order to get the exterior lighting working correctly per schedule.</p> <p><b>10.02.14--</b>Mike Gregory was on site checking lighting operations and stated the following via an email to TCE; <i>"I needed to confirm relay locations and load ID's to make sure we had the correct ID for all the relays (see attached). After that I needed to make sure the proper relays were in the proper scheduling &amp; switch groups. That took a lot of time. There was also a panel ID issue that was corrected. After that I educated Nick as to how the panels worked and how to change relay/channel assignments. I think he now has a very comfortable understanding of how everything operates and can make changes if they need to be made anytime in the future.</i></p> <p><i>Next was looking at the points brought in my discussion with Nick and the Principal (Lance). The outside lights were mentioned as "being ON all day but that was because Nick had been turning them ON not knowing which relays they were. Auxiliary GYM lights were mentioned as being ON all night. That was corrected with assigning those relays to a different schedule. There was also a switch that wasn't energized, that I mentioned to Dillon. He was going to troubleshoot that and then program it after he brought it online. There were also a couple of switches that weren't operating correctly"</i></p>	<p>01.28.15</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-38 Cont'd	<p><b>While on site, it was generally noted the low voltage lighting controls system has not been programmed correctly.</b></p> <p><b>08.13.14--</b> Linda C confirmed the LV lighting controls switch layout has been agreed upon by the district and provided to TCE.</p> <p><b>04.15.14--</b> In speaking with Linda C, we have determined that we will wait to complete all final testing of the Low Voltage lighting controls until she's had ample time to work with the district in identifying the switch/lamp configurations that will work best for the district and staff.</p> <p><b>08.26.13--</b> During functional performance testing of Phase 1 &amp; 2 lighting, in the both the Boy's and Girl's Locker room, the Low Voltage Lighting control panels were not working which seems appropriate given the time of day. What is to occur during unoccupied hours? Has schedule been provided? What has been programmed for each zone etc.?</p>	<p><b>02.27.14--</b> TCE responded with the following; "Please note, lighting is currently programmed per plans. If the owner wants a change, we need the owner to provide a schedule they want programmed then we can coordinate with lighting control vendor for programming."</p>	<p><b>Mike Gregory's continued 10.02.14 statement:</b>  <i>"I needed to ask WS how to correct it but at that time there wasn't anybody from WS available. I will pursue that issue and get back to Nick. I also mentioned to Nick to document any other issues and send them to me and I will do whatever is necessary to make things right. What we need to do now is watch what goes on and address any issue as it arises. The network system health tested positively and correcting the duplicate panel ID should help a lot."</i></p>	01.28.15
E-39	<p><b>08.26.13--</b> During functional performance testing in the Girl's Locker room Coach's Office 118, we noted the light switch orientation was such that for one pole, "ON" was in the up position and for the adjacent pole, "ON" was in the down position. No 3-way switch for this space.</p>		<p>During our November site visit, the light switches were tested and found to be working normally and installed with continuity throughout the school with regards to the on position being up.</p>	11.20.13
E-40	<p><b>08.26.13--</b> During functional performance testing in the Girl's Locker room, the GFI electrical receptacle in between sinks closest to the Coach's Office has an open ground and doesn't trip when the test button on our plug tester is pushed. It does, however, work when the receptacle's test button is pushed.</p>		<p>TCE stated there was a bad ground and the receptacle was replaced. CSG verified it was operating normally.</p>	11.20.13



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-41	<b>08.26.13--</b> During functional performance testing, none of the three hand dryers were operating and were not tested.		During our November site visit CSG verified all hand dryers were operational.	11.20.13
E-42	<b>08.26.13--</b> During functional performance testing in the Girls locker room, we noted several uncovered electrical boxes throughout the area. No wiring appeared to be pulled to them. Are they to be covered?		During our November site visit CSG verified all open electrical boxes had been adequately covered.	11.20.13
E-43	<b>08.26.13--</b> During functional performance testing in the Sports Med classroom 127, we noted several uncovered electrical boxes throughout the area. No wiring appeared to be pulled to them. Are they to be covered?		During our November site visit CSG verified all open electrical boxes had been adequately covered.	11.20.13
E-44	<b>08.26.13--</b> During functional performance testing in the Gym and Adjacent Storage rooms, we noted several uncovered electrical boxes throughout the area. No wiring appeared to be pulled to them. Are they to be covered?		During our November site visit CSG verified all open electrical boxes had been adequately covered.	11.20.13
E-45	<b>04.15.14--</b> As of this date, there was still one fixture with burned out tubes that require replacement. What is the expected life span of these tubes? Do they require a burn-in period? <b>08.26.13--</b> During functional performance testing in the Gym, we noted there were already 8 fixtures where the bulbs were either burned out or were simply not working.		CSG verified all lamps had been replaced and were working normally. <b>02.27.14--</b> TCE responded with the following; on 01.08.14 all lamps and ballast ordered in December 2013 have been replaced and found to be all working. <b>11.01.13--</b> 4 (4-lamp) have been changed. 4 (2-lamp) remain and will be addressed week of 11/15.	10.02.14
E-46	<b>08.26.13--</b> During functional performance testing in the Gym, we noted there was no power to the cooler for the water fountain and it could not be tested. CSG will do so at a subsequent visit.		During our November site visit CSG verified power was supplied to the water coolers.	11.20.13



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-47	<p><b>09.30.14-</b> Back checks of the lighting systems concluded there are still inconsistencies with the light switching duties in relation to the detail on sheet E-500. Particularly so when the switch will not be mounted on any walls perpendicular to the perimeter windows, which is not accounted for the electrical detail. CSG held a brief meeting on site in order to come to an understanding with what the expectations of the district are regarding the switching duties. ESD electrician John Kiedrowski, Linda Colasurdo (CSG), Tim Franz (Petra), and Dillon Thomason (TCE) were in attendance and all settled on the proper layout of the switches when they are mounted to either side of the entry door. The switches closest to the door will be tied to the closest zone to the entry and teaching wall. The next set of switches will control daylighting zone 2 and the furthest switches daylighting zone 1.</p> <p><b>08.26.13--</b> During testing of lighting throughout the school, we noted several instances where the switching duties did not match what is showing in details # A-1 &amp; D-1 on sheet E 500. Primarily, the "b2" switch, which should always be located at the bottom of the two, and is supposed to be de-energized as the lights are stepped down via the daylighting controls, have not always been wired as such. At times, CSG noted the "a" switch being de-energized. Also, the placement of the order of the switches from "a" to "b" to "c" have not followed the details which indicates the "a" is always to control daylight zone 1, the "b" always controls daylight zone 2 and the "c" always controls the teaching and zone 3 with respect to the windows.</p>	<p><b>Update: 08.13.14--</b> TCE has stated the switches have been rewired and the lighting works per plans, however, as of our most recent site visit on 09.30.14, CSG verified in fact, all previous reported deficiencies with the classroom lighting controls systems had not been addressed by TCE. Testing of the final phase of work indicated additional issues as well which are singularly documented further down the report. TCE should verify all light switch duties have been wired according to the detail on sheet E 500. Where there may be discrepancies with the floor plans, they should verify with Coffman engineers as to the order of the switch configuration. Please ensure the as builds drawings include any changes that have been approved or made from the bid set documents. We have gone through this with Brandon and will verify at a subsequent visit.</p>	<p><b>01.06.15--</b> CSG was on site with TCE, Linda C and Seann T to review the lighting and switching duties in the 700 and 800 wings and found some were still not working according to the electrical detail. TCE made all corrections on the spot to those that were found still not working correctly. CSG verified all classrooms light switching duties were installed per plans and specifications.</p> <p><b>10.20.14--</b> TCE states wiring at switch is corrected and functioning per plans.</p> <p><b>10.06.14--</b> Email from Travis Sanchez of TCE claimed they have gone through the switch wiring deficiencies in Phase 1A classrooms.</p> <p><b>04.15.14--</b> Linda C has confirmed no other diagrams or documents has been provided to TCE directing them of any layout changes. CSG as completed back checks and found several operating issues that still require correction by the contractor.</p> <p><b>02.27.14--</b> TCE responded with the following; <i>"on 12.13.13, TCE addressed the wiring in this area twice - once per plans and once following a diagram provided by the owner which differs from the plans. I recommend this area be reviewed with TCE and the Owner to insure we meet what the owner desires."</i></p>	01.06.15
E-48	<p><b>04.15.14--</b> Back checks completed at the last site visit indicates there is still one down light out located in front of Classroom #749 that is not working.</p> <p><b>11.20.13--</b> Only one down light was noted as not working yet.</p> <p><b>08.26.13--</b> None of the down lighting throughout the entire 700 and 800 areas was operating normally at the time of our site visit. In some cases lighting was on, in others it was off. Area work was still under way and was not fully complete enough for testing. CSG will do so at a subsequent visit. What is the normal sequence for this lighting?</p>	<p><b>04.15.14--</b> TCE still has one fixture to correct located at room 749</p>	<p><b>10.02.14--</b> CSG re-visited this classroom and noted all ceiling lighting fixtures were working per plans and specifications.</p> <p><b>08.13.14--</b> TCE has stated 1 lamp was replaced and is now working and can be back checked.</p> <p><b>2.10.14--</b> TCE stated ballasts were changed and lights were now working. However, our visit in April revealed one down light was still not working properly.</p>	10.02.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-49	<p>Classroom 745--Half of center window fixture lamps are burned out.</p> <p><b>09.30.14</b>--Further back checks revealed the status of the lighting systems has not changed and still not functioning per plans and specs.</p> <p><b>04.15.14</b>--Classroom 745-- there is a fixture that only reaches 50% of brightness, with no daylighting active. When daylighting is active, the fixture turns off completely. Switching duties regarding the de-energizing of the lower switch (#2) are not yet working per the detail on E-500.</p> <p><b>08.26.13</b>-- Half of center window fixture lamps are burned out.</p>	<p><b>08.13.14</b>--TCE has stated 1 ballast was replaced and is now working and can be back checked. Recent testing indicates there is no change.</p> <p><b>04.15.14</b>-- TCE will need to investigate the wiring in this space to ensure proper connections with the correct switch. CSG has provided a new lighting installation checklist to use during installation that will aid the contractors prior to calling for additional back checks.</p>	<p><b>01.06.15</b>-- CSG verified the lighting system in this classroom worked per plans and specifications once TCE made the necessary wiring corrections and installed new ballasts.</p> <p><b>10.20.14</b>-- TCE states ballasts were changed in fixtures and switch wiring was corrected.</p> <p><b>10.06.14</b>--Email from Travis Sanchez of TCE claimed they have gone through the switch wiring deficiencies in Phase 1A classrooms. Also stated there are 4 daylight dimming sensors (Photo cells) to be installed in the south part of 700 which are on order.</p>	01.06.15
E-50	<p>Classroom 831--Center window fixture lamp does not work.</p> <p><b>09.30.14</b>--Further back checks revealed the status of the lighting systems has not changed and still not functioning per plans and specs.</p> <p><b>04.15.14</b>--Classroom 831--Either switch turns on a zone of lights to full brightness instead of each switch cycling on 50% until full brightness is attained. Switching duties regarding the de-energizing of the lower switch (#2) are not yet working per the detail on E-500.</p> <p><b>08.26.13</b>-- Center window fixture lamp does not work.</p>	<p><b>08.13.14</b>--TCE has stated 1 ballast was replaced and is now working and can be back checked. Recent testing indicates there is no change.</p> <p><b>04.15.14</b>-- TCE will need to investigate the wiring in this space to ensure proper connections with the correct switch. CSG has provided a new lighting installation checklist to use during installation that will aid the contractors prior to calling for additional back checks.</p>	<p><b>01.06.15</b>-- CSG verified the lighting system in this classroom worked per plans and specifications once TCE made the necessary wiring corrections and installed new ballasts.</p> <p><b>10.20.14</b>-- TCE states a new power pack and ballasts were changed in fixtures and switch wiring was corrected.</p> <p><b>10.06.14</b>--Email from Travis Sanchez of TCE claimed they have gone through the switch wiring deficiencies in Phase 1A classrooms. Also stated there are 4 daylight dimming sensors (Photo cells) to be installed in the south part of 700 which are on order.</p>	01.06.15
E-51	<p>Classroom 832--Center window fixture lamp does not work.</p> <p><b>09.30.14</b>--Further back checks revealed the status of the lighting systems has not changed and still not functioning per plans and specs.</p> <p><b>04.15.14</b>-- Classroom 832; With daylighting active, lamps did not dim in zone 1 yet, the top switch was still de-energized. (which is also incorrect as it should be the bottom switch). Zone 2 also did not dim when daylighting was active but the correct switch did become de-energized (the bottom switch). With no daylighting active, either switch will turn on any given zone's lights completely yet both are needed to be in the off position in order for the lights to actually turn off.</p> <p><b>08.26.13</b>-- Center window fixture lamp does not work.</p>	<p><b>08.13.14</b>--TCE has stated they are waiting on a back ordered ballast. Once it arrives, it will installed and this issue can be back checked.</p> <p><b>04.15.14</b>-- TCE will need to investigate the wiring in this space to ensure proper connections with the correct switch. CSG has provided a new lighting installation checklist to use during installation that will aid the contractors prior to calling for additional back checks.</p>	<p><b>01.06.15</b>-- CSG verified the lighting system in this classroom worked per plans and specifications once TCE made the necessary wiring corrections and installed new ballasts.</p> <p><b>10.20.14</b>-- TCE states a new power pack and ballasts were changed in fixtures and switch wiring was corrected.</p> <p><b>10.06.14</b>-- Email from Travis Sanchez of TCE claimed they have gone through the switch wiring deficiencies in Phase 1A classrooms. Also stated there are 4 daylight dimming sensors (Photo cells) to be installed in the south part of 700 which are on order.</p>	01.06.15



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E-52	<p><b>08.26.13--</b> Classroom 831-- the mini fridge plug has no power to it.</p>		<p>During our November site visit CSG verified power was supplied to this receptacle.</p>	<p>11.20.13</p>
M-53	<p><b>11.20.13--</b>During functional performance testing of the HVAC systems, we noted on several occasions where incorrect min/max airflow set points were entered. As an example, VAV 19-23 has a design min/max CFM set point of 250/500 that was operating at 125 CFM. VAV 19-26 has design CFM set points of 200/400 that was found at 250/500. In some cases, the Minimum CFM set points for both Occupied and Unoccupied modes have been left at zero. These are only two examples and all VAV's/EAV's should be verified as having the correct operating parameters entered.</p>	<p>The contractors need to be certain all correct operating set points and parameters has been entered correctly and properly coordinated between the SPH&amp;C, Riley Engineers and MSI.</p>	<p>CSG and Pat Fullerton with SPH&amp;C reviewed the programming for the VAV boxes and CFM set points. He stated they work off a programmed percentage of the Maximum set point which is entered and won't always necessarily move directly to the value inputted into the program. All other set points will be entered in as "0" CFM.</p>	<p>04.16.14</p>
M-54	<p>The hallway space temps are well below the WAC requirements for occupied schools</p> <p><b>04.03.14--</b> Shawn with Petra stated the following via email; "I believe this has been resolved since we insulated the hallway per CCA #63 but waiting for confirmation." However, during our most recent site visit on 04.15.14, the expansion joint was still open as it always has been, allowing non tempered air, dirt and dust from the area still under construction to enter into the unfinished corridor. This, in turn, had an extremely negative effect on the other interior spaces (Labs &amp; Pre-K Classrooms etc.) due to the fact the shared HRU was having air as low as 55°F being returned to it from the space, instead of a more tempered 68-70°F. This limited the HRU's ability to reclaim heat being put into the building and increased run times on the electric resistance heater, as well as increasing the energy necessary to operate in such a matter all winter long and during shoulder seasons.</p> <p><b>11.20.13--</b> As noted as part of other HVAC issues, the corridors cannot reach occupied space temperatures and is in violation of the WAC by not providing adequate occupied space temps in school buildings.</p>	<p>Petra needs to seal the finished portion of the Upper Classroom section from the open envelope of the adjacent. The Aluminum Joint Cover has not been installed, allowing a severe infiltration of unconditioned airflow into the area. This was discussed during the Cx meeting held on 11.20.13.</p>	<p><b>11-18-14--</b> Pat Fullerton provided trend data for both the 700/800 corridors as well as the adjacent 800 northerly classrooms. They were distributed among all Cx team members including ALSC and MSI. Trend data provided indicates the space temperature heating set point seems to be adequately maintained throughout occupied hours.</p> <p><b>10.01.14--</b> During the Cx meeting on 10.01.14, Petra stated they had indeed completed the construction of the expansion joint and insulation per the detail provided by ALSC.. CSG will simply verify adequate space temperatures are being maintained once ambient temps are cooler.</p> <p><b>04.15.14--</b> During back checks, we noted the corridor expansion joint has never been covered allowing non-tempered air to infiltrate the space, driving down temperatures and increasing energy costs associated with the constant heating necessary to try and maintain space temps. During the course of the past winter, it seems excessive run times on the heating</p>	<p>11.18.14</p>



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M-55	<p><b>11.20.13--</b> The graphical displays for the Fume hoods located in Area 800 Science classrooms/prep rooms are not easily located. They do not reside on the equipment tree nor is there a link to them on the floor plan graphic for the area. We stumbled upon them while viewing the EAV for a Science classroom adjacent to the Prep room. The display should include both the Fan number, the space it resides in and possibly a link to the associated fan systems it works in conjunction with as it affects associated VAV / EAV CFM set points to adjacent spaces.</p>	<p>SPH&amp;C should ensure each graphical display contains the fan ID's as well as the rooms they serve.</p>	<p>All graphical displays were reviewed by the Eastmont School District maintenance staff with Pat Fullerton of SPH&amp;C and were found to be acceptable.</p>	<p>03.27.15</p>
M-56	<p><b>11.20.13--</b>There are several spaces that are not approaching design space temperatures by the time Occupied hours begin. For example, Area 800 classrooms and hallways were well below set point at 8:30AM, causing AHU-19 to remain in Morning Warm-Up mode; operating at 0% OSA and providing no ventilation to occupied spaces. AHU-19 was operating with the appropriate sequence for the environment. It was providing an adequate supply air temperature of 62°F. However, viewing the attached controls photo reveals return air from the space is only 54°F. VAV 19-30 serving class 829 was providing 107.8°F supply air temperature at 600 CFM which was also appropriate, however the room temp was only 62°F. VAV's 19-29, 19-31 and those serving the corridors all reported similar conditions. Those VAV's serving the Science classrooms will have no ventilation airflow to make up for the exhaust air being removed via a separate fan system, creating extremely negative space conditions. We wonder whether the CFM set points are adequate for the spaces? Comparing the heating volume of air to other similarly sized classrooms, the heating CFM of 400 for the spaces mentioned here may not be enough. This may be addressed as part of Issue M-53. It may also need to be reviewed by MSI if an increase in volume is necessary. Another contributing factor is directly related to Issue M-54 in that the hallway is not being isolated from the adjacent construction zone which has no enclosed building envelope yet. With outside temperatures in the 20's, freeze protection of the sprinkler piping must be considered.</p>	<p><b>1.)</b> SPH&amp;C needs to determine whether the Optimum Start Stop Programming (OSSP) is working properly. Also, the Morning Warm up sequence needs to have provisions for those times space temperatures aren't met during occupied hours and ventilation air must still be provided to meet WAC requirements in classrooms. This should be applied to all HVAC systems throughout the High School and not solely for those mentioned as part of this issue.  <b>2.)</b> MSI may need to review the CFM set points for those classrooms that cannot meet space set points prior to occupied hours, once OSSP is found to be working normally.  <b>3.)</b> Petra should address Issue ID M-54 prior to seeking additional designer input as the 50 degree hallways could be contributing to adjacent spaces not adequately heating up to temp if space pressurization is not correct.</p>	<p>Once the building envelope was enclosed and insulated, we again reviewed operations in the space. And although they typically remain slightly cooler than other occupied spaces, because it is a transient space that isn't necessarily considered negative. The fact the temperature sensors can be influenced by cold air with the opening of several entry doors may also explain the slightly lower temperatures being reported on the DDC front end. Pat Fullerton with SPH&amp;C stated the following; <i>"In reality, the DDC system was doing it's job. Because the cold air being returned to the HRU is only 55, due to the lack of a sealed envelope, heat recovery is no longer available and the mixed air temperature had approached the low level MAT, thus closing the OSA damper and allowing the MAT to rise with the mixture of warmer, return air. In theory, it is working, however, we cannot verify it until the building envelope is properly sealed."</i> CSG verified the sequence of operations was working per plans and specifications. If in the future these spaces are considered uncomfortably cooler than others, we can re-examine the system and re-engage the designers as well. Optimum start stop programming appears to be working as designed.</p>	<p>11.18.14</p>



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M-57	<p><b>11.20.13--</b> The fume hoods located in the area 800 Science prep rooms were not integrated with the correct VAV box serving the same space. Presently, as the fume hood fan is enabled on, the VAV box serving the adjacent Science classroom is being re-indexed to make up the entire amount of exhaust air. The problem is it doesn't serve the Prep room at all. As the fume hood switch is enabled, the VAV box serving the Prep room should increase the primary air to the space to make up air for the added exhaust. Because the VAV box serving the prep rooms is not sized to manage the entire amount of make up air, the sequence states <i>additional make up air shall come from the adjacent classrooms</i>. Presently, it is unclear whether the result is to re-index the primary airflow to the adjacent classroom's VAV box in addition to doing so for the VAV box serving the actual Prep room.</p>	<p>SPH&amp;C needs to be certain the correct VAV's, FEF's and EAV's are integrated together properly. An RFI to MSI may be necessary to determine exactly how the various pieces of HVAC equipment are to work together. Also, the graphical displays need to provide a sensible way for an end user to move between each of them as they verify correct systems operations. Having to continually search the equipment tree, particularly when the fans are being represented in a different area, is very confusing.</p>	<p>Pat Fullerton re-mapped the VAV and EAV boxes to the correct fume hoods so that not only the correct sequences were maintained between equipment but they are now being displayed appropriately as well. CSG verified the sequences of operations worked according to plans and specifications.</p>	04.15.14
M-58	<p><b>11.20.13--</b> During functional performance testing, we determined the electric resistance heater for VAV 7-1 serving the Agriculture Lab 610 was not functioning properly. With a 100% heating command, the discharge air temperature only reaches approximately 67°F. The design DAT is 94°F. Although the space cannot reach its set point of 70°F, it seems to be able to slowly heat to nearly 68°F which meets the WAC for temperatures in school buildings.</p>	<p>Bruce, and perhaps SPH&amp;C needs to review the operation of the electric resistance heater to determine the failure. Either repair or replacement is necessary.</p>	<p>A loose wire to the eclectic heater was the root cause the heater would not work properly. CSG re-tested and verified it was now working per plans and specifications. Space temperatures are presently being adequately maintained.</p>	03.13.14
M-59	<p><b>12.04.13--</b> This fan system has been temporarily shut down until the heater section can be replaced or repaired.  <b>11.20.13--</b> During functional performance testing, we determined the electric resistance heater for AHU-5 serving the Woods Shop 622 was not functioning properly. With a 100% heating command, the discharge air temperature only reaches approximately 54°F and had a Delta T of 3°F. This space cannot maintain the minimum space temperature as required by the WAC for school buildings.</p>	<p>Bruce, and perhaps SPH&amp;C needs to review the operation of the electric resistance heater to determine the failure. Either repair or replacement is necessary.</p>	<p>Bruce HVAC replaced failed parts for the electric resistance heater section under warranty. Bruce HVAC failed to provide any additional information regarding which parts had failed. CSG re-tested and verified the electric resistance heater is now working per plans and specifications.</p>	01.15.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-60	<p><b>11.20.13--</b> During functional performance testing, we determined the electric resistance heater for VAV 19-28 serving the Science classroom 832 was not functioning properly. With a 100% heating command, the discharge air temperature only reaches approximately 61°F. The design DAT is 80°F. The space temperature at 9:00AM was only 59°F which does not meet the WAC for temperatures in school buildings.</p>	<p>Bruce, and perhaps SPH&amp;C needs to review the operation of the electric resistance heater to determine the failure. Either repair or replacement is necessary.</p>	<p>On <b>03.13.14</b>, Pat Fullerton with SPH&amp;C stated the following; <i>"The signal to the SCR heater is working. We have status of the electric heat. I tested this morning. The DAT reached 86 degrees. We are controlling the VAV to what the equipment is capable of."</i> CSG re-tested the heating operations of the system and found them to be working per plans and specifications.</p>	04.15.14
M-61	<p><b>11.20.13--</b> During functional performance testing, we determined AHU-23 which is the Make up fan for the Welding Shop was not operable with the disconnect at the unit shut off. This provided make up air for when any of the various exhaust systems within the welding shop are on. Without AHU-23 running, when exhaust fans are on, the space becomes extremely negative, drawing air from the adjacent Metal Shop and through any openings to the outdoors. The TAB report indicates this system was not yet tested or balanced.</p>	<p><b>1.)</b> Bruce needs to verify and whether or not this unit can function normally.  <b>2.)</b> Riley Engineering needs to finalize all TAB work and include it in an updated TAB report.</p>	<p>Once the contractors completed the installation and start up the make up air unit, CSG continued functional performance testing on AHU-23. All testing revealed it to be working per plans and specifications.</p>	04.15.14
M-62	<p><b>04.15.14--</b> CSG back checked this fan and determined the fan is still not operable. The light fixture worked. When the button was turned on for the fan, we could here the relay making inside the control cabinet, but the fan did not start. The VFD was not in fault but remained at 0% signal. Also, there is a safety concern that there is no enclosure around the actual fan blades. If a kid were to reach inside the opening while the fan is operating, they would become severely injured.</p> <p><b>11.20.13--</b> During functional performance testing, we determined the exhaust fan for the welding shop paint booth was not running. All electrical in the paint booth itself appears to incomplete and we were told the space was to remain locked until the Inspector cleared it for use.</p>	<p><b>04.23.14--</b> Bruce HVAC will send a technician next week to verify the VFD functions normally and will report back.  <b><i>The Eastmont School District should inspect the access to the fan blades of the Metals Spray Booth to better determine whether a dangerous condition exists and whether a remedy is required.</i></b></p>	<p><b>08.29.14--</b>Petra filed an RFI and the response provided by ALSC was that Per IFC 903.4 #5, the valve can be locked open and does not need to be connected to the fire alarm system. Eastmont School District will take ownership of this as it is presently installed.  Bruce HVAC replied that the paint booth exhaust fan is working, VFD faults have been resolved. CSG verified the manual controls for the spray booth fan were working normally.</p>	8.29.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-63	<b>11.20.13--</b> During functional performance testing, we determined the Woods Make up air fan, AHU-16 was not working nor were there any switches in the space to control it from. Was this system to be completed as part of Phase II work?	Can Petra and Bruce comment on what is to occur in this space to make it operable?	On <b>03.13.14</b> , Pat Fullerton with SPH&C stated the following; <i>"AHU-16 runs when status has been proven from a current sensor installed on the paint booth exhaust fan."</i> Once the paint booth fan was functioning normally, CSG verified it is working	04.15.14
M-64	<b>11.20.13--</b> During functional performance testing, we determined the Woods Exhaust air fan, EF-18 was not working nor were there any switches in the space to control it from. Was this system to be completed as part of Phase II work?	Can Petra and Bruce comment on what is to occur in this space to make it operable?	On <b>03.13.14</b> , Pat Fullerton with SPH&C stated the following; <i>"I believe this is phase 2 work. I am also pretty sure this exhaust fan is for the mechanical room ventilation."</i> Once the work in Phase II work was completed, CSG verified the exhaust fan was working per plans and specifications.	04.15.14
M-65	<b>11.20.13--</b> During functional performance testing, we determined the exhaust fan for AHU-5 remained running during the Night Low Limit sequence of operation. This is incorrect per the design documents which state the exhaust fan is to remain off, keeping only the supply fan running and operating in full recirculation mode.	SPH&C was made of aware of this issue while on site and work to reprogram this sequence is in progress.	On <b>01.25.14</b> Pat Fullerton with SPH&C stated the following; <i>"Looked into programming for the AHU. The program has been changed to not allow the Exhaust / Return fan to run during unoccupied time."</i> CSG re-tested the sequences and determined they are working per plans and specifications.	04.15.14
M-66	<b>11.20.13--</b> During functional performance testing, we determined the exhaust fan for AHU-6 remained running during the Night Low Limit sequence of operation. This is incorrect per the design documents which state the EF is to remain off, keeping only the supply fan running and operating in full recirculation mode.	SPH&C was made of aware of this issue while on site and work to reprogram this sequence is in progress.	On <b>01.25.14</b> Pat Fullerton with SPH&C stated the following; <i>"Looked into programming for the AHU. The program has been changed to not allow the Exhaust / Return fan to run during unoccupied time."</i> CSG re-tested the sequences and determined they are working per plans and specifications.	04.15.14
M-67	<b>11.20.13--</b> During functional performance testing, we determined the programming parameters for the Night Low Limit sequence of operations was prohibiting it from occurring altogether. In the logic, the number of zones required to be in a call for unoccupied heating before cycling on the AHU is greater than 3. This VAV system only has two zones (VAV boxes) and will never allow the NLL sequence to begin.	SPH&C needs to review the parameters and change so that when any one zone is in a call for unoccupied heating, the fan system will be enabled. MSI may want to review to determine whether that is appropriate or whether they would like to see both zones in a call for unoccupied heating before cycling on the AHU.	On <b>01.25.14</b> Pat Fullerton with SPH&C stated the following; <i>"This has been changed to 0 until told otherwise. This is an easy change to be made to the system if need to be set back."</i> CSG re-tested the sequences and determined they are working per plans and specifications.	04.15.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-68	<b>11.20.13--</b> During functional performance testing, we determined the exhaust fan for AHU-24 remained running during the Night Low Limit sequence of operation. This is incorrect per the design documents which state the EF is to remain off, keeping only the supply fan running and operating in full recirculation mode.	SPH&C was made of aware of this issue while on site and work to reprogram this sequence is in progress.	On <b>01.25.14</b> Pat Fullerton with SPH&C stated the following; <i>" Looked into programming for the AHU. The program has been changed to not allow the Exhaust / Return fan to run during unoccupied time."</i> CSG re-tested the sequences and determined they are working per plans and specifications.	04.15.14
M-69	<b>11.20.13--</b> During functional performance testing, we determined that AHU-24's supply static pressure sensor was reporting 1.3" WC of pressure with all fans off and dampers closed. This would indicate the sensor must not be accurate or calibrated correctly. Of concern would be the system can not meet actual CFM requirements since the static pressure set point is almost being met with the supply fan off.	SPH&C should review and determine whether this sensor is accurate or what may be the cause of the it reading pressure in a system that is not running.	On <b>02.07.14</b> Pat Fullerton with SPH&C stated the following; <i>"The pressure device was bad. I have replaced and checked for accuracy. I also adjusted the static pressure to 1" wc. 1.5 seemed high after the new device was installed."</i> CSG re-tested the sequences and determined they are working per plans and specifications.	04.15.14
M-70	<b>11.20.13--</b> During functional performance testing, the graphics could not be located for SEF's 4, 8 and 9 located in the CTE area.		On <b>03.20.14</b> , The engineer of record with MSI, Brad Snow, responded to the contractors by stating the Shop exhaust fans noted are to be locally (manually) controlled by the shop instructors, and not tied into the DDC system. As such, these fans are not monitored by the DDC system, so no graphical displays will be required on the DDC computer.	04.15.14
M-71	<b>11.20.13--</b> During functional performance testing, we determined EDH-18 serving the Girls restroom in the Gym was not cycling on or being reported as cycling on when commanded to do so. The space temp = 65°F, with a 100% command on the duct heater, the status remains Off.	SPH&C along with Bruce HVAC should review and determine whether it is a DDC or mechanical issue.	On <b>01.25.14</b> Pat Fullerton with SPH&C stated the following; <i>"The program has been changed. Status of the heat is being displayed and working."</i> CSG continued performance testing and verified the electric duct heater is working normally.	04.15.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-72	<p><b>04.16.14</b>--The air flow monitoring stations calibration at the AHU's is an issue CSG will continue to monitor as the project progresses. As more AHU's come on line, we will continue to review the flow sensor operation for accuracy. We may require the TAB agency to perform back checks with us to prove the accuracy of the reported CFM values.</p> <p><b>11.20.13</b>-- During functional performance testing, we determined that several air flow measuring stations were not reporting accurately when compared to both the TAB report and each other. In some cases, the reported airflows exceeded the rating of the fan itself. The reported values are examples of our findings however, all AHU flow stations should be calibrated. The results of our findings are documented as an attachment to this report.</p>	<p>We suggest having the manufacturer re-calibrate all airflow measuring stations and include the TAB contractor's report if not personal on site readings to ensure accuracy. This should not be limited to the examples provided but include all AHU's for the entire project.</p>	<p><b>02.07.14</b>-- Pat Fullerton with SPH&amp;C stated the signal coming from the unit airflow stations fluctuates. Possibly from wind entering the hood where the sensor is installed. He scaled them to be as close as possible. The TAB contractor also verified air flows were within standard tolerances. CSG verified with the test and balance contractor that the airflow monitoring stations were reporting airflows as accurately as possible at the DDC display.</p>	11.20.14
M-73	<p><b>11.20.13</b>-- During functional performance testing, we determined that one, if not two temperature sensors in AHU-15 were not reporting accurately. The Mixed air sensor reported 70°F air while the downstream supply air temperature sensor was reporting only 62.2°F air. Although the chilled water coil is between the two, the coil was closed and the entire chilled water system remains inoperable. There is no other way the air handler can condition air to lower it by nearly 8°F.</p>	<p>SPH&amp;C and perhaps Bruce HVAC need to review whether this is an actual sensor issue or whether the supply fan may be pulling in ambient air through excessive leakage around the cabinet or access doors to the air handler itself. Please report back with any findings.</p>	<p><b>05.02.14</b>-- Pat Fullerton with SPH&amp;C stated the mixed air temperature sensor was located incorrectly and has been relocated and securely installed. CSG has re-tested and verified the sensor was reporting temperatures accurately.</p> <p><b>02.07.14</b>-- Pat Fullerton with SPH&amp;C stated the following; <i>"Looking at the logic and testing the control of the face and bypass dampers. I believe the mixed air temperature sensor may be picking up a temperature rise from the electric coils. I will follow up with a site visit to check the installed location. The HR is not being utilized enough for energy recovery."</i></p>	08.22.14
M-74	<p><b>11.20.13</b>-- The latest TAB report did not contain any operational or balancing data for the Sawdust Collector system.</p>	<p>Riley Engineers should complete this work and update the report since the equipment and sawdust collecting system is being operated by the ESD.</p>	<p>Riley Engineers provided the final TAB information when it submitted it's final report for the design engineer's review.</p>	03.25.14
M-75	<p><b>11.20.13</b>-- The latest TAB report did not contain some critical operating information regarding minimum ventilation air rates and/or damper positions. AHU's 5,</p>	<p>Riley Engineers should complete this work and update the report since the equipment and sawdust collecting system is being operated by the ESD.</p>	<p>Riley Engineers provided the final TAB information when it submitted it's final report for the design engineer's review.</p>	03.25.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-76	<b>11.20.13--</b> The Main Gym is served by two separate AHU's via separate thermostats. The AHU's have different operating parameters which may cause one unit to be in heating while the other may be in cooling. While this action may not be a direct violation of the Washington State Energy Code, we do feel that providing simultaneous heating and cooling operations, although via separate fan systems, to the same space is no different and proves to be a waste of energy for the district.	We suggest having both AHU's operating off a single T-stat if not both as averaging T-stats. This will allow the entire space to be sensed at once while maintaining uniform operations with regards to space conditioning. MSI and SPH&C should review and comment to determine whether another way of controlling space temps with separate AHU's is feasible.	<b>02.07.14--</b> Pat Fullerton with SPH&C stated he put a network point in the program to average the 2 AHU sensors. He also changed both AHU's set points to match. This will allow for both AHU's serving the Gym will always work in unison to serve the condition requirements of the space. This will limit any simultaneous heating and cooling operations in the space.	04.15.14
M-77	<b>11.20.13--</b> During functional performance testing, we determined that as AHU-5 cycled the fans down as it moved into Unoccupied mode, the fans would appear to go into a "failure" alarm.	SPH&C should review to determine what in the programming may be causing this to happen.	<b>02.07.14--</b> Pat Fullerton with SPH&C stated the graphic has been fixed. There was a delay keeping the DI and DO alarm on, which has now been removed.	04.15.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-78	<p>700 and 800 area classroom temperatures are below normal.</p> <p><b>09.30.14</b>--CSG CM group held a meeting with Cx staff, Petra and the ESD facilities and capital projects staff to discuss this issue. We all agreed to wait for cooler ambient temperatures and monitor indoor temperatures before signing off on this issue. If it is determined that space temperatures cannot be adequately maintained, both contractors and MSI may need to work together to determine why.</p> <p><b>11.20.13</b>-- During this recent week of the 2nd with ambient temperatures in the teens and 20's, we have noted several classrooms within the 700 and 800 areas are not able to reach room temperature set points by occupancy, and in some cases, all day. Even during moderate temps in the high 30's to low 40's, the Pre-School and Early Childhood classrooms do not reach space temperature set points. Often times, the space temps are in the low 60's as Occupied periods begin at the High School. Because there are several zones well below setpoint, AHU-19 remains in AM Warm up mode well into occupancy which does not provide any ventilation air to the spaces. This contributes to the negative pressurization in the Science wing due to the LEF's running and exhausting air via the EAV's, which consequently brings in the 40°F air from the adjacent hallways which are still open to the outside due to the incomplete ceiling and placing an additional load in those spaces. The design supply air heating temps are only 80°F. The result is that many spaces fall below WAC guidelines for acceptable temperatures in classrooms as well as maintaining prescribed ventilation rates during occupied hours. In order to help the spaces warm up quicker, we have changed some operating parameters that are outside the design criteria. We have temporarily increased the max supply air temperature to 75°F from 65°F. We have also increased the VAV CFM set points where heating maximum airflows were only 400 CFM. Prior to any trends taken for design review, we recommend replacing those parameters back to their design.</p>	<p>Over Christmas break, we recommend SPH&amp;C provide trends for the 700 and 800 area classrooms for CSG and MSI to review. CSG will re-enter all design operating temperatures and air flows once school is out on its winter break.</p>	<p><b>11.18.14</b>-- Pat Fullerton provided trend data for both the 700/800 corridors as well as the adjacent 800 northerly classrooms. They were distributed among all Cx team members including ALSC and MSI. Trend data provided indicates the space temperature heating set point throughout the various areas are being adequately maintained throughout occupied hours. Functional performance testing on the area HVAC equipment revealed it is working properly.</p> <p><b>03.203.14</b>-- Pat Fullerton said the trends will be enabled for the requested areas. A CCA was accepted for adding insulation to the ceiling and walls in the area.</p>	<p>11.18.14</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-79	<b>11.20.13</b> -- Trendlogs of HVAC systems need to be maintained for both MSI and CSG in order to evaluate system performance. Trendlogs should be set up to provide 3-4 weeks worth of data for review for those systems agreed upon by all.	Can SPH&C increase the period it saves trends to 3-4 weeks worth?	<b>02.07.14</b> -- Pat Fullerton with SPH&C has set up trends for various systems through the campus. CSG verified data is being accumulated and saved for future evaluation.	02.20.14
P-80	<b>11.20.13</b> -- During functional performance testing, we noted the during the flushing of the toilet located in the Boy's Coach's locker room toilet caused backsplash in the floor drain.	JRT mentioned they would adjust the trap primer flow to limit water from splashing up through the floor drain.	CSG verified the trap primer flow was adjusted and no longer splashes outside of the drain.	04.15.13
E-81	<b>02.27.14</b> --TCS stated the keyed switch for the roll up doors in the locker rooms was installed but during our inspection on 04.16.14, we have determined the keyed switch is NOT installed, and the door was manually rolled down. <b>11.20.13</b> -- During functional performance testing, we determined the roll up door separating the boys PE locker room from the boy's athletics locker room was not functioning. The motor was not yet wired the and two keyed switches did not have cores installed.	TCE should complete installation and testing to verify the roll up door assembly with all safeties in place, is working normally.	CSG has verified the keyed switches have been installed for the roll up doors and they are functioning per plans and specifications.	10.02.14
E-82	<b>11.20.13</b> -- During functional performance testing, we determined the water cooler in the Girl's Athletics Lockers did not work. The GFCI electrical receptacle it was plugged into was tripped and would not reset.	TCE probably needs to replace this receptacle with one that works.	CSG verified the water cooler was working correctly. TCE stated the GFCI receptacle was faulty and was replaced with a new one.	04.15.14
E-83	<b>04.16.14</b> -- We noted that two switches had been adequately labeled but there is still one switch adjacent to the door in between the Agricultural and Small engines shops that is missing the label. <b>11.20.13</b> -- During functional performance testing, we determined there were several wall switches in the Agricultural Science Shop that were not apparently working and did not have identifying markers.		<b>10.20.14</b> -- TCE has stated the low voltage labeling has been completed. CSG has verified the labeling meets plans and specifications.	04.15.15
M-84	<b>04.16.14</b> -- During FPT's in the Shop areas, we noted that SEF-5 which serves the welding shop hood, did not cycle on when enabled to do so via the end user switch.		<b>04.23.14</b> --TCE notified Petra there was a disconnect off at the fan on the roof. CSG will verify the operation and sequence of operations at our next site visit.	10.02.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-85	<b>04.16.14--</b> During FPT's of AHU-16, the make up fan for the woods spray booth, we noted the electric resistance heater would not cycle on when called upon to do so.	Bruce should investigate. As the project has already experienced several failures with electric resistance heaters, please provide a root cause, even if the heater overload was simply tripped. If proper start up was completed, and the amp draws are below FLA, why are safeties still tripping on the unit?	Bruce HVAC replied with the following: <i>"We have revised the discharge air temperature set point. Heating is working."</i> CSG verified the electric resistance heater worked normally. Bruce HVAC did not provide an adequate response to follow up questions regarding corrections.	10.02.14
M-86	<b>04.16.14--</b> During FPT's of EAV 1-4, with the wall switch off, the sequence of operations calls for the airflow to be 100 CFM higher than that of the VAV serving the space, in this case, VAV 19-27. We noted the CFM setpoint at the EAV was only 100 CFM total airflow.	SPH&C was notified and will be looking into the programming.	<b>05.02.14--</b> Pat Fullerton with SPH&C stated <i>"After looking into the program the logic is now corrected for the proper control."</i> CSG has re-tested the sequence of operation for EAV 1-4 and found it to be working per plans and specifications.	10.02.14
E-87	<b>04.16.14--</b> During FPT's, we noted the electrical enclosures for the exhaust fans in the welding shop were not fastened with four screws, allowing the covers to remain quite loose.	TCE should verify the installation meets code.	<b>09.14.14--</b> TCE corrected the installation and CSG has verified them to be acceptable. <b>08.14.14--</b> TCE has stated the installation meets both NEC and WAC codes. <b>CSG response:</b> Loose screws and poorly fastened plates are not. CSG will verify but if the installation is as we discovered it to be, the contractor will still have to securely fasten them.	10.02.14
E-88	<b>04.16.14--</b> There are lamps out in the Welding shop that require replacement.	TCE needs to review and replace any burned out lamps via warranty.	<b>08.13.14--</b> TCE has stated 1 lamp was replaced and is now working and can be back checked. CSG has verified the lights are all working in the Welding Shop.	10.02.14
E-89	<b>04.16.14--</b> There are lamps out in the Small Engines lab that require replacement.	TCE needs to review and replace any burned out lamps via warranty.	<b>08.13.14--</b> TCE has stated 1 ballast was replaced and is now working and can be back checked. CSG has verified the lights are all working in the Small Engines shop.	10.02.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-90	<b>04.16.14--</b> There are lamps out in the Floral Shop lab that require replacement.	TCE needs to review and replace any burned out lamps via warranty.	<b>08.13.14--</b> TCE has stated 1 ballast was replaced and is now working and can be back checked. CSG has verified the lights are all working in the Floral shop lab.	10.02.14
E-91	<b>04.16.14--</b> There are lamps out in the Woodshop lab that require replacement.	TCE needs to review and replace any burned out lamps via warranty.	<b>08.13.14--</b> TCE has stated 1 ballast was replaced and is now working and can be back checked. CSG has verified the lights are all working in the Woodshop lab.	10.02.14
E-92	<b>04.16.14--</b> During FPT's of the Wood shop lighting system, we noted the Low Voltage control panel buttons did not work or control any lighting functions in the space.	Can TCE confirm whether this panel is programmed and how the lights are presently being controlled?	<b>10.20.14--</b> TCE states the panel is programmed and final adjustments are needed. CSG has verified all lighting controls in the Wood shop have ben programmed correctly. <b>08.13.14--</b> TCE has stated the LV lighting controls have now been programmed and are ready for back checks.	01.05.15
E-93	<b>04.16.14--</b> During FPT's, we noted several occupancy sensor shut off delay settings to be well above 30 minutes before shutting of lights. CSG held a brief meeting on site with ESD electrician John Kiedrowski, Linda Colasurdo (CSG), Tim Franz (Petra), and Dillon Thomason (TCE) all present. It was determined and agreed upon that the district wanted the delays to be uniformly set throughout the entire project and to be between 10-15 minutes long. We agreed if the factory default setting was within that range, it would be okay to leave them there so long as TCE tested them to ensure they indeed cycle lighting off within the prescribed amount of time. Otherwise, TCE would field adjust them all to within 10-15 minute delay.	TCE was going to find out what the factory setting was and let everyone know. They also stated all would be final adjusted to within the set point agreed upon by the Eastmont school district.	<b>08.13.14--</b> TCE has stated there is a programming issue they had to work through. Since then, additional testing revealed the occupancy sensors have been generally cycling off lighting after 15-20 minutes of no motion in the space. CSG re-tested several classrooms and found this to be the case.	10.01.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-94	<p><b>04.16.14--</b> Fans being left in "Auto" mode are inadvertently running 24/7. During FPT's, we noted a Hand - Off - Auto switch was installed for manual control of SEF-4 located in the welding shop as part of Electrical Addendum #1. (Also for SEF-10) As such, it has been removed from any DDC integration or display as allowed for thru MSI's response to RFI # 994. H-O-A style switches are typically included on those systems where DDC integration is included, and provides a means for an end user to "override" or bypass the automated control and place the fan in "Hand" mode. The question remains as to why an H-O-A switch meant to operate DDC controlled systems has been used for a system that's solely intended to be enabled on and off by an end user? If there is no scheduled enabling via the DDC system, there is no need for an H-O-A switch, just a typical light switch that has been provided for the other shop exhaust fans would work. In order to alleviate the chances of exhaust fans running all night long while left in "Auto" mode, (SEF-4 is a 3000 CFM fan) should these end user switches be a single pole switch?</p>	<p>We still think the best method of control is to allow the DDC system to provide a daily scheduled enable/disable signal while still allowing for an end user to "override" it off and on via wall mounted switches. This would limit the chances of exhaust fans being left on all night long and throughout weekends. While we were on site, we noted they were continually left running after school hours. I am not sure that was the intention of adding H-O-A's to these two fans. We recommend the Eastmont school district and MSI review the shop fans operations. Perhaps additional training is necessary for the school staff to ensure these fans aren't left on all night, but the style of switches being used insinuates the fans are operating in an automated mode and will shut off by themselves.</p>	<p>CSG held meeting with ESD's Seann Tanner and explained the situation to him. He determined the school district would re-wire the switch to ensure the system would not be left bypassing the controls system.</p>	<p>10.01.14</p>
M-95	<p><b>08.06.14-</b> The links to Areas 200 &amp; 300 located on the Main Level graphics page are not working. They should lead the end user to an exploded view of those particular areas containing the individual HVAC equipment and systems serving those areas.</p>	<p>SPH&amp;C should review all graphical displays to ensure all workable links are mapped correctly.</p>	<p><b>08.15.14--</b> Pat with SPH&amp;C has corrected the graphic displays. CSG has verified that all graphics links are working and mapped correctly.</p>	<p>08.22.14</p>
M-96	<p><b>08.06.14-</b> The Bacnet interfaces for operating data of both Chillers has not yet been linked to the DDC graphical displays. The pages are located on the Tree but to date, no data is being provided or trended for the end user.</p>		<p><b>08.15.14--</b> Pat with SPH&amp;C has corrected the graphic displays. CSG has verified that all graphics links are working and mapped correctly.</p>	<p>08.22.14</p>
M-97	<p><b>08.06.14-</b> The exhaust fan EF-18 providing ventilation for the Mechanical room is displayed as a fan failure.</p>	<p>08.15.14--Pat Fullerton with SPH&amp;C has stated that low speed is not working although it previously had been. Will review the operation.</p>	<p>Pat with SPH&amp;C stated it was caused by a bad CT and the fan was actually on. CSG re-tested this exhaust system and found it to be working per plans and specs.</p>	<p>10.01.14</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-98	<p><b>08.24.15--</b> The cooling tower experiences sporadic failures. A third party contractor was hired to review the operations of the cooling tower to determine the continued failures. Terry Keating with North Cascade Heating discovered the cooling tower blower VFD had tripped, inhibiting the cooling tower operation altogether.</p> <p><b>08.06.14-</b> While reviewing operations of the chilled water system, CSG notes there are several questions that need to be addressed and provide a response for:</p> <p><b>1.)</b> The cooling tower fluid delta T is not meeting the expected design of 10°F. This is occurring with moderate OSA temps in the upper 80's, with entering water temps well below the design and with both the spray pump on and the CT fan VFD at 100%. We have typically noted a delta T of only 6°F with the CT operating at maximum capacity which does not meet the manufacturer's performance curve.</p> <p><b>2.)</b> In addition, we have noted the fan VFD always seems to reside at a 100% signal with no modulation, even though the Leaving Fluid Temp is sometimes below the designed 77°F. We do not have access to trends that may better indicate how the system is functioning throughout each day.</p> <p><b>3.)</b> The DDC flow sensor indicates the CT fluid flow rate being 950 GPM while the manufacturer's submittal data states it should be 1500 GPM. Why the discrepancy?</p> <p><b>4.)</b> Design temps are not being met. Schedule suggest an EWT of 95.5°F and a LWT of 85.5°F. As set, the system is trying to maintain a 75.5°F LWT, possibly needlessly keeping the Fan speeds at 100% and wasting energy.</p>	<p>We would expect the contractor's can provide the operating data for the cooling tower and include the flow rate, the airflow rate, the spray water flow rate as well as the wet bulb temperature measurements to determine whether it meets the design criteria. We expect the TAB report to also provide certain test results. Please also provide trend data for the CT and chillers that reflect proper operations. SPH&amp;C needs to verify that all operating set points meet the design requirements. If these parameters have been changed during start up, the contractors should confer with MSI to determine whether the present operating set points are approved or not. Please provide documentation.</p>	<p><b>08.24.15--</b>Seann Tanner has inspected the cooling tower blower VFD to determine whether the VFD fan is working properly. He discovered the fan filters were still in their shipping packaging which would not enable the fan to provide the necessary cooling to the VFD, causing it to fail on high heat. Once the filters were unwrapped, the VFD appears to function normally with no other failures occurring.</p> <p><b>10.03.14--</b>JRT installed a new spray pump and motor and then re-tested the cooling tower operation. Flow through the condensing water loop appeared to be within design parameters as was the differential water temperature across the cooling tower. Due to ambient temperatures not being within the design tolerances, CSG will re-visit these same tests once temperatures warm up again. The Johnson Controls technician who started the chillers stated the design entering water temp to the chillers should be decreased from 85°F to 75°F for better operating chiller efficiencies.</p> <p><b>09.22.14--</b> JCI along with SPH&amp;C were on site performing a "stress test on the Chilled water system to determine whether the both chillers were functioning correctly. Along with that, CSG monitored the system characteristics of the entire chilled water loop, including AHU coil performance. It has been determined the chillers are both operating efficiently and within the manufacturer's design parameters. JCI has recommended a change in the cooling tower loop temperature set point for the entering water temperature to the chillers. The designed called for it to be 85°F but has since been changed to 75°F.</p>	08.24.15



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## Commissioning Issues List

Project: Eastmont High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-98 Cont'd	<p><b>08.06.14-- The cooling tower experienced continued failures and alarms over the course of the first of use.</b>            Unfortunately, seasonal changes occurred that precluded us from completely diagnosing the problems. 3.)            The DDC flow sensor indicates the CT fluid flow rate being 950 GPM while the manufacturer's submittal data states it should be 1500 GPM. Why the discrepancy?</p>	<p><b>09.09.14--</b> Rush Consultants, Inc. checked out the cooling tower at EHS. I noticed that the tower water was being bled off with the spray pump on which explains the low values. I turned off the bleed valve and disconnected the tube. There should be no bleed from the tower. With no bleed the conductivity of the tower water has been running &gt;20,000 µS. This indicates a very high mineral level which explains the white deposits on hand after immersion. It is much too high for conventional water treatment. However, with the present patented regime it is desirable. The high sodium silicate concentration in the water stops white rust attack on the tower by forming a monomolecular coating on the galvanizing. And the softener, providing a nearly continuous supply of soft water, prevents scale on the tower tubes. This no-bleed regime has important advantages:  <b>1.)</b> Water usage is cut dramatically.  <b>2.)</b> There is no sewage charge with no bleed.  <b>3.)</b> The high mineral level is accompanied by a high pH. Under these conditions biological growth is stopped.  <b>4.)</b> With no chemicals, except salt for the softener, this method is environmentally friendly.            The temperature differential of the condenser water across the tower has been about 11 deg indicating good efficiency.</p>	<p><b>09.22.14--</b> Several weeks ago, Pat determined the flow sensors for the cooling tower loop were not reporting accurately and sent them back to the factory for calibration. The TAB contractor verified water flow readings. Pat re-installed the newly calibrated sensors and they are reportedly reading correctly. CSG compared them to the TAB reported values and has verified they are reading accurately.  <b>09.18.14--</b> JRT reviewed the cooling tower operations. It was determined the level of mineral deposits was much too high. It has been determined that the spray pump and motor may only be working intermittently. After discovering the heavy deposit and low water levels in the sump, the Cooling Tower manufacturer has suggested replacing the motor and pump assembly. This is to occur in about 2-3 weeks.</p>	08.24.15



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## Commissioning Issues List

Project: Eastmont High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-99	<p><b>08.06.14-</b> While reviewing operations of the chilled water system, CSG notes the loop temperature set point of 42°F is not being met. It is unknown whether the chillers are operating normally as no operating data is being captured by the DDC system at this time. However, several spaces throughout the high school are above their space temperature set points and most of the AHU's at the opposite end of the school cannot attain their discharge air temperature set points while in a 100% call for cooling. This has occurred over the past several days with only moderate daytime ambient temperatures in the upper 80's. The attached screenshot taken around 2PM and with an OSA temp of 89°F, reflects the chiller set points of 42°F yet the loop temperature is at 57°F and reached as high as 62°F. All the while with several zones failing to meet their space temperature requirements or discharge air temperatures at the AHU's. Is this system operating in Auto mode yet? Or are there still overrides placed on parts of the system?</p>	<p>JRT and SPH&amp;C may need to review the operations of the entire chilled water system to determine why set points do not appear to be met. The TAB report may indicate whether the system water flows are operating near design.</p>	<p>CSG, along with SPH&amp;C determined the loop temperature set point not being met was mostly due to programming parameters not being set up correctly. We would move on to other operational issues that was affecting the chilled water plants ability to maintain adequate loop temperatures that revolved around the cooling tower that were monitored, tracked and tested via a separate Cx issues ID. We consider this issue closed.</p> <p><b>08.15.14--</b> Pat Fullerton with SPH&amp;C has stated that Tab was not complete with water balance at time CX looked. Also the program had the incorrect OSA reset values. Should be 80/55=45/55. This has been changed. CSG will continue checking the operation of this system and perform FPT's at the next site visit.</p>	<p>10.01.14</p>
M-100	<p><b>08.06.14-</b> The graphics for the chilled water loop reflects an alarm condition for CWP-1 VFD. Also noted on the same screenshot is that the loop differential pressure set point is not being met with CWP-1 operating at 100%, and yet CWP-2 remains off. In a different shot from the day before, we note CWP-2 is meeting the differential set point all by itself. Because most all AHU's on site are not meeting their cooling requirements, the cooling coil control valves are mostly wide open. Is the Lead/lag operation functioning correctly? The runtime on CWP-1 is 5508 hours while the runtime for CWP-2 is only 1309 hours or roughly 75% less than CW-1</p>	<p>JRT and SPH&amp;C may need to review the operations of the entire chilled water system to determine why set points do not appear to be met. The TAB report may indicate whether the system water flows are operating near design.</p>	<p><b>08.15.14--</b> Pat Fullerton with SPH&amp;C has stated an operating parameter 1409 in the bypass section of the drive was not changed from the default value on CWP-1's VFD as it had been for CWP-2. This has been fixed. CSG re-tested the lead lag pump sequence of operations as well as differential pressure pump control sequence and both proved to be working per design and specifications.</p>	<p>08.26.14</p>
M-101	<p><b>08.06.14-</b> AHU-1 is not functioning. The controller has the message; "Failed Download. Communication Failed...."</p>	<p>SPH&amp;C needs to complete downloading and point to point checks on various systems.</p>	<p><b>08.15.14--</b> Pat Fullerton with SPH&amp;C has stated this work to be completed 08.19.14. CSG has verified the system is operational and ready for functional performance testing. Any additional issues with testing will become a separate Cx issues ID.</p>	<p>08.26.14</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-102	<b>08.06.14-</b> There are several systems that are not yet functioning. The controllers for EF-20, VAV's 1-8, 3-26, 10-2, 19-9, LEF's 2 & 3, EDH 9-1, EAV 1-1 all have the same message; "Failed Download. Communication Failed...."	SPH&C needs to complete downloading and point to point checks on various systems.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated LEF 1&2 has been tested. VAV10-2 was a power issue. The rest of the VAV's are disconnect problems. EDH 9-1 is a power issue. EF 20 not installed yet as the cabinet installation is holding it up. CSG verified all worked per plans and specifications through performance testing.	08.27.15
M-103	<b>08.06.14-</b> While reviewing operations, we noted EF-16 was not running with a command to be on.	Either Bruce HVAC or SPH&C need to investigate why this system is not functioning on command.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated there was a wiring issue with this fan but has since been corrected. CSG verified it functions per plans and specifications.	08.27.15
M-104	<b>08.06.14-</b> AHU-3 has failed and there is an unidentifiable alarm indicated towards a portion of the graphic that is not accessible. There is no way to scroll over in order to view it. Graphic should be so that it can be seen in its entirety.	Either Bruce HVAC or SPH&C need to investigate why this system is not functioning on command.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated AHU-3 was in a high static alarm. The high limit static pressure set point was too low and has been adjusted and reset. You can see the graphic alarm once the screen has been expanded but does not always appear on smaller screens on lap tops. If the end user closes the pop up tree, the graphic shifts over and the far right corner comes into view. AHU graphic is large.	08.26.14
M-105	<b>08.06.14-</b> AHU-6 has failed and has been overridden off. Contractors should investigate and report back what findings there are.	Either Bruce HVAC or SPH&C need to investigate why this system is not functioning on command.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated AHU-6 was in the off position. Turned back on. Has 2002 alarm over current on the VFD. Bruce HVAC is responsible for the VFD's operation. Although CSG has verified AHU-6 worked normally, Bruce HVAC never provided a response explaining what the issue with the VFD was.	08.26.14
M-106	<b>08.06.14-</b> AHU-8 has failed and been overridden off. Contractors should investigate and report back what findings there are.	Either Bruce HVAC or SPH&C need to investigate why this system is not functioning on command.	<b>8/15/14--</b> Pat Fullerton with SPH&C has stated AHU-8 was turned off due to work still be finished in the auditorium. Unit is now running. CSG verified the AHU runs normally.	08.26.14



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## Commissioning Issues List

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-107	<b>08.06.14-</b> AHU-11 has an alarm on the return fan VFD.	Either Bruce HVAC or SPH&C need to investigate the source of this alarm.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated an operating parameter in the VFD had been changed although he had no explanation for why it was changed.. Alarm was cleared. AHU-11 was reviewed and found to be working as specified.	08.26.14
M-108	<b>08.06.14-</b> AHU-19 has failed and there is an unidentifiable alarm indicated towards a portion of the graphic that is not accessible. There is no way to scroll over in order to view it. Graphic should be so that it can be seen in its entirety.	Either Bruce HVAC or SPH&C need to investigate the source of this alarm.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated AHU-19 was a high static alarm. The high limit static pressure set point was too low and has been adjusted and reset. You can see the graphic alarm. Close the pop up tree. AHU graphic is large.	08.26.14
M-109	<b>08.06.14-</b> FPT's won't begin on AHU-20 until this system has been completed and is functioning normally.	SPH&C needs to complete downloading and point to point checks on various systems.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated point to point checks have been done. Electric heat needs filters to be installed in order to work.	08.26.14
M-110	<b>08.06.14-</b> FPT's won't begin on AHU-22 until this system has been completed and is functioning normally.	SPH&C needs to complete downloading and point to point checks on various systems.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated AHU-22 has been functioning for some time now but had no explanation as to why CSG found it not running. CSG did verify that AHU-22 ran normally during functional performance testing.	08.26.14
M-111	<b>08.06.14-</b> Tthe following systems require BACnet interfacing to be completed; AHU's 3, 8, 9, 10, 11, 17, 18, 21,and 22	SPH&C needs to finalize all programming.	<b>08.15.14--</b> Pat Fullerton with SPH&C has stated he is currently working on setting up the drives for Bacnet Interface. CSG has verified that all systems are now reporting operational data from their respective VFD's to the front end DDC work station.	08.26.14
M-112	<b>08.06.14-</b> EF- 22 is not running.	SPH&C needs to finalize all programming.	<b>8/15/14--</b> Pat with SPH&C has stated the breaker was off. CSG has verified that it is functioning normally.	08.26.14
M-113	<b>08.06.14-</b> The thermostat for VAV 10-4 reflects a space temperature of 45°F?		<b>08.15.14--</b> Pat Fullerton with SPH&C has stated he is working on this issue. It is likely to be a bad input on module. CSG has verified the reading is now stable.	08.26.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-114	<b>08.06.14-</b> The thermostat for VAV 11-2 is not represented on the graphics screen.		<b>08.15.14--</b> Pat Fullerton with SPH&C has stated VAV 11-2 shares a temperature sensor with VAV 11-1. No physical stat.	08.26.14
M-115	<b>08.06.14-</b> VAV box 17-1 is not meeting it design CFM. Presently supplying 88% of design airflow. Has the system operating static pressure set point for the AHU been set up correctly? What is the cause for such discrepancy in airflows from actual to the design?	Riley engineers will provide TAB report. Prior to suggesting it is a design issue, contractors should investigate what contributing factors are responsible for such low airflows.	CSG has verified through functional performance testing the VAV box properly modulates its damper to maintain CFM set points. It is also quite capable of meeting maximum design CFM's.	08.26.14
M-116	<b>08.06.14-</b> VAV box 17-3 is not meeting it design CFM. Presently supplying 88% of design airflow. Has the system operating static pressure set point for the AHU been set up correctly? What is the cause for such discrepancy in airflows from actual to the design?	Riley engineers will provide TAB report. Prior to suggesting it is a design issue, contractors should investigate what contributing factors are responsible for such low airflows.	CSG has verified through functional performance testing the VAV box properly modulates its damper to maintain CFM set points. It is also quite capable of meeting maximum design CFM's.	08.26.14
M-117	<b>08.06.14-</b> VAV box 4-8 is not meeting it design CFM. Presently supplying 88% of design airflow. Has the system operating static pressure set point for the AHU been set up correctly? What is the cause for such discrepancy in airflows from actual to the design?	Riley engineers will provide TAB report. Prior to suggesting it is a design issue, contractors should investigate what contributing factors are responsible for such low airflows.	CSG has verified through functional performance testing the VAV box properly modulates its damper to maintain CFM set points. It is also quite capable of meeting maximum design CFM's.	08.26.14
M-118	<b>08.06.14-</b> VAV box 24-1 is not meeting it design CFM. Presently supplying 88% of design airflow. Has the system operating static pressure set point for the AHU been set up correctly? What is the cause for such discrepancy in airflows from actual to the design?	Riley engineers will provide TAB report. Prior to suggesting it is a design issue, contractors should investigate what contributing factors are responsible for such low airflows.	CSG has verified through functional performance testing the VAV box properly modulates its damper to maintain CFM set points. It is also quite capable of meeting maximum design CFM's.	08.26.14
M-119	<b>08.06.14-</b> VAV box 24-5 is not meeting it design CFM. Presently supplying 88% of design airflow. Has the system operating static pressure set point for the AHU been set up correctly? What is the cause for such discrepancy in airflows from actual to the design?	Riley engineers will provide TAB report. Prior to suggesting it is a design issue, contractors should investigate what contributing factors are responsible for such low airflows.	CSG has verified through functional performance testing the VAV box properly modulates its damper to maintain CFM set points. It is also quite capable of meeting maximum design CFM's. Contractors discovered the flex connection to the VAV inlet was obstructing air flow.	10.02.14



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## Commissioning Issues List

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-120	<p><b>08.26.14</b>-- CSG notes there are several AHU's with dirty filter alarms. In order to accurately measure systems performance, it is critical that all AHU's are flowing near design air and water flows. The following were noted with alarms; AHU's 5, 6, 8, 17, 24</p>	<p>Both the school district as well as the contractors need to ensure clean filters have been installed prior to Cx functional performance testing.</p>	<p>Dirty filters were changed out for new filters prior to additional functional performance testing in order to determine whether they meet the design requirements.</p>	10.01.14
M-121	<p><b>09.30.14</b>--It has been reported by Riley engineering the level of accuracy of the existing flow sensors is so far beyond tolerances through it's entire range that it will not be possible to control the amounts of outside air, and consequently control supply fan speeds.</p> <p><b>08.26.14</b>--While reviewing operations of AHU-1., we noted the airflow readings are being displayed with a negative number.</p>	<p><b>10.01.14</b>--The Eastmont School district was made aware of the condition of the flow sensors. Alternatives were discussed for a method of controlling the AHU without them, as it was decided upon not to incur the added expense of replacing them. Contractors are to put forth an RFI for further direction. But all in attendance at the Cx meeting were in agreement to simply have the TAB contractor determine the minimum damper position that provided adequate ventilation rates and then determine the offset in fan speeds that will provide a correct space pressure.</p> <p><b>08.26.14</b>--Contractors probably only need to re-connect the pressure tubing which are cross connected.</p>	<p><b>10.15.14</b>--This existing HVAC equipment useful life is nearing its end. The contractors have confirmed the existing airflow monitoring flow stations are no longer accurate enough nor can they be restored to function normally to be relied upon for a method of controlling fan speeds and airflows. It was suggested in order to maintain consistent control of this AHU as is present with the new systems, that new flow stations be purchased and installed as change order. The ESD has decided not to pursue this course of action. The contractors along with CSG recommend having the TAB contractor determine the minimum outside air damper position and determine the offset of fan speeds in order to maintain adequate space pressures and airflows. A CCA was issued on 10.10.14 responding to RFI 1086 stating the design team concurred with the method of control of fan speeds for AHU-1. CSG verified the TAB contractor completed this work and the fan was tracking and maintaining adequate space pressure.</p>	10.15.14



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## Commissioning Issues List

### Project: Eastmont High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-122	<b>10.02.14--</b> Functional performance testing revealed there was no "Jogging routine" to limit the energy recovery wheel's static position. This becomes especially necessary whenever there is high relative humidity in the air and the heat recovery wheel isn't running as the wheel can become latent with moisture, which may cause indoor air quality issues as well as load up sections of the wheel with dirt which causes excess maintenance.		Initially Pat Fullerton with SPH&C was under the impression this programming came as part of the HRU's integrated control functions. Functional performance testing revealed it was not. Pat then created a program by which the heat wheel, when off for an adjustable amount of time, in this case, 60 minutes, will cycle on briefly, rotating the heat wheel so that it rests in a different position, limiting the chances of prematurely fouling the heat wheel. CSG verified this programming performed as expected.	10.03.14
M-123	Some filter clips are missing and one filter has fallen out of rack and is laying on the floor.		Bruce HVAC replaced any missing clips and CSG verified they were being adequately held in place.	10.03.14
M-124	The fan and lights randomly come on when the end user switch has been disabled to Off.		Ryan Stewart with Captive Aire Systems, the supplier of the kitchen hood, stated the system auto activates based on an offset above room temperature. Programmed offset is 10°F. The reason for doing it this way is what if the kitchen has no HVAC on and is 90°F in the summer, the fan would run all the time. With the offset the fan would only activate when the temperature in the hood is 10°F above the room temp. CSG has verified this sequence is working per design.	10.03.14
M-125	Switched exhaust fan for teacher station doesn't turn on in Cooking Classroom 820		The contractor stated the breaker had been turned off and after switching it back on, the EF worked fine. CSG verified the exhaust fan's operation.	10.03.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-126	<b>10.02.14</b> --Most all Mechanical and HVAC equipment has not been properly labeled per specifications. This includes but is not limited to AHU's, HRU's, EF's, Chillers, Boilers , Cooling Tower and Pumps.		<b>01.06.15</b> -- CSG verified all mechanical equipment required to be labeled has been properly completed. <b>10.06.14</b> -- Shawn Milligan stated via email the ID tags mentioned for HVAC equipment have been ordered. JRT has completed this work. David with Bruce does not know whether HVAC equipment has been labeled.	01.06.15
M-127	<b>10.02.14</b> --Openings/holes in cabinet are not sealed. Added dog house is not insulated. The AHU coil access door has been removed. The conduit penetrating the cabinet connecting the fans to their VFD's was never sealed and is noticeably leaking a considerable amount of airflow.	Both JRT and Bruce HVAC should review ID tag requirements and ensure all HVAC and mechanical equipment located on the equipment schedules are labeled accordingly.	<b>11.11.14</b> -- Work has been completed. The doghouse was insulated. DKB was on site and installed board insulation with aluminum wrap throughout the interior of the added doghouse built around the coil sections. It is weather tight now.	01.06.15
M-128	<b>10.02.14</b> -- AHU-2's chilled water coil opening penetrations need to be sealed properly. Some sheet metal covers that have been installed has either blown apart completely because of the differences in static pressures between the two cabinets, or was not cut properly and had large gaps around it. Gaps were left around the coils where airflow may escape into unconditioned building spaces above ceilings. Pressurization cannot be properly maintained and in some cases, space temperatures may be difficult to control properly as significant amounts of airflow is being short cycled instead of distributed to the space or VAV boxes.	Petra has already hired Bruce HVAC to provide new caps and ensure they have been properly sealed.	CSG verified all coils penetrations were adequately sealed by Bruce HVAC. Airflows between the various cabinets is no longer leaking from one area to the next.	12.16.14



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Project: Eastmont High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-129	<p><b>10.02.14--</b> AHU-12's chilled water coil opening penetrations need to be sealed properly. Some sheet metal that has been previously installed has either blown apart completely because of the differences in static pressures between the two cabinets, or was not cut properly. Gaps were left around the coils where airflow may escape into unconditioned building spaces above ceilings. Pressurization cannot be properly maintained and in some cases, space temperatures may be difficult to control properly as significant amounts of airflow is being short cycled instead of distributed to the space or VAV boxes.</p>	<p>Petra has already hired Bruce HVAC to provide new caps and ensure they have been properly sealed.</p>	<p>CSG verified all coils penetrations were adequately covered and sealed by Bruce HVAC. The sheetmetal work was well supported enough to withstand the high static pressures in between fan sections.</p>	12.16.14
M-130	<p><b>10.02.14--</b> AHU-14's chilled water coil opening penetrations need to be sealed properly. Some sheet metal that has been previously installed has either blown apart completely because of the differences in static pressures between the two cabinets, or was not cut properly. Gaps were left around the coils where airflow may escape into unconditioned building spaces above ceilings. Pressurization cannot be properly maintained and in some cases, space temperatures may be difficult to control properly as significant amounts of airflow is being short cycled instead of distributed to the space or VAV boxes.</p>	<p>Petra has already hired Bruce HVAC to provide new caps and ensure they have been properly sealed.</p>	<p>CSG verified all coils penetrations were adequately covered and sealed by Bruce HVAC. The sheetmetal work was well supported enough to withstand the high static pressures in between fan sections.</p>	12.16.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-131	<p><b>11.03.14--</b> The contractors created RFI #1098 which stated the following: "During troubleshooting, I found the EF tracking to OSA set point correctly but also found the EF dampers modulating. I would like to know why the EF damper is not stroked 100% open upon EF enable." Shawn Milligan stated "Pat and I ran tests and found if we locked the EF dampers open, the airflow stations read accurately and the VFD's reduced as much as 30% to maintain the same CFM. The dampers are downstream of the EF. With the dampers in auto, the VFD was at 71% to maintain 3300 CFM. When locked open, the VFD reduced to 40% speed and still maintained the 30 CFM set point."</p> <p><b>10.02.14--</b>The airflows for AHU- 3's exhaust fan being displayed read 0 CFM although the fans were verified to be operating.</p>	<p>Seth with Bruce HVAC was on site and has already begun looking into repair and/or replacement.</p>	<p><b>11.10.14--</b> Pat Fullerton with SPH&amp;C altered the programming of the exhaust fan dampers to function per MSI's RFI response. CSG verified the dampers were now functioning per design.</p> <p><b>11.06.15--</b> Brad Snow with MSI Engineers provided the following response to the contractors: "The exhaust fan damper should be open 100%, not modulating, whenever the unit is running with the exhaust fan VFD used to regulate airflow.</p>	<p>11.10.14</p>
M-132	<p><b>10.02.14--</b>The airflows for AHU- 15's exhaust fan being displayed read 0 CFM although the fans were verified to be operating.</p>	<p>Seth with Bruce HVAC was on site and has already begun looking into repair and/or replacement.</p>	<p>The contractor investigated and determined the fan belt was broken. Once replaced, the fan was operating normally.</p>	<p>11.06.14</p>
M-133	<p><b>11.03.14--</b> The contractors created RFI #1098 which stated the following: "During troubleshooting, I found the EF tracking to OSA set point correctly but also found the EF dampers modulating. I would like to know why the EF damper is not stroked 100% open upon EF enable." Shawn Milligan stated "pat and I ran tests and found if we locked the EF dampers open, the airflow stations read accurately and the VFD's reduced as much as 30% to maintain the same CFM. The dampers are downstream of the EF. With the dampers in auto, the VFD was at 71% to maintain 3300 CFM. When locked open, the VFD reduced to 40% speed and still maintained the 30 CFM set point."</p> <p><b>10.02.14--</b>The airflows for AHU- 19's exhaust fan being displayed read 0 CFM although the fans were verified to be operating.</p>	<p>Seth with Bruce HVAC was on site and has already begun looking into repair and/or replacement.</p>	<p><b>11.10.14--</b> Pat Fullerton with SPH&amp;C altered the programming of the exhaust fan dampers to function per MSI's RFI response. CSG verified the dampers were now functioning per design.</p> <p><b>11.06.15--</b> Brad Snow with MSI Engineers provided the following response to the contractors: "The exhaust fan damper should be open 100%, not modulating, whenever the unit is running with the exhaust fan VFD used to regulate airflow.</p>	<p>11.10.14</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-134	<b>10.02.14--</b> The modulating damper called for in the sequence of operations for relief air fan EF-22 has not been provided for or installed per drawings and specifications. It is being displayed on the DDC's graphics screen though.	During our Cx meeting, we discussed this with Petra. Shawn stated he would review with Bruce HVAC.	CSG has verified that Bruce HVAC completed the installation of the damper actuator and that it is working per design and specifications.	01.06.15
M-135	<b>10.02.14--</b> There are two science fume hood roof top exhaust fans that require caps and flashing for weather proofing. They are presently wrapped in blue plastic as a temporary cover.	Bruce HVAC needs to complete the installation to ensure exposed ductwork system will remain weather proof.	<b>10-15.14--</b> Seth with Bruce flashed the penetrations around the ductwork however, on our January site visit, there were still two other fume hood exhaust penetrations that required to be properly sealed.	01.06.15
M-136	<b>10.02.14--</b> Office room 821, has an exceptionally loud noise in the space. The supply main ductwork for AHU-2 is located directly overhead. There is also a transfer duct installed directly below the supply main duct, possibly increasing the amount of noise into the space. The mechanical drawing for the area shows the transfer grille in 821 ducted to room 817 where the pathway for return is located via a main return duct opening for AHU-2. Has the placement of the present transfer grille allowed for a path back to the AHU? Does the present installation add to the noise levels within the office?	Bruce HVAC needs to investigate and determine whether a clear path of return air is present with the present transfer grille installation. Can they possibly move it in order to reduce noise from the supply duct main located directly above this grille?	The transfer grille and associated ductwork in this space was moved to where it was shown on the HVAC floorplan drawing. This was changed to meet plans and specs and to try and mitigate the air noise located within the AHU supply main and directly overhead of the office space.	01.06.15



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-137	<p><b>10.02.14-- Chilled Water Piping Noises in Room 817.</b></p> <p><b>06.18.15--</b>JRT removed the internal flow control spring loaded cartridges for AHU's 2 &amp; 3 and reported no noise throughout the range of motion on each modulating control valve. MSI will recommend a manual balancing valve to the ESD should they decide to pursue a different means for controlling flow through both AHU's.</p> <p><b>06.12.15--</b> JRT performed the work as suggested by MSI on 06.1.15 and after isolating AHU's 1-4, there was no change to the noise issue at AHU's 2 &amp; 3. However, JRT does feel the noise is being caused by the spring mechanisms within the control valves at AHU'2 2 &amp; 3.</p> <p><b>05.06.15--</b> Brad Snow with MSI reviewed the noise and control valve data and stated the following: <i>"After reviewing our hydronic system pipe sizing and cooling coil control valve sizing, we believe that we can rule out either of these elements as a possible sources of the noise. The pipes in the network connecting AHU's 1, 2, 3 &amp; 4 in this vicinity are all sized in accordance with ASHRAE recommendations for flow rates and velocities. Likewise, a review of the control valve sizing indicates that none of the valves are undersized, which would otherwise create excess pressure drop and noise (hissy sounds) at peak flow rates. We continue to believe that a certain amount of trapped air in the section of piping that travels in the second floor ceiling, between AHU-3 at the south end of the floor and AHU-2 at the north end, is the source of the objectionable system noise. The fact that the noise increases with higher coil flow rates makes sense, because the velocity and turbulence in the lines increases proportionally."</i></p> <p><b>04.29.15--</b> Pat Fullerton, Linda Colasurdo and Shawn Milligan spent time performing the test CSG recommended with regards to stroking the control valves to different positions to see whether the piping noise became more evident at certain valve positions than others. As it turns out, noise levels were higher along AHU-3's control valve range than AHU-2's. Noise was noted throughout the entire range of motion at AHU-3' control valve but was excessive from 80-100% open to the</p>	<p><b>6.12.15--</b> Upon hearing JRT's results, Brad suggested removing the cartridges altogether to see if the noise is eliminated. Allowing the coil's control valves to throttle flow based off discharge air temperatures would be acceptable.</p> <p><b>06.11.15--</b> MSI suggested removing and replacing the internal cartridges within the FDI auto flow valve on AHU-2 to see if the mechanism is the cause for the noise. After JRT replaced it, the noise was still present. MSI responded to the news with the following: <i>"Perhaps the source of the pulsation sound is coming from the other AHU-3, that also uses this same cartridge style, and the sound is traveling through the pipes, and heard clear back at AHU-2. Before Lee replaces the other FDI flow cartridges on AHU-3, I would suggest he first isolate the flow (valve off) AHU-3 from the system. If AHU-3 is in fact the source of the pulsation sound, and the sound goes away when it gets isolated from the loop, we have found the source, and the cartridges should then be replaced as planned."</i></p>	<p>The Eastmont School District considers the FDI auto flow valve noise issue resolved in that removal of the cartridges eliminated the periodic burping sound, which was verified as the source by compression on the bench (out of system) and observing the same sound, and then absence of that sound during subsequent system operation. No new flow control devices were added as a replacement, instead relying on the DDC system's modulating control valve's response to air temperature demands to be the sole limiting factor regarding water flow through the coils.</p> <p><b>06.03.15--</b> The TAB contractor was asked to provide additional test data regarding chilled water flows and pressure drops at various AHU's coils. Riley Engineers provided the following data for the Cx team's review:</p> <p><b>AHU-1:</b> No noticeable noise problems at the unit. This unit has a 2-way PICCV control valve and a flow design manual balance valve for verifying GPM. Design GPM: 95. Act GPM: 105 GPM. Coil pressure drop: 32.3 Ft. Pressure drop across PICCV: 6 PSI</p> <p><b>AHU-2:</b> This unit has pronounced noise emanating from the control valve or automatic flow control valve area (see attached videos). This unit has a 3-way belimo control valve. with a CV of 46 and an 82 GPM flow design automatic flow control valve. Design GPM: 82. Act GPM: 82 GPM (pressure drop is 14 PSI). Coil pressure drop: 13.9 Ft.</p> <p><b>AHU-3:</b> This unit has pronounced noise emanating from the control valve or automatic flow control valve area (see attached videos). Same set up at AHU-2 Design GPM: 106. Act GPM: 106 GPM (pressure drop is 11 PSI). Coil pressure drop: 13.5 Ft.</p>	06.26.15



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-137 Cont'd	<p><b>04.29.15 Continued:</b> coil. AHU-2's noise level was excessive between 0-35% open and again at 100%. This was the first indication the piping noises were associated with AHU-3 or the piping serving it. The noises were noted while standing in classrooms 718 and 817.</p> <p><b>04.01.15--</b> JRT has drained several 5 gal buckets of glycol while bleeding the entire chilled water piping system and placed them back into the glycol feeder.</p> <p><b>03.27.15--</b> It has been further reported the noises may be fan related as noise has also been reported as scraping noise. I stated it has always been flow related in our minds. It could be the flow characteristics in the piping when the three-way control valve is in bypass, partial bypass or full open to the coil. Something to remember is that there is always water flowing through this section of piping feeding AHU-2 which is located directly in the ceiling above room 817. There is an auto-flow control valve on this installation that appears to be operating within the manufacturer's pressure drop range. The TAB report does not list readings when the coil is being bypassed.</p> <p><b>03.25.15--</b> Teachers within the space have reported the same gurgling type noises have re-emerged once again. It is not coincidental that space temperatures required the chilled water system to be on. The contractors have ben called in once again to investigate and determine the root cause. Although the designers believe air trapped in a certain section of piping may be to blame, the contractors are adamant that enough bleeding has occurred to remove any air still trapped.</p>	<p><b>04.01.15--</b> CSG suggested to Lee with JRT that they should try and isolate the sound to certain system flow characteristics through AHU-2. With the chilled water system pumps on and the system delta P being met, I recommended opening the 3-way CV incrementally and seeing if the noise is more evident when it's in a certain position. We are trying to see if there are changes in flow characteristics contributing to the noises heard in the piping leading to AHU-2 which has a 3-way control valve. Unlike other AHU's with 2 way assemblies, there is always water flowing to AHU-2. Sometimes through the coil, sometimes through the bypass and mostly through a combination of the two. There may be a position on that control valve that creates the anomaly being heard through the piping above the classroom.</p>	<p><b>06.03.15 Continued:</b>  <b>AHU-4:</b> No noticeable noise problems at the unit. This unit has a 2-way belimo control valve, a flow design manual balance valve, and stacked coils which each have a Taco manual balance valve which was used for setting the GPM on this unit. Design GPM: 128. Act GPM: 120 GPM. GPM according to Taco manual balance valves at the stacked coils: 134 GPM. Coil pressure drop: 13.9 Ft. Pressure drop across PICCV: 15 PSI</p>	<p>06.26.15</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-137 Cont'd	<p><b>10.02.14-- Chilled Water Piping Noises in Room 817.</b>  <b>10.23.14--</b> Lee with JRT installed the bleeders found missing during Mechanical punchlist. On several occasions, JRT has spent time bleeding air from the system and believe there to be a minimal amount in the chilled water piping system. The contractors stated during a Cx conference call on 12.15.14 there have been no more reported issues from school staff regarding high noise lever. However, the chilled water system is no longer circulating so it is unknown what the exact cause is. CSG is inclined to believe the reduction is complaints is likely due to the fact the CWS is no longer operational for the winter but that the absence of noise since that system has been off indicates the chilled water system is the likely root cause of the noises in some classrooms. The Eastmont School District has determined this issue will fall back on the warranty process to track further corrective measures taken by the contractors once the chilled water system is brought back on line next cooling season.</p> <p><b>10.02.14-- Chilled Water Piping Noises in Room 817.</b>  <b>10.17.14--</b>Shawn Milligan stated the glycol feeder was filled last Saturday and Lee with JRT bled air from coils Saturday and Monday. 3 AHU's missing coil ports to get installed this week or next to complete air bleeding.  <b>10.02.14--</b> There have been complaints from the ESD. regarding sporadic high noise levels within classroom 817. CSG noted what sounded like water and air rushing through piping while the chilled water system was operating at a high flow rate. The piping to AHU-2 is located directly overhead. We also noted what sounds like air in the system, particularly while inside the cabinet of AHU-2 during functional performance testing. We wonder whether this is contributing to the noise levels in the classrooms below.</p>	<p>Both contractors and designers may need to review these spaces to determine the proper course of action. The ESD may determine the noise levels in the classrooms are acceptable and do not pose any disturbances to the learning environment.</p>		<p>06.26.15</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-138	<b>10.02.14--</b> AHU-8 has a broken handle on one of the cabinet access doors that requires replacement.	CSG showed Seth with Bruce HVAC the damaged handle.	CSG has verified the handle was replaced by Bruce HVAC and it works normally.	11.05.14
M-139	<b>10.02.14--</b> AHU's 12 & 14 were noted as having their finishes peeling off the casing. All AHU's should be inspected and re-finished wherever noted.		CSG has verified the factory finish has been applied to the cabinet areas where paint was noted as peeling.	11.05.14
M-140	<p><b>10.02.14--</b> AHU's 9, 19 &amp; 23 did not shut down during the fire alarm.</p> <p><b>11.07.14--</b> CSG raised the question as to whether all of the AHU's were programmed or wired correctly per the new directive. Petra stated they were not and re-programming would be necessary.</p> <p><b>11.06.14--</b> Kurt Niven with Coffman Engineers stated: <i>"per the local Fire Marshall, Brian Brett, the AHU's should only be shut down by their associated duct smoke detectors and not by a general fire alarm initiated by pull stations, water flow events, smoke detectors, etc. The duct smoke detectors will send a supervisory alarm to the fire alarm control panel."</i></p> <p><b>11.05.14--</b> After re-working AHU's 9 &amp; 19, RFI-1099 was written in order to provide clarification as to whether the AHU's should shut down with a pull station or off a water flow alarm. They presently do.</p> <p><b>10.02.14--</b> While on site for FPT's, the local fire department held a fire alarm test. During this time, we reviewed the HVAC integration with the life safety system. Several AHU's did not shut off as expected and designed to. AHU's 9,19 &amp; 23 all need to be reviewed and verified to shut down correctly upon a fire alarm. It was also noted that all other AHU's and HRU's were shutting down off a general alarm via the pull stations. We witnessed all HVAC equipment auto started upon clearing the alarms.</p>	Bruce HVAC, TCE and Petra may all need to review this life safety feature together in order to ensure it works properly before re-testing.	<p><b>12.05.14--</b> Fire Systems West completed any wiring and necessary programming to meet the expectations of the Fire Marshall. The AHU's are no longer shutting down off any pull stations and are instead, controlled locally via their duct smoke detectors tied into the fire alarm system. The Fire Marshall re-tested the entire system.</p> <p><b>11.05.14--</b> Bryan Hilfiker with Fire Systems West was called in to verify the AHU's operation in the event of a fire alarm and confirmed the following:  <b>AHU #9--</b>no duct smoke installed on this unit. We tested the two relays currently installed and found on the Supply VFD controller a jumper was installed to bypass the relay shutdown from the fire alarm system, preventing it from shutting off. We added a duct smoke to this unit and removed the jumper from the controls. This unit operated properly after this change.  <b>AHU 19--</b> we found two duct smokes on this unit. The shutdown of this unit was tied directly to the duct smokes. Shutdown was on the local unit only. We added two relays to match the rest of the AHU units. Relays were tied into the Return and Supply VFD's. This unit functioned properly after this addition was completed.  <b>AHU 23--</b> No controls or duct smokes were on this unit. After speaking on the phone with the design team, it was determined that this unit is a Make up Air Unit and does not require a duct smoke as it is a supply air only.</p>	12.05.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-141	<b>10.02.14--</b> The range hood fan at station #1 in the Cooking Lab does not function.	Bruce and TCE may need to review together in order to determine whether there is a problem with the fan or lack of power to the fan. There was no light bulb installed.	All have been checked and were found working normally.	1.06.15
M-142	<b>10.02.14--</b> Room 512 Fixture only measures 85F. Hand washes should typically be 100-110F.		Dillon with JRT has taken care of any adjustments to increase water temperatures at hand washes. He noted they have low consumption faucets and with individual toilets with Circuit setters, and given the amount of piping, it may take a little longer than normal to get warmer water out of the fixture. The health inspector did not take exception to the length of time it takes to get hot water at fixture. The Eastmont School District does not take any exception to their operation.	12.15.14
M-143	<b>10.02.14--</b> Room 517 Lavatory only measures 69F. Changing Room Lav on 67F after 10 mins running.		Dillon with JRT has taken care of any adjustments to increase water temperatures at hand washes. He noted they have low consumption faucets and with individual toilets with Circuit setters, and given the amount of piping, it may take a little longer than normal to get warmer water out of the fixture. The health inspector did not take exception to the length of time it takes to get hot water at fixture. The Eastmont School District does not take any exception to their operation.	12.15.14
M-144	<b>10.02.14--</b> 700 area staff restroom lavatory only measures 71F after 5 mins running.		Dillon with JRT has taken care of any adjustments to increase water temperatures at hand washes. He noted they have low consumption faucets and with individual toilets with Circuit setters, and given the amount of piping, it may take a little longer than normal to get warmer water out of the fixture. The health inspector did not take exception to the length of time it takes to get hot water at fixture. The Eastmont School District does not take any exception to their operation.	12.15.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-145	<b>10.02.14--</b> 800 area staff restroom lavatory near Room 801 only measures 68F after 5 mins running.	JRT should review.	Dillon with JRT has taken care of any adjustments to increase water temperatures at hand washes. He noted they have low consumption faucets and with individual toilets with Circuit setters, and given the amount of piping, it may take a little longer than normal to get warmer water out of the fixture. The health inspector did not take exception to the length of time it takes to get hot water at fixture. The Eastmont School District does not take any exception to their operation.	12.15.14
M-146	<b>10.02.14--</b> 800 area staff restroom lavatory near Room 815 only measures 69F after 5 mins running.	JRT should review.	Dillon with JRT has taken care of any adjustments to increase water temperatures at hand washes. He noted they have low consumption faucets and with individual toilets with Circuit setters, and given the amount of piping, it may take a little longer than normal to get warmer water out of the fixture. The health inspector did not take exception to the length of time it takes to get hot water at fixture. The Eastmont School District does not take any exception to their operation.	12.15.14
E-147	<b>10.02.14--</b> AHU-19 Interior cabinet light fixtures do not work.	TCE needs to investigate wiring is correct.	<b>11.11.14--</b> Bruce corrected the factory wired relay which was wired incorrectly. <b>10.20.14--</b> TCE states the wiring for the receptacles and lighting is present. The lights in the AHUs come pre-installed from the factory and are not in the scope of TCE. They have confirmed they have been wired per plans and specs.	11.11.14
E-148	<b>10.02.14--</b> Room 517 Light switching duties do not match electrical drawings. Only 4 fixtures are on one switch when the drawing shows 6.	TCE needs to investigate wiring is correct.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states the wiring in the J box has been corrected. Switch duties now match electrical drawings.	01.06.15



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E-149	<b>10.02.14--</b> Room 517 No dimming switches have been installed for the space as shown on the drawings. Unsure whether dimming ballasts are installed.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>12.05.14--</b> Petra stated this is complete. <b>10.20.14--</b> TCE states dimming switches are on order. <u>Dimming switches have been installed.</u>	01.06.15
E-150	<b>10.02.14--</b> Room 517 has several electrical receptacles with no power.	TCE should ensure the installation meets the contract drawings and specifications.	TCE corrected this issue while on site. CSG re-tested the receptacles and were found to be working normally.	10.02.14
E-151	<b>10.02.14--</b> Room 411 has several electrical receptacles with no power.	TCE should ensure the installation meets the contract drawings and specifications.	<b>10.20.14--</b> TCE states breakers were turned on and electrical receptacles were working. CSG verified they worked normally.	12.15.14
E-152	<b>10.02.14--</b> Room 736 has several electrical receptacles with no power.	TCE should ensure the installation meets the contract drawings and specifications.	<b>10.20.14--</b> TCE states breakers were turned on and electrical receptacles were working. CSG verified they worked normally.	12.15.14
E-153	<b>10.02.14--</b> Kitchen staff mentioned having seen an arc at the floor receptacle nearest the kitchen hood. Plug tester shows it is wired correctly. CSG relayed this information during the Cx meeting.	TCE stated they would investigate immediately.	<b>10.20.14--</b> TCE states the electrical receptacles were tested and found to be operating. CSG verified they worked normally.	12.15.14
E-154	<b>10.02.14--</b> Located in the piping chase directly across from the mechanical room, there is a GFCI receptacle that tripped and doesn't reset.		<b>10.20.14--</b> TCE states the GFCI electrical receptacle was replaced and is working. CSG verified they worked normally.	12.15.14
E-155	<b>10.02.14--</b> Room 715 has several electrical receptacles with no power.	TCE should ensure the installation meets the contract drawings and specifications.	<b>10.20.14--</b> TCE states breakers were turned on and the electrical receptacles were working. CSG verified they worked normally.	12.15.14
E-156	<b>10.02.14--</b> 700 Area Data-Electrical room has several electrical receptacles with no power.	TCE should ensure the installation meets the contract drawings and specifications.	<b>10.20.14--</b> TCE states breakers were turned on and the electrical receptacles were working. CSG verified they worked normally.	12.15.14
E-157	<b>10.02.14--</b> The LV panel located in room 204 has not been labeled.	TCE should ensure the installation meets the contract drawings and specifications.	<b>10.20.14--</b> TCE states labels have now been installed. CSG verified they worked normally.	12.15.14



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-158	<b>10.02.14--</b> Located in the north corridor between the Commons and the Gyms, a recently installed low voltage lighting switch is not controlling the Commons lighting from the exterior entrance.	TCE should ensure the installation meets the contract drawings and specifications.	<b>10.20.14--</b> TCE states the panel has been programmed. CSG verified they worked normally.	01.06.15
E-159	<b>10.02.14--</b> The exterior push button switch does not open the ADA doors at the main school entrance. ADA push buttons turned out to be a switch on the door that needed to be turned on. This has been done. The main entry door works fine (since the door is 'dogged' open all day) but the 2 in the 1A hall need to have the door 'dogged' if they are to work properly.		Petra stated the door needs to be dogged daily by school staff. They have been shown this and it now works. The two-way toggle switch was toggled the wrong way. CSG has verified the automatic ADA doors are working normally.	12.15.14
E-160	<b>10.02.14--</b> Room 702 photocells have not been installed. Presently, there isn't daylighting controls being provided per the WSEC. Lamps have been left programmed at 50% light levels which may be below the minimum foot candles required by the Dept of Health.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>12.05.14--</b> Petra stated this is complete. <b>10.20.14--</b> TCS stated the photocells are on order. Currently they have bypassed the power pack until they can be installed.	01.06.15
E-161	<b>10.02.14--</b> Room 702 daylighting zones have not been wired according to the electrical drawings. Zone 2 has one too many fixtures on it. .		CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states the daylighting zones have been wired per electrical drawings. Does this mean they've done anything? Or just what we found is how its supposed to be?	01.06.15
E-162	<b>10.02.14--</b> Room 703 daylighting zones have not been wired according to the electrical drawings. Zone 2 has one too many fixtures on it. .	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states the daylighting zones have been wired per electrical drawings. Does this mean they've done anything? Or just what we found is how its supposed to be?	01.06.15



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-163	<b>10.02.14--</b> Room 709 photocells have not been installed. Presently, there isn't daylighting controls being provided per the WSEC. Lamps have been left programmed at 50% light levels which may be below the minimum foot candles required by the Dept of Health.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states the daylighting zones have been wired per electrical drawings.	01.06.15
E-164	<b>10.02.14--</b> Room 712 photocells have not been installed. Presently, there isn't daylighting controls being provided per the WSEC. Lamps have been left programmed at 50% light levels which may be below the minimum foot candles required by the Dept of Health.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states the daylighting zones have been wired per electrical drawings.	01.06.15
E-165	<b>10.02.14--</b> There are two lighting fixtures that do not work in room 736.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states all fixtures are now installed and working properly.	01.06.15
E-166	<b>10.02.14--</b> None of the light bulbs have been installed in the range hoods located in the Cooking Lab.	TCE should ensure the installation meets the contract drawings and specifications.	CSG verified all bulbs were installed and working in the cooking lab's range hoods. <b>10.20.14--</b> TCE states the range hoods aren't in their scope. That the fixtures are pre installed from the factory. <i>Petra has taken care of this and are all working.</i>	12.17.14
E-167	<b>10.02.14--</b> There is one blue foot light located on the rear stage wall that does not work.	TCE should ensure the installation meets the contract drawings and specifications.	CSG verified all blue lights on the stage were working per plans and specifications. <b>10.20.14--</b> TCE states the blue lights have all been installed and are working properly.	01.06.15



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E-168	<b>10.02.14--</b> There are several uncovered junction boxes located on exterior walls all around the perimeter of the campus.	TCE should ensure the installation meets the contract drawings and specifications.	<b>10.20.14--</b> TCE states the empty J boxes located along the exterior are for the mounting of the owner provided security cameras. All J boxes that are not designated for a camera have been properly covered. The Eastmont School District agrees with this assessment and CSG considers the matter closed.	12.15.14
E-169	<b>10.02.14--</b> There are 5 low voltage lighting control switches located in room 209 that are not controlling any lighting features in the space.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states the cover plate was preventing the switches from moving. Once adjusted, they worked properly.	01.06.15
E-170	<b>10.02.14--</b> There are two bi level switches in Room 433 that are not functioning correctly. One switch is supposed to turn the lights on to 50% brightness, the second switch turns them on full bright. The second switch does not appear to be controlling any light level changes.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states this was caused by the temporary fixtures that were installed. Permanent specified fixtures are installed now and are functioning per plans and specs.	01.06.15
E-171	<b>10.02.14--</b> There are two bi level switches in Room 450 that are not functioning correctly. One switch is supposed to turn the lights on to 50% brightness, the second switch turns them on full bright. The second switch does not appear to be controlling any light level changes.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states drawings don't call out for bi level dimming in this space.	01.06.15
E-172	<b>10.02.14--</b> After over an hour, there were many occupancy sensors that failed to cycle off lighting in the following rooms; 422, 423, 435, 450, 506, 507, 536, and 546. When speaking to TCE on site, they mentioned knowing about several failed devices.	TCE should ensure the installation meets the contract drawings and specifications.	CSG has re-tested the lighting system in this space and has found them to be working per plans and specifications. <b>10.20.14--</b> TCE states rooms 423 506 536 are functioning properly. 450 doesn't call for an occupancy sensor. Rooms 422 435 450 507 and 546 still investigating.	01.06.15



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-173	<p><b>10.02.14--</b> Because the thermostats were installed prior to finish work in the lower level fitness room, paint and or sheetrock dust has covered the inside of the thermostat display obstructing the temperature display.</p>	<p>Petra should ensure the covers are removed and cleaned or replaced.</p>	<p>CSG verified the lense and cover on the thermostat has been cleaned.  <b>12.05.15--</b> Petra has notified us this work has been completed.</p>	<p>01.06.15</p>
M-174	<p><b>AHU-5 high cooling coil supply air temperatures.</b>  <b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.  <b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again.            The OSAT = 71.5°F. The CWS loop was 45.7-- 47.8°F. AHU-5 EAT = 73.4°F; LAT = 57.5°F; ΔT= 15.9°F. Although this is an improvement over previous results, it is still below design. SPH&amp;C also reviewed operations and experienced similar results.  <b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data.            On this day, the OSAT = 72.6°F at 1PM.            The CWS loop temp = 44.7-- 45.7°F.            AHU-5 EAT = 72.6°F; LAT = 59°F; ΔT= 13.6°F.  <i>OSAT = outside air temperature.</i>  <i>EAT = entering air temperature at the AHU.</i>  <i>LAT = leaving air temperature at the AHU.</i>  <i>AHU = air handler unit.</i>  <i>CWS = chilled water system</i></p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.  <b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.03.15, CSG re-tested the chilled water system's performance.</b> After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. CSG also reviewed trends for space temperatures over the course of several days to ensure adequate space temperatures are being maintained. Final data:            OSAT = 87.2°F at 12 PM.            The CWS loop temp = 44.6 -- 46.1°F.            AHU-5 EAT = 78.6°F; LAT = 58.8°F; ΔT= 19.8°F.  <b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 36. Previous GPM = 35. Final GPM = 38.  <b>10.03.14--</b>JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance.</p>	<p>08.05.15</p>



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-175	<p><b>AHU-6 high cooling coil supply air temperatures.</b></p> <p><b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.</p> <p><b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again.</p> <p>The OSAT = 71.5°F. The CWS loop was 45.7-47.8°F. AHU-6 EAT = 73.7°F; LAT = 57.5°F; ΔT= 16.2°F. Although this is an improvement over previous results, it is still below design. SPH&amp;C also reviewed operations and experienced similar results.</p> <p><b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data. On this day, the OSAT = 72.6°F at 1PM.</p> <p>The CWS loop was 44.7-45.7°F.</p> <p>AHU-6 EAT = 72.6°F; LAT = 59°F; ΔT= 13.6°F.</p> <p>OSAT = outside air temperature.  EAT = entering air temperature at the AHU.  LAT = leaving air temperature at the AHU.  AHU = air handler unit.  CWS = chilled water system</p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.</p> <p><b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.13.15, CSG re-tested the chilled water system's performance.</b> After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. Final data:  OSAT = 93.3°F at 4:20 PM.  The CWS loop temp = 44.9 -- 46.1°F.  AHU-6 EAT = 87.6°F; LAT = 74.9°F; ΔT= 12.7°F. It should be noted that although the delta T is below design, the control valve was only partially open so full flow through the coil was not available. Trends revealed space temperatures were within design parameters over several days with the cooling coil control valve never opening 100%.</p> <p><b>08.05.15--</b> CSG re-tested the chilled water coil performance and space temperatures and noted it was still underperforming. The contractors later determined the AHU's filters were clogged and replaced.</p> <p><b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 33. Previous GPM = 33. Final GPM = 33.</p> <p><b>10.03.14--</b>JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance.</p>	<p>08.17.15</p>



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M-176	<p><b>AHU-12 high cooling coil supply air temperatures.</b></p> <p><b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.</p> <p><b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again.</p> <p>The OSAT = 71.5°F. The CWS loop was 45.7-47.8°F. AHU-12 EAT = 73.2°F; LAT = 60.5°F; ΔT= 12.7°F. Although this is an improvement over previous results, it is still below design. SPH&amp;C also reviewed operations and experienced similar results.</p> <p><b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data. On this day, the OSAT = 72.6°F at 1PM.</p> <p>The CWS loop was 44.7-45.7°F.</p> <p>AHU-12 EAT = 72.6°F; LAT = 60.2°F; ΔT= 12.4°F.</p> <p>OSAT = outside air temperature.  EAT = entering air temperature at the AHU.  LAT = leaving air temperature at the AHU.  AHU = air handler unit.  CWS = chilled water system</p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.</p> <p><b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.03.15</b>, CSG re-tested the chilled water system's performance. After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. CSG also reviewed trends for space temperatures over the course of several days to ensure adequate space temperatures are being maintained. Final data:  OSAT = 87.2°F at 12 PM.  The CWS loop temp = 44.6 -- 46.1°F.  AHU-12 EAT = 83.2°F; LAT = 63.4°F; ΔT= 19.8°F.</p> <p><b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 86. Previous GPM = 86. Final GPM = 86.</p> <p><b>10.03.14--</b>JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance.</p>	<p>08.05.15</p>



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M-177	<p><b>AHU-14 high cooling coil supply air temperatures.</b></p> <p><b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.</p> <p><b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again. The OSAT 71.5°F. The CWS loop was 45.7-47.8°F. AHU-14 EAT = 71.2°F; LAT = 59°F; ΔT= 12.2°F. SPH&amp;C also reviewed operations and experienced similar results.</p> <p><b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data. On this day, the OSAT = 72.6°F at 1PM. The CWS loop was 44.7-45.7°F. AHU-14 EAT = 72.6°F; LAT = 59°F; ΔT= 13.6°F. OSAT = outside air temperature. EAT = entering air temperature at the AHU. LAT = leaving air temperature at the AHU. AHU = air handler unit. CWS = chilled water system</p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.</p> <p><b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.13.15</b>, CSG re-tested the chilled water system's performance. After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. Final data: OSAT = 92.4°F at 4:10 PM. The CWS loop temp = 44.9 -- 46.1°F. AHU-14 EAT = 74.8°F; LAT = 60.2°F; ΔT= 14.6°F. It should be noted that although the delta T is below design, the control valve was only partially open so full flow through the coil was not available. Trends revealed space temperatures were within design parameters over several days with the cooling coil control valve never opening 100%.</p> <p><b>12.05.15--</b> CSG was notified the correct belimo PICCV control valve was installed and re-balanced to the correct flow per plans and specs.</p> <p><b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 44. Previous GPM = 34. New GPM = 36. AHU-14's belimo PICCV control valve was determined to be the wrong size valve body and came programmed for the incorrect GPM flow rating.</p> <p><b>10.03.14--</b> JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance. This has been accepted as is by MSI. CV's were accepted with lower GPM</p>	08.17.15



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-178	<p><b>AHU-15 high cooling coil supply air temperatures.</b></p> <p><b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.</p> <p><b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again. The OSAT = 71.5°F. The CWS loop was 45.7-47.8°F. AHU-15 EAT = 71.2°F; LAT = 58.2°F; ΔT= 13°F. SPH&amp;C also reviewed operations and experiences similar results.</p> <p><b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data. On this day, the OSAT = 72.6°F at 1PM. The CWS loop was 44.7-45.7°F. AHU-15 EAT = 72.2°F; LAT = 59°F; ΔT= 13.2°F. OSAT = outside air temperature. EAT = entering air temperature at the AHU. LAT = leaving air temperature at the AHU. AHU = air handler unit. CWS = chilled water system</p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.</p> <p><b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.12.15</b>, CSG re-tested the chilled water system's performance. After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. CSG also reviewed trends for space temperatures over the course of several days to ensure adequate space temperatures are being maintained. Final data: OSAT = 93.3°F at 4:20 PM. The CWS loop temp = 44.9 -- 46.1°F. AHU-15 EAT = 78.4°F; LAT = 59.9°F; ΔT= 18.5°F.</p> <p><b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 55. Previous GPM = 65. Final GPM = 65. AHU-15's belimo PICCV control valve was determined to be the wrong size valve body and came programmed for the incorrect GPM flow rating. Because the flow rating is higher than design, MSI approved of the installation as is.</p> <p><b>10.03.14--</b> JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance.</p>	<p>08.17.15</p>



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M-179	<p><b>AHU-20 high cooling coil supply air temperatures.</b></p> <p><b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.</p> <p><b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again. The OSAT = 71.5°F. The CWS loop was 45.7-47.8°F. AHU-20 EAT = 74.4°F; LAT = 57.2°F; ΔT= 17.2°F. Although this is an improvement over previous results, it is still below design. SPH&amp;C also reviewed operations and experienced similar results.</p> <p><b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data. On this day, the OSAT = 72.6°F at 1PM. The CWS loop was 44.7-45.7°F. AHU-20 EAT = 72.2°F; LAT = 58.4°F; ΔT= 13.2°F. OSAT = outside air temperature. EAT = entering air temperature at the AHU. LAT = leaving air temperature at the AHU. AHU = air handler unit. CWS = chilled water system</p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.</p> <p><b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.03.15,</b> CSG re-tested the chilled water system's performance. After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. CSG also reviewed trends for space temperatures over the course of several days to ensure adequate space temperatures are being maintained. Final data: OSAT = 87.3°F at 4:20 PM. The CWS loop temp = 45.8 -- 46.1°F. AHU-20 EAT = 74.3°F; LAT = 56.9°F; ΔT= 17.4°F. This AHU also have compressor Dx cooling available as needed for a third stage of cooling for the kitchen.</p> <p><b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 38. Previous GPM = 35. Final GPM = 39.</p> <p><b>10.03.14--</b>JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance.</p>	08.17.15



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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-180	<p><b>AHU-21 high cooling coil supply air temperatures.</b></p> <p><b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.</p> <p><b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again. The OSAT 71.5°F. The CWS loop was 45.7-47.8°F. AHU-21 EAT = 70.5°F; LAT = 58.7°F; ΔT= 11.8°F. SPH&amp;C also reviewed operations and experiences similar results.</p> <p><b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data. On this day, the OSAT = 72.6°F at 1PM. The CWS loop was 44.7-45.7°F. AHU-21 EAT = 72.2°F; LAT = 59.7°F; ΔT= 12.5°F. OSAT = outside air temperature. EAT = entering air temperature at the AHU. LAT = leaving air temperature at the AHU. AHU = air handler unit. CWS = chilled water system</p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.</p> <p><b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.03.15</b>, CSG re-tested the chilled water system's performance. After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. CSG also reviewed trends for space temperatures over the course of several days to ensure adequate space temperatures are being maintained. Final data: OSAT = 87.3°F at 12 PM. The CWS loop temp = 45.8 -- 46.1°F. AHU-21 EAT = 76.6°F; LAT = 60.3°F; ΔT= 16.3°F.</p> <p><b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 42. Previous GPM = 38. Final GPM = 44.</p> <p><b>10.03.14--</b>JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance.</p>	8.17.15



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Project: Eastmont High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-181	<p><b>AHU-22 high cooling coil supply air temperatures.</b></p> <p><b>10.28.14--</b> Riley Engineers, the TAB contractor, noted there was still a significant amount of air trapped in the system as indicated by the drastic fluctuations in readings. JRT has been asked to bleed the system again.</p> <p><b>10.08.014--</b> After JRT bled air from the system, Petra requested CSG review coil performance again. The OSAT = 71.5°F. The CWS loop was 45.7-47.8°F. AHU-22 EAT = 68.2°F; LAT = 56.9°F; ΔT= 11.3°F. SPH&amp;C also reviewed operations and experienced similar results.</p> <p><b>09.22.14--</b>SPH&amp;C along with Johnson Controls performed a maximum capacity test on the chilled water system in order to final tune and test the operations of the cooling tower and both chillers. During the test, CSG reviewed the performance characteristics of various AHU systems and determined some coils were not performing according to expectations based off the design criteria and the manufacturer's submittal data. On this day, the OSAT = 72.6°F at 1PM. The CWS loop was 44.7-45.7°F. AHU-22 EAT = 72.2°F; LAT = 58.4°F; ΔT= 13.8°F. OSAT = outside air temperature. EAT = entering air temperature at the AHU. LAT = leaving air temperature at the AHU. AHU = air handler unit. CWS = chilled water system</p>	<p>The contractors should gather any additional performance data necessary, along with all final balancing data and confer with the equipment manufacturer as well as MSI to determine why this AHU is underperforming.</p> <p><b>09.30.14--</b>CSG, SPH&amp;C and Riley Engineering reviewed chilled water flows at these coils. All measured flows were within 10% of those reported in the preliminary TAB report.</p>	<p><b>On 08.03.15</b>, CSG re-tested the chilled water system's performance. After the contractors continued efforts to bleed air from the piping system and water flows through the coil were increased, the LAT at the chilled water coil met design criteria. Final data: OSAT = 87.2°F at 12 PM. The CWS loop temp = 44.9 -- 46.1°F. AHU-22 EAT = 70.6°F; LAT = 57.1°F; ΔT= 13.5°F. It should be noted that although the delta T is below design, the control valve was only partially open so full flow through the coil was not available. Trends revealed space temperatures were within design parameters over several days with the cooling coil control valve never opening 100%.</p> <p><b>12.05.15--</b> CSG was notified the correct belimo PICCV control valve was installed and re-balanced to the correct flow per plans and specs.</p> <p><b>10.28.14--</b> Riley Engineers and SPH&amp;C were on site to verify and adjust water flows to the problematic cooling coils. Coil strainers were pulled, flushed and verified to be clean. The correct Belimo valve actuators were noted as being installed per plans and specs. It was also determined some AHU coils did not have air bleeders installed in them per plans and specs. JRT has since installed all bleeders at the high points in the piping systems as directed by MSI. Water flow readings: Design GPM = 32. Previous GPM = 22. New GPM = 28. AHU-22's belimo PICCV control valve was determined to be the wrong size valve body and came programmed for the incorrect GPM flow rating.</p> <p><b>10.03.14--</b> JRT has checked the coils and chilled water system for air and bled out any excess when found. This has not provided enough improvement in the coil performance. This has been accepted as is by MSI. CV's were accepted with lower GPM</p>	08.17.15



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## Commissioning Issues List

### Project: Eastmont High School

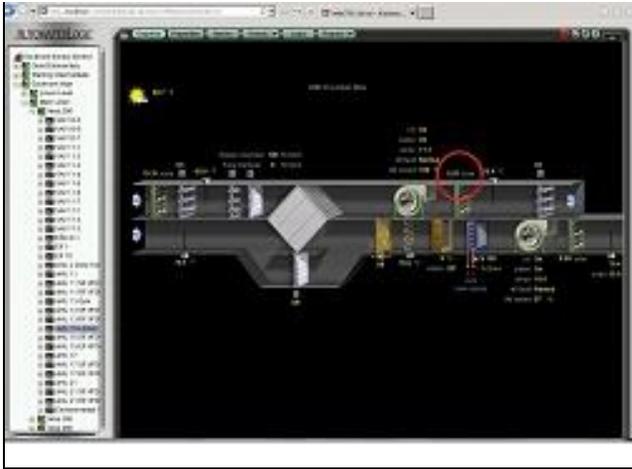
ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-182	<b>09.22.14-- No proof of duct cleaning has been supplied by the contractor's.</b> Plans and specifications state duct cleaning by a NADCA certified outfit must provide duct cleaning to all existing ductwork to be re-used on the project. Proof of such work needed to be provided to the district.		Bruce HVAC provided a report by Northwest Abatement Services stating duct cleaning was completed on the project.	01.05.06
E-183	<b>01.06.05--</b> The second can light on the east side main entry is askew and should be re-installed and secured correctly.		CSG verified the can light has been installed properly.	01.21.15
M-184	<b>01.06.06--</b> TWP-2 has continually been found in alarm. The condensing loop pump sporadically fails, which can lead to a failure of the chillers and the entire chilled water system.		TCE electricians, Seann Tanner and John the district electrician all reviewed this issue recently. Seann said they found a couple loose lugs on the starter for TWP2 and tightened them awhile back. No trip outs since. Mark from TCE just shut it down right now so he could check inside the housing for any other obvious issues but the lugs may have been the problem.	08.13.15



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PHOTOS

### EASTMONT HIGH SCHOOL COMMISSIONING ISSUES



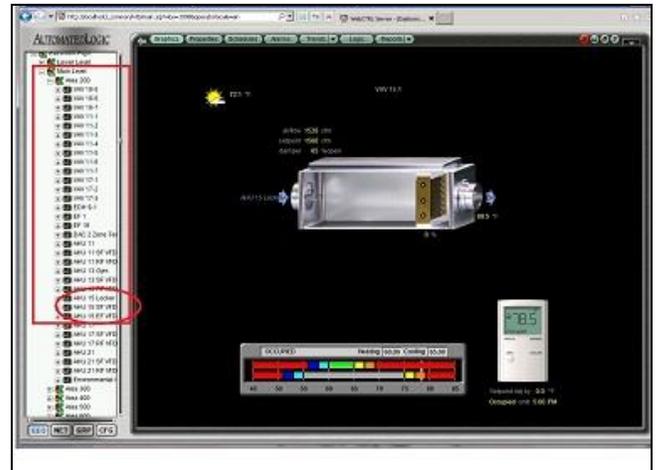
Issue ID #M-01 –Bad Air Flow Sensor



Issue ID # M-05—Exhaust duct is open



Issue ID #M-08—T-stat reading +4°F



Issue ID #M-013—Equipment Tree



Issue ID #M-19—Fume Hood Alarm’s are not powered or available to provide an audible alarm to an end user in case of airflow failure across the hood sash.



Issue ID #M-23—Missing Filters—AHU-14



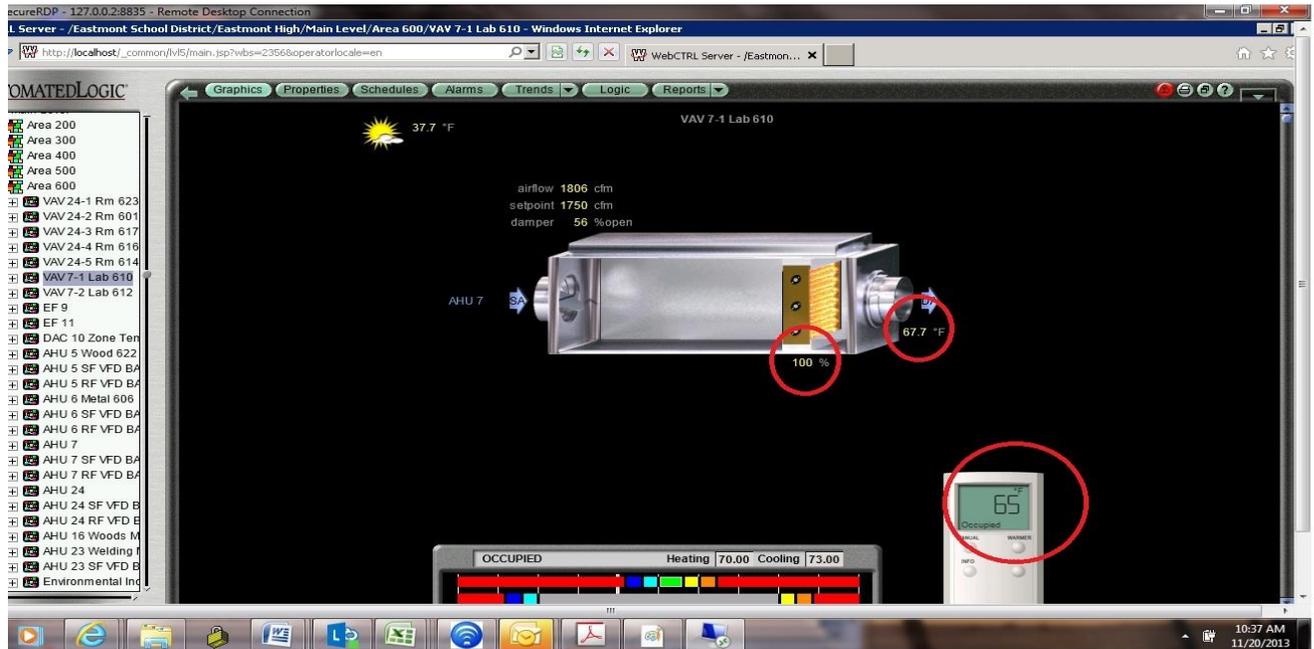
Issue ID #P-24—Roof Drains



Issue ID #P-32—Leak above ceiling



Issue ID #P-43 & 44—Area 100 open boxes



Issue ID #M-58—Electric heater not working. With 100% command, DAT = 67.7°F.

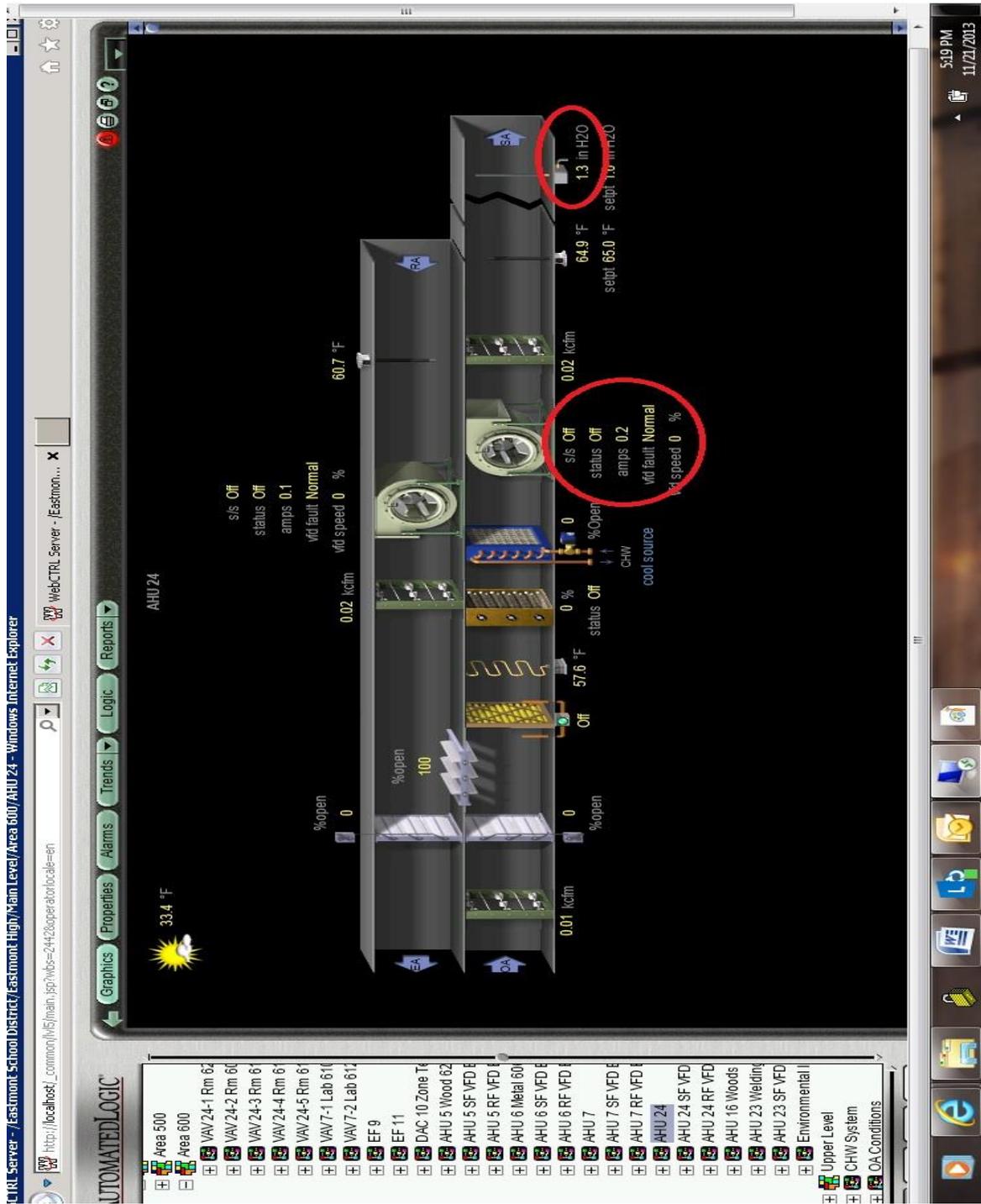
**AUTOMATED LOGIC**

1. School District  
 2. Elementary  
 3. Intermediate  
 4. High  
 5. Lower Level  
 6. Main Level  
 7. Area 200  
 8. Area 300  
 9. Area 400  
 10. Area 500  
 11. Area 600  
 12. VAV24-1  
 13. VAV24-2  
 14. VAV24-3  
 15. VAV24-4  
 16. VAV24-5  
 17. VAV7-1  
 18. VAV7-2  
 19. EF 9  
 20. EF 11  
 21. DAC 10 Zone Temp Mc  
 22. AHU 5  
 23. AHU 5 SF VFD BACnet  
 24. AHU 5 RF VFD BACnet  
 25. AHU 6  
 26. AHU 6 SF VFD BACnet  
 27. AHU 6 RF VFD BACnet  
 28. AHU 7  
 29. AHU 7 SF VFD BACnet  
 30. AHU 7 RF VFD BACnet  
 31. AHU 24  
 32. AHU 24 SF VFD BACnet  
 33. AHU 24 RF VFD BACnet  
 34. AHU 16 Woods MAU  
 35. AHU 23 Welding MAU  
 36. AHU 23 SF VFD BACnet  
 37. Environmental Index 60  
 38. Upper Level  
 39. CHW System  
 40. OA Conditions  
 41. DHW System 1  
 42. Mech Room Ventilation  
 43. Environmental Index  
 44. Chiller 1 BACnet Interface  
 45. Chiller 2 BACnet Interface

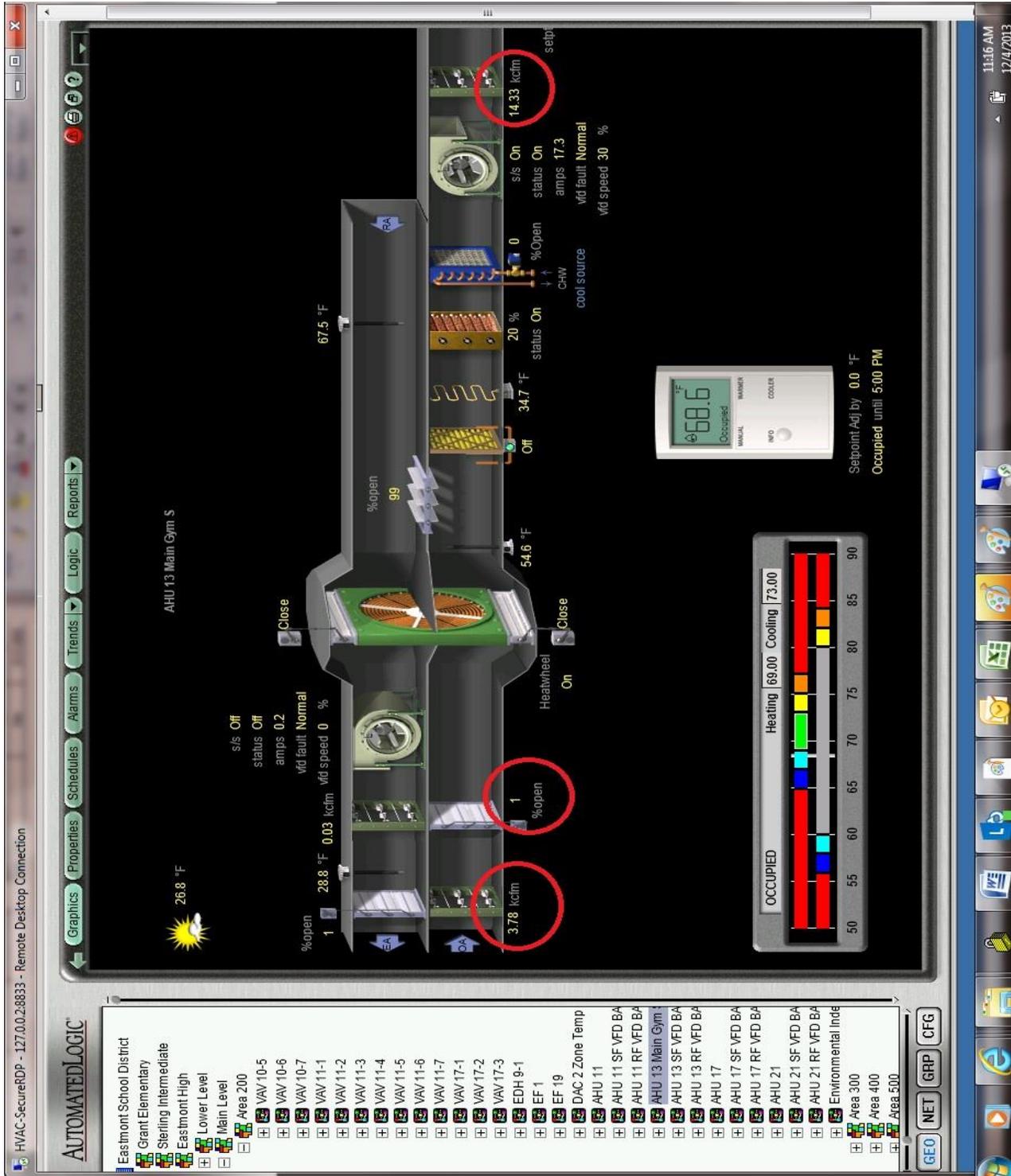
65.4 °F  
 AHU 16 Woods MAU  
 paint booth effect status Off  
 s/s Off status Off  
 75.5 °F sept 70.0 °F  
 0 %  
 Clean  
 dust collector filler  
 Clean  
 Open

Issue ID #M-063—MAU-AHU-16 serving the Woods Shop was not running.





Issue ID #M-069—Although all fans are off, the static pressure within the duct is still being reported at 1.3”.



Issue ID #M-072—Airflow stations not measuring accurately. The supply air reading surpasses both design air for the unit as well as what’s reported in the TAB report. With OSA damper essentially closed, there should not be 3780 CFM at the flow sensor.

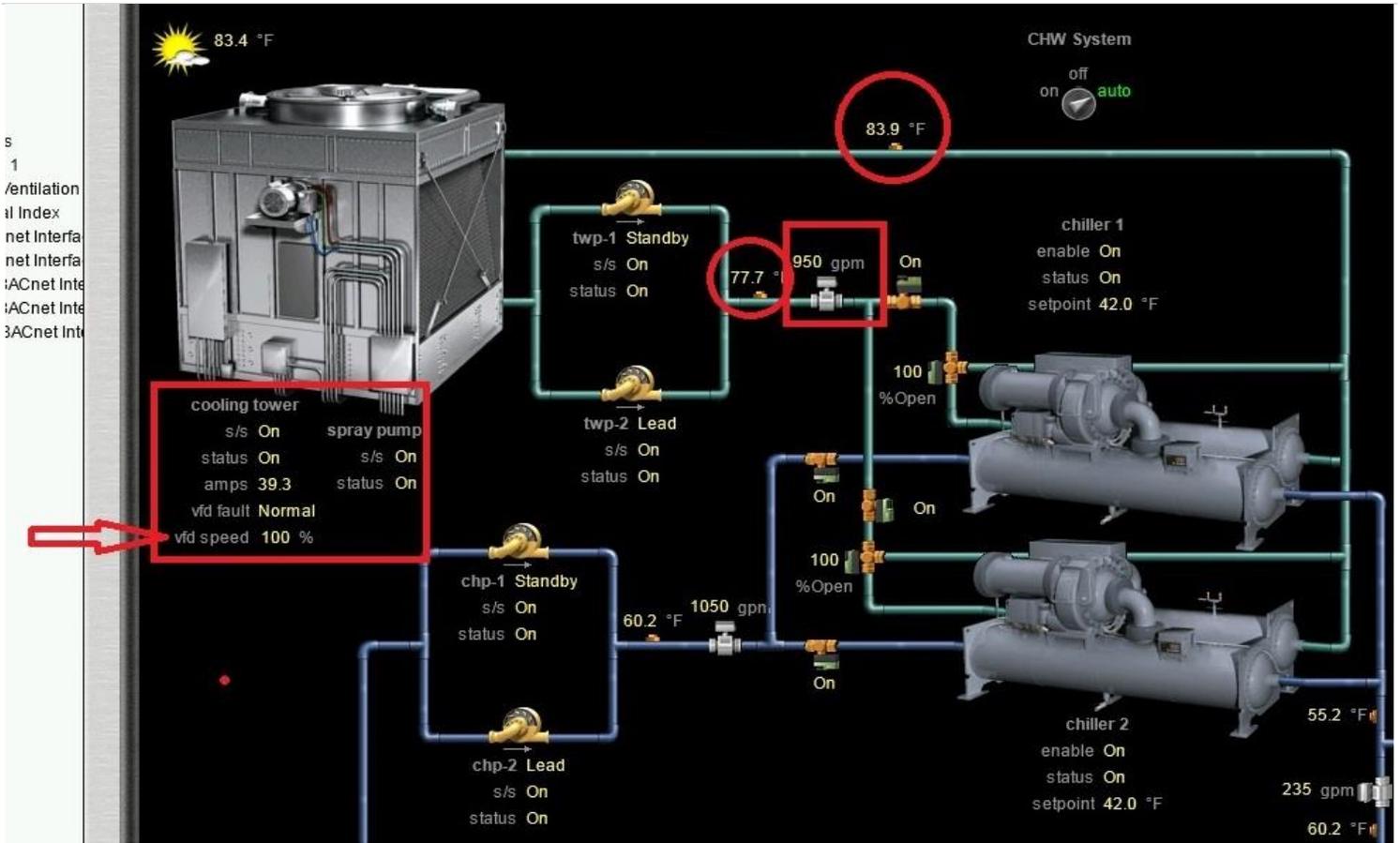




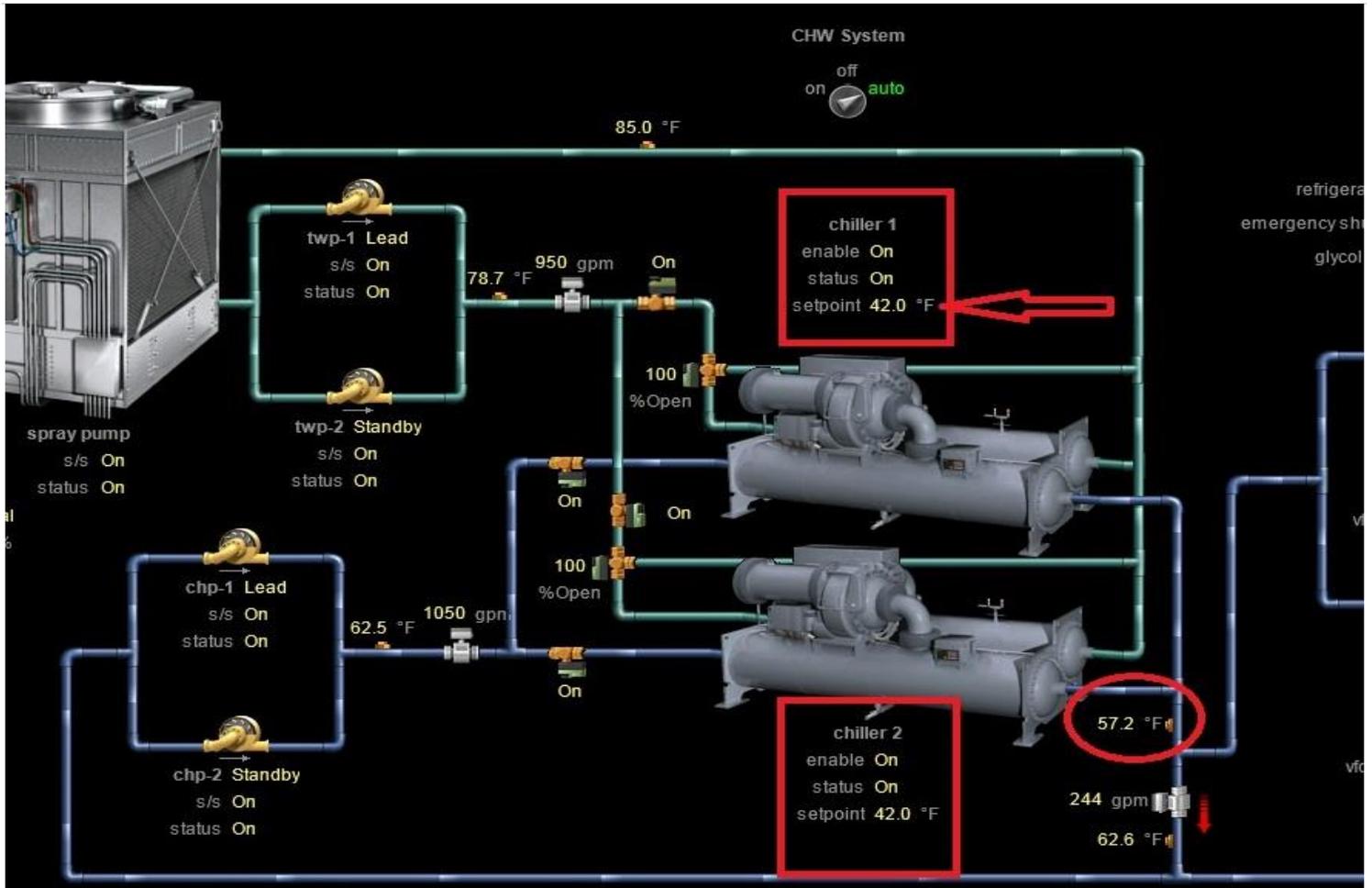
Issue ID #M-078— At 10:30 AM, the return air temperature from the space is only at 55.4°F indicating the space temps are extremely low throughout the entire 700/800 Areas. Of even more concern is the lack of ventilation air to occupied spaces because the lack of space temps keeping the AHU in Morning Warm up mode. Both issues violate WAC requirements for schools.



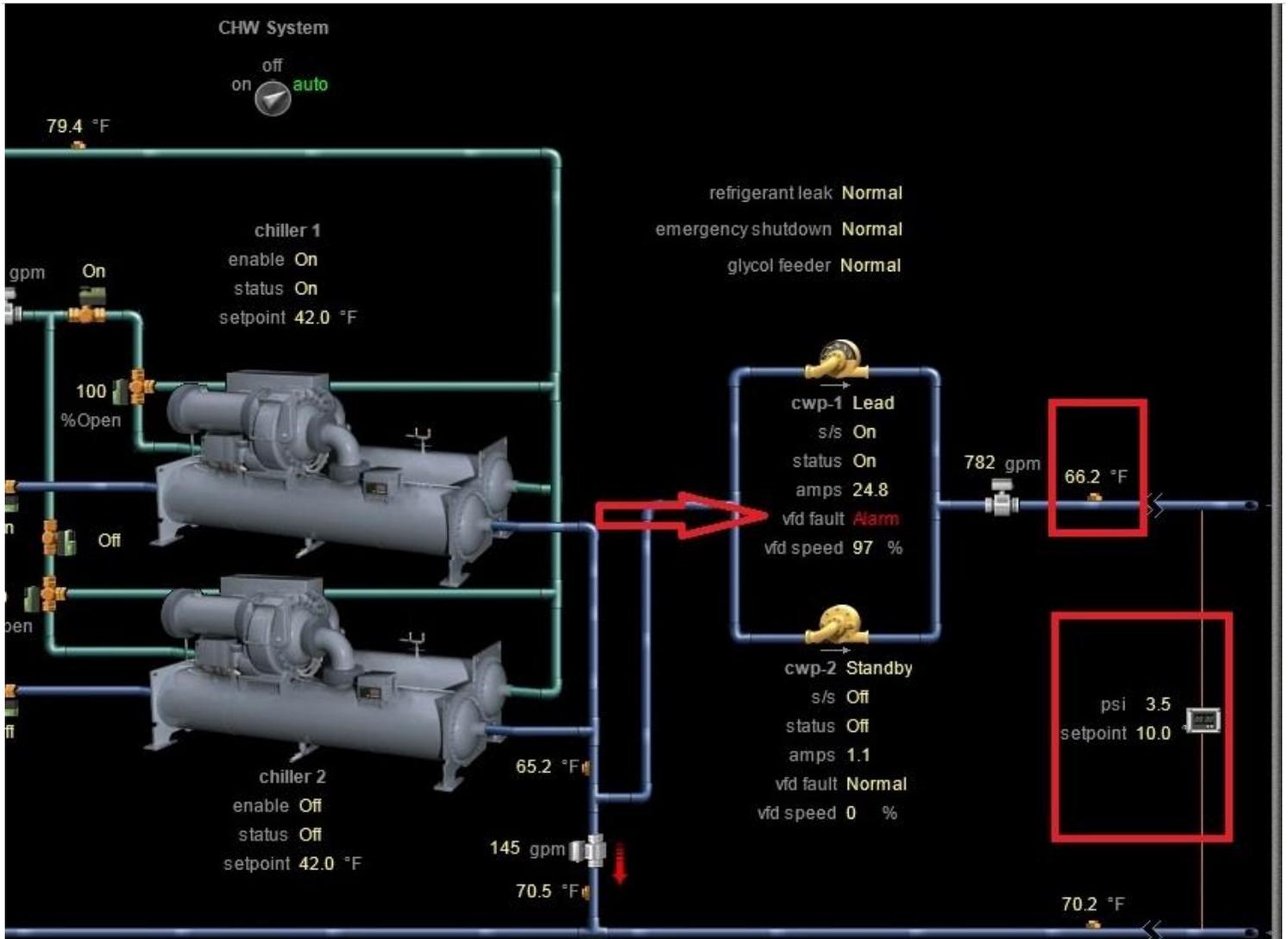
Issue ID #M-97—EF-18 has a failure. Commanded to run but is not capable.



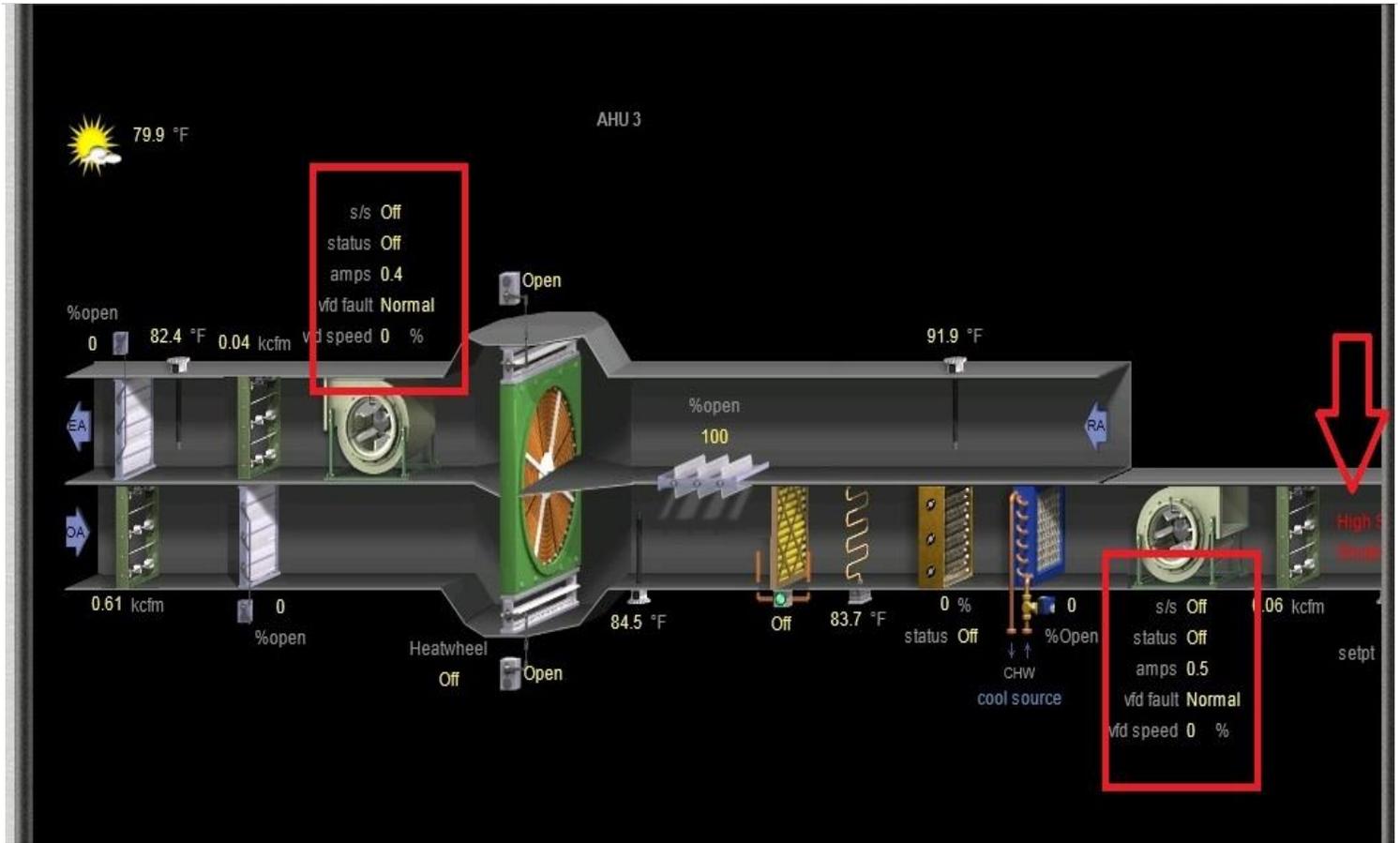
Issue ID #M-98—Cooling tower performance does not appear to match the manufacturer’s performance data. A 6°F delta T at 100% capacity at only 83°F ambient temperatures seems low. The flow rate does not match the design. It is unknown what the wet bulb temperature is, what the air flow and spray water flow is at this time but that data should be provided in order to determine why it is underperforming. The design indicates a delta T of 10°F with a leaving fluid temp of 85.5°F. Here, the entering fluid temp isn’t even 84°F. It seems as though this system is wasting energy by operating at 100% capacity to get a 6°F delta T with entering and leaving fluid temps below the design. The cooling tower loops requires additional tuning to provide the most efficiency.



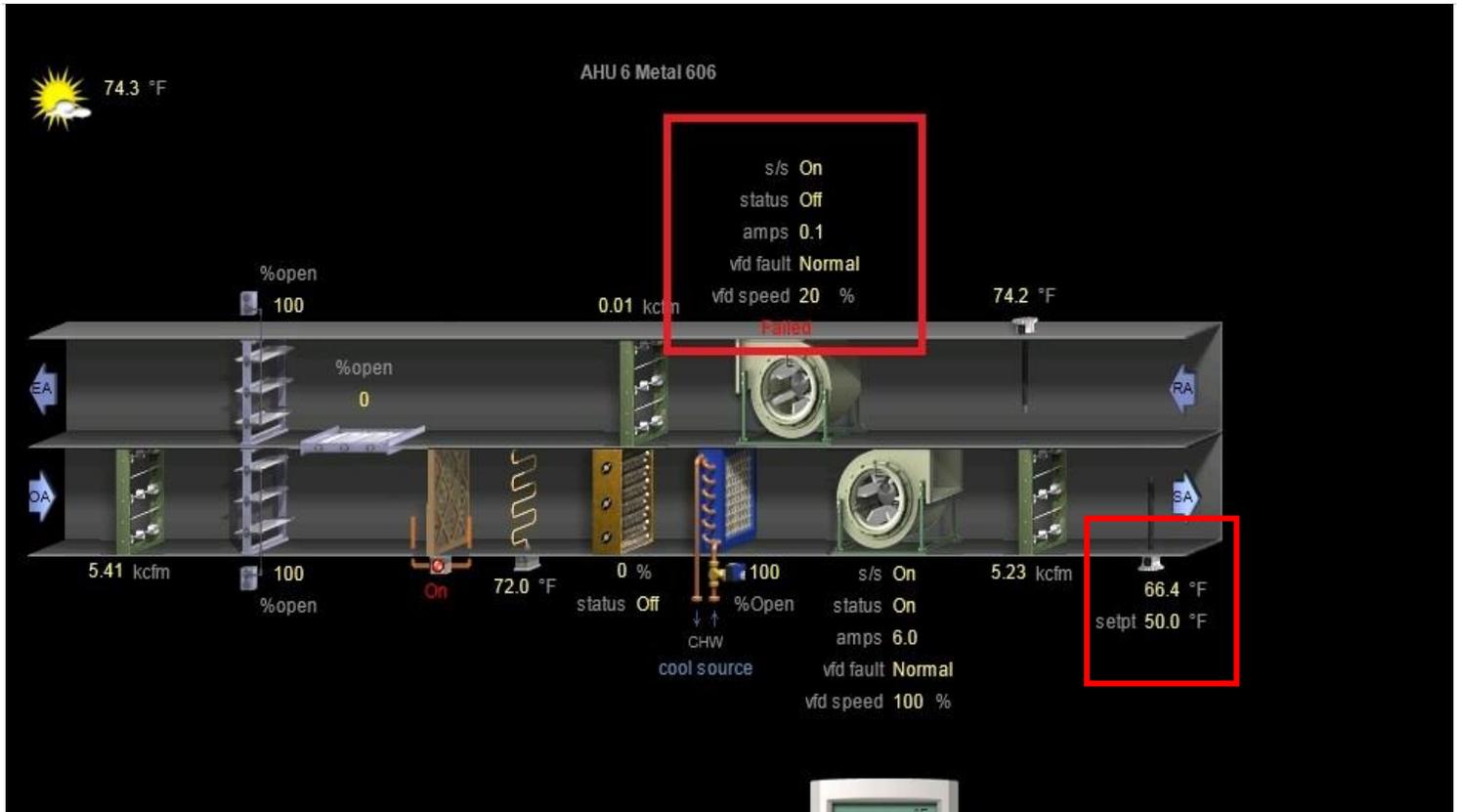
Issue ID #M-99—the chilled water loop temperature is unable to meet the set point of 42°F. Even with both chillers operating, the leaving water temperature is only 57.2°F and slightly warmer in the actual secondary loop after the circulation pumps. Because the Bacnet interface for both chillers is not yet completed, we are unable to determine whether the chillers were operating at full capacity. But in either case, there appears to be an issue that it is operating at 15°F above the loop set point. None of the AHU's are able to meet their respective discharge air temperature set points either and are operating with their CW control valves wide open. I am unable to access trends at the moment, but reviewing operations for the previous 4 days indicates the system has yet to meet the loop setpoint at all. In the diagram below, note the loop temperature is up to 66.2°F which offers very little cooling capacity.



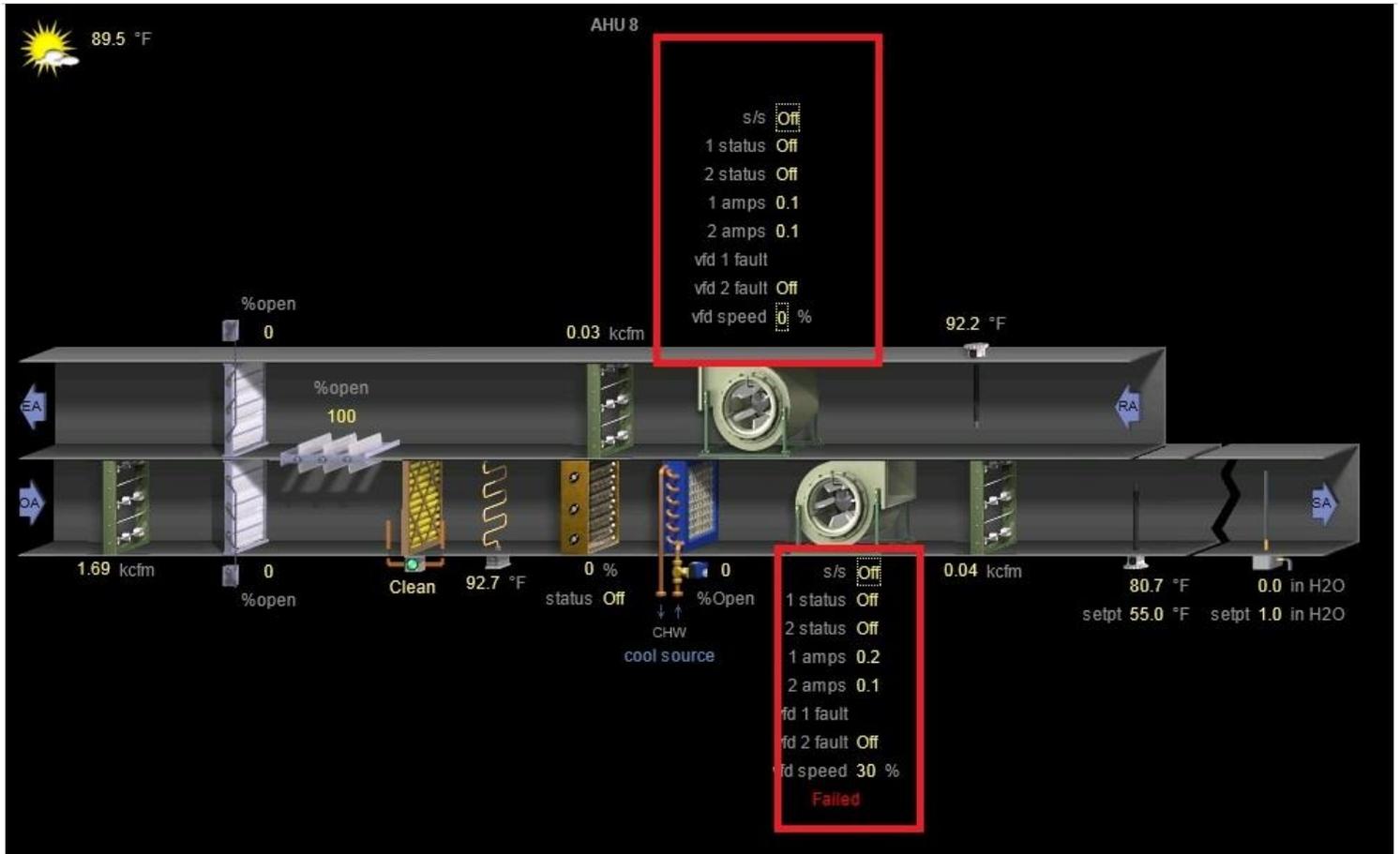
Issue ID #M-100—The CWP-1 VFD is in alarm. The CW loop differential pressure set point is not being met. Here the dP is 3.5 psi with a set point of 10 psi. CWP-2 is still on standby and should be cycling on to help increase water flow. Runtime is significantly higher for CWP-1 indicating lead / lag operation may not be working correctly. Trend data is not accessible at this time.



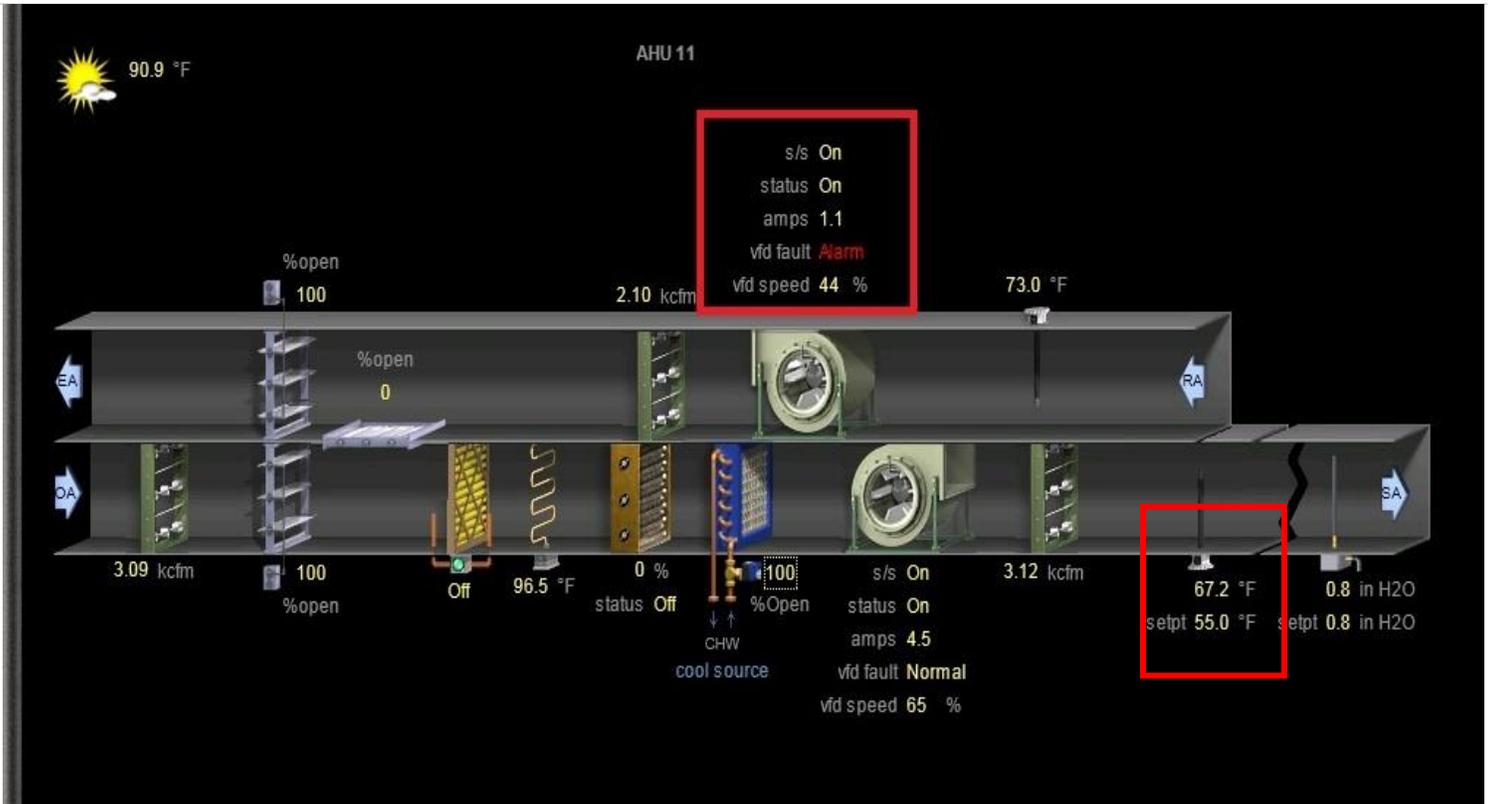
Issue ID #M-104—AHU-3 has failed and there is an unidentifiable alarm indicated towards a portion of the graphic that is not accessible. There is no way to scroll over in order to view it. Contractors should investigate and report back what findings there are prior to additional onsite Cx testing. Graphic should be so that it can be seen in its entirety.



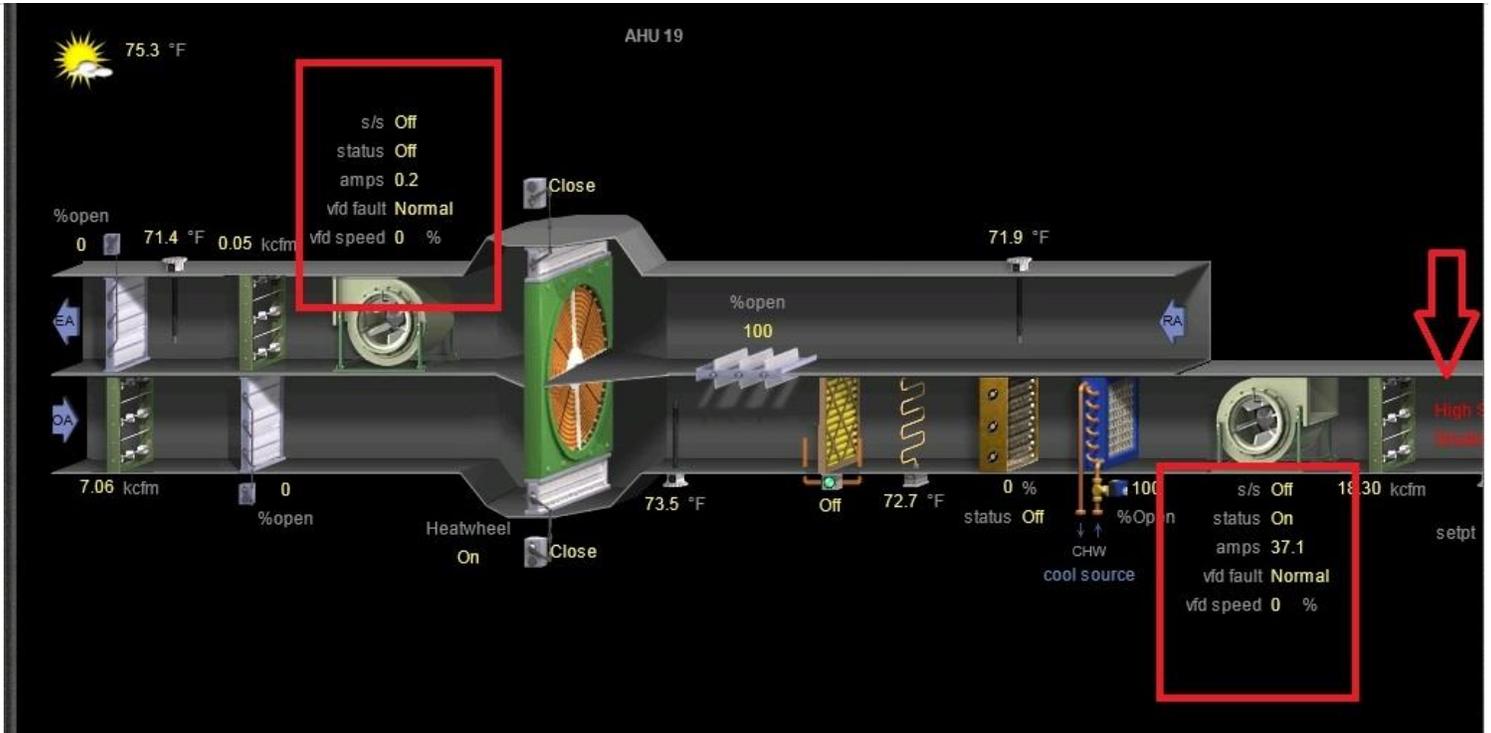
Issue ID #M-105—AHU-6 Return Fan has failed. Contractors should investigate and report back what findings there are prior to additional onsite Cx testing. Notice discharge air temperature with CW control valve wide open which is related to the concerns over the chilled water loop temperature.



Issue ID #M-106—AHU-8 has failed and been overridden off.



Issue ID #M-107—AHU-11 has an alarm on the return fan VFD. Notice discharge air temperature with CW control valve wide open which is related to the concerns over the chilled water loop temperature.



Issue ID #M-108—AHU 19 has failed and there is an unidentifiable alarm indicated towards a portion of the graphic that is not accessible. There is no way to scroll over in order to view it. Contractors should investigate and report back what findings there are prior to additional onsite Cx testing. Graphic should be so that it can be seen in its entirety.

**Parameter download required.**

Download

73.8 °F

AHU 20 Kitchen

ef-5 kitchen hood status Off

ef-4 dishwasher hood status Off

15 %open

85 %Open

Off 70.9 °F 0 %

0 %Open

CHW cool source

dx stage 1 Off

dx stage 2 Off

s/s status On

72.7 °F

70.6 °F

Occupied

cooler monitor Alarm

freezer monitor Alarm

refer monitor Normal

Issue ID #M-109—AHU-20 serving the Kitchen is not yet functioning.

