Final Commissioning Report For Woodland High School

July 2017

Figure 1. Woodland High School

CSG
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 Woodland 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: Back Courtyard

2. The Commissioning Process

2.1 Background and Definition

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 The problem is not the people that they hire, but rather the traditional processes have become outdated for the complexities of today's buildings.

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

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

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

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[1] *The Cost-Effectiveness of Commercial-Buildings Commissioning: A Metra-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.

[2] ASHRAE Standard 90.1-2004, the model for energy codes in many states, including a minimum level of systems commissioning as part of the completion requirements (6.7.2) for mechanical systems that is less detailed than the Washington Energy Codes.

Work on the commissioning process began formally in 1982 when the American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE) formed a committee to develop a better process for ensuring functional buildings were turned over to building owners.

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

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

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

2.1.1 Definitions

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

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

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

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

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

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

2.2 Team Data

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

2.2.1 Party Definitions:

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

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

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

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

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

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

Figure 3: 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: Main Corridor

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.

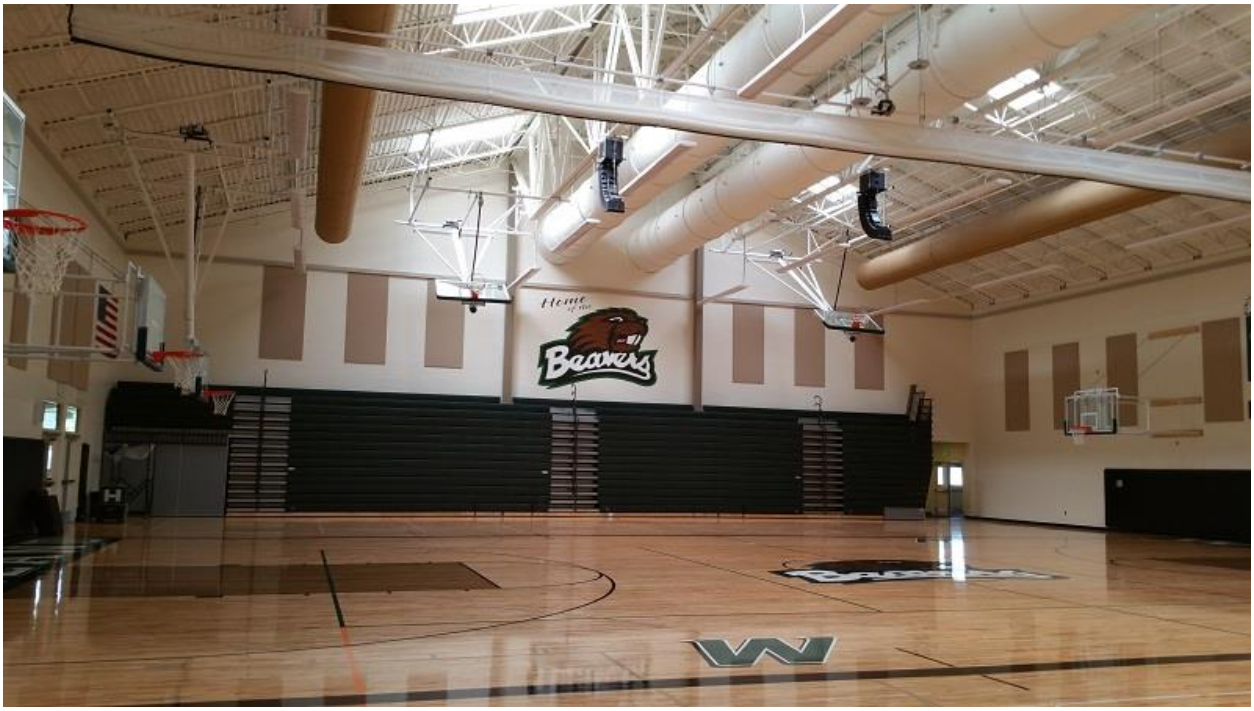

Figure 5: Gym

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: Boilers/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 Manufacture'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 covering the pipe. Lines are pressure-tested 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, 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: Stage/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 reviews the reports from the Architect or Engineer that witnessed the test.

6. Functional Performance test

Functional Performance Tests were conducted on the mechanical and electrical systems at Woodland 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 and electrical systems will perform during the year. The tests were developed to be run on maintenance schedule and can verify that the systems are working as originally designed. Statistical sampling is used to verify that the systems are working correctly. Whenever the test is performed, different units can be selected and alternated to check all equipment over time.

6.1 Other System Tests

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

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

6.2 Results of Testing

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

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

7. Operations and Maintenance

During the Acceptance Phase of the project, training sessions were held for Woodland School District staff. O & M manuals were completed, 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: Stadium and Football Field

7.1 Areas of Training

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

- Plumbing Systems
  - Location of clean-outs, back-flow preventors, and equipment
  - “As - Built” Drawings
- Built-up Heat Recovery Units
- Air Handling Units
- Chillers, Boilers and pumps.
- Domestic Water Heating system and pumps
- Direct Digital Controls Systems
- Electrical Systems including automatic lighting controls

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 Woodland 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: Typical Science Lab/Classroom

Appendix A – Field Reports, Testing & Issues Log

Figure 10: Chiller

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Commissioning Issues Report

Project: Woodland High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues--Classroom wings						
1	E-01	06.09.15	Low Voltage lighting controls	The exterior light fixtures on the perimeter of the building remains on during daylight hours.	Advanced Electrical	Closed
2	E-02	06.09.15	Interior occupancy sensors	The occupancy sensors located in the bathrooms cycle off the lights too quickly.	Advanced Electrical	Closed
3	E-03	06.09.15	Classroom 2403 occupancy sensor	Lights are on several hours after non-occupancy without the occupancy sensor cycling off the lights.	Advanced Electrical	Closed
4	E-04	06.09.15	Classroom 2401 occupancy sensor	Lights are on several hours after non-occupancy without the occupancy sensor cycling off the lights.	Advanced Electrical	Closed
5	E-05	06.09.15	Corridor occupancy sensor	The 2nd Floor North Corridor lights do not cycle off lights.	Advanced Electrical	Closed
6	E-06	06.09.15	Corridor occupancy sensor	The 1st & 2nd Floor South Corridor occupancy sensor does not pick up motion while entering from the concourse until we were 20-25 feet inside the corridor.	Advanced Electrical / BCE	Closed
7	E-07	06.09.15	Classroom occupancy sensor	Occupancy sensors are picking up motion from the adjacent corridors when doors are left open.	Advanced Electrical	Closed
8	E-08	06.09.15	Daylight harvesting controls	Some fixtures are wired to share photocells but are located in locations with very different ambient light levels.	Advanced Electrical / BCE	Closed
9	E-09	06.09.15	Classroom occupancy sensor	Coverage within the space is poor. Lights are noted to consistently cycle off while still occupied and seated.	Advanced Electrical / BCE	Closed
10	E-10	06.09.15	Daylight harvesting controls	The photocells in every 2x2 RL3P light fixture do not sit flush in the factory bracket, affecting dimming operations.	Advanced Electrical / BCE	Closed
11	E-11	06.09.15	Daylight harvesting controls	Light levels in some classrooms do not meet the WAC requirements of 30 FC or 50 FC (labs) when dimmed	Advanced Electrical / BCE	Closed

Please view Narrative sheets for a more in depth explanation of each issue as well as a chronological account of corrective measures.

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Project: Woodland High School

ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues--Classroom wings						
12	E-12	06.09.15	Incorrect light fixture installed	ASB room 2503 has a dimming fixture with photocell though the drawings don't show them to be.	Advanced Electrical	Closed
13	E-13	06.09.15	Identification labeling	The mechanical room has several disconnects and emergency button missing identification labels.	Advanced Electrical	Closed
14	E-14	06.09.15	Identification labeling	Lab prep rooms require some switches/knobs to be identified and labeled properly.	Ednetix	Closed
15	E-15	06.09.15	Lab vacuum pumps	Switches have not been provided to turn on the vacuum pumps located at the teachers station in Labs (where provided).	BCE	Closed
Plumbing Issues Classroom wings						
16	P-16	06.09.15	Emergency wash shower drain	Water from the emergency wash shower located in Lab 2401 mostly passes by the drain and collects in front of the doorway.	Skanska / Eagle Harbor	Closed
17	P-17	06.09.15	Lab vacuum pump gauge	Drawing M2.23 shows a gauge should be plumbed to the vacuum pump.	Eagle Harbor	Closed
18	P-18	06.09.15	Trap primer	Air and gurgling noises are emanating from the drain of the Lab 2204 sink located at the most northeasterly work station.	Eagle Harbor	Closed
19	P-19	06.09.15	Thermostatic mixing valves	Groaning in the thermostatic mixing valve cabinet can be heard whenever the emergency wash station is turned on in Lab 2402.	Eagle Harbor	Closed
20	P-20	06.09.15	Heating water piping leak	The hot water piping is leaking in the mezzanine above AHU-40.	Eagle Harbor	Closed
Mechanical Issues Classroom wings						
21	M-21	06.09.15	EF-8	Exhaust fan EF-8 was found disassembled and non operational.	Eagle Harbor	Closed

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ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Mechanical Issues Classroom wings						
22	M-22	06.09.15	AHU-26 control valve	The black handle on the end of the control valve rod attached to the actuator is missing.	NCC	Closed
23	M-23	06.09.15	Bypass piping on HRU's	Both HRU's 7 & 8 chilled water bypass piping has not been insulated and sweats to the point it puddles beneath it.	Eagle Harbor	Closed
24	M-24	06.09.15	Extremely noisy supply air diffusers	AHU-25 airflow serving the Stage is excessively noisy and may exceed WAC requirements.	BCE / ABA	Closed
25	M-25	06.09.15	Extremely noisy supply air diffusers	HRU-9 airflow serving the Industrial tech Lab is excessively noisy and may exceed WAC requirements for classrooms.	BCE / ABA	Closed
26	M-26	06.09.15	Paddle Fans air turbulence	The paddle fan maximum speed in the Commons creates extreme drafts that will lead to occupant discomfort.	BCE / NCC	Closed
27	M-27	06.09.15	DCV sequence of operations	The demand control ventilation sequence did not modulate the outside air damper open beyond the adjustable minimum DCV position as programmed.	NCC	Closed
28	M-28	06.09.15	Standby Mode sequence of operations	The non-occupied standby mode sequence of operation did not modulate the outside air damper closed.	NCC	Closed
29	M-29	06.09.15	Unoccupied night high limit sequence	The Unoccupied NHL sequence of operation did not modulate the outside damper open for economizer cooling.	NCC	Closed
30	M-30	06.09.15	Space differential pressure sensors	The space differential pressure sensors are not reporting back to the DDC graphics accurately.	NCC	Closed
31	M-31	07.28.15	AHU-1 sequence of operations	AHU-1 outside air damper does not move to programmed minimum position of 25% and instead moves to 10% open.	NCC	Closed
32	M-32	07.28.15	AHU-1 sequence of operations	With space temperature 2.8°F > set point, AHU-1 did not move into cooling mode. Cooling valve remained closed. Discharge air temperature remained at 82°F	NCC	Closed

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Mechanical Issues Classroom wings						
33	M-33	07.28.15	HRU-8 CO2 sensor	HRU-8 CO2 sensor display is not an accurate representation of CO2 levels.	NCC	Closed
34	M-34	07.28.15	HRU-8 space pressure sensor	With the entire HVAC system in unoccupied mode and off, the space static pressure is reading a -.50" which is not accurate.	NCC	Closed
35	M-35	07.28.15	AHU-12 overridden	We discovered the occupancy sensor source was overridden to "Network". Can NCC verify whether this is correct?	NCC	Closed
36	M-36	07.28.15	HRU-6 sequence of operations	HRU-6 was discovered running at 10:28 am on Saturday morning during unoccupied mode. All HVAC equipment should not be running unless placed in an override condition.	NCC	Closed
37	M-37	07.28.15	HRU-14 CO2 sensor	HRU-14 CO2 sensor display is not an accurate representation of CO2 levels.	NCC	Closed
38	M-38	07.28.15	HRU-15 CO2 sensor	HRU-15 CO2 sensor display is not an accurate representation of CO2 levels.	NCC	Closed
39	M-39	07.28.15	HRU-11 overridden	We discovered the cooling and heating set points overridden. Can NCC verify whether this is correct?	NCC	Closed
40	M-40	07.28.15	HRU-16 CO2 sensor	HRU-16 CO2 sensor display is not an accurate representation of CO2 levels.	NCC	Closed
41	M-41	08.08.15	AHU-22 Space pressure sensor	With the entire HVAC system in unoccupied mode and off, the space static pressure is reading a .01" which is not accurate.	NCC	Closed
42	M-42	08.08.15	ERU-1 sequence of operations	ERU-1 serving the Grandstands was found in occupied mode and running on Sat at 11:00 am when all HVAC equipment should remain off.	NCC	Closed
43	M-43	08.08.15	Chiller graphics	Although the chilled water system is off, the graphics reflect the condenser fans as running.	NCC	Closed

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Mechanical Issues Classroom wings						
44	M-44	08.08.15	Exhaust Fans- space temperature set points	Those exhaust fans being controlled via reverse acting T-stats do not have similar set points from one space to another. Set point continuity should be maintained throughout the entire campus.	NCC	Closed
45	M-45	08.08.15	EF-8 sequence of operations	We discovered this exhaust fan's status was being displayed as On during unoccupied hours. All HVAC equipment should not be running unless placed in an override condition.	NCC	Closed
46	M-46	08.08.15	EF-15 sequence of operations	We discovered this exhaust fan's status was being displayed as On during unoccupied hours. All HVAC equipment should not be running unless placed in an override condition.	NCC	Closed
47	M-47	08.08.15	Space differential pressure set points	The set point of .02" is too low, driving the relief damper to open before space pressure is truly .02". We suggest increasing it.	NCC / BCE	Closed
48	M-48	07.28.15	AHU-39 sequence of operations	AHU-39 outside air damper does not move to programmed minimum position of 18% and instead only moves to 10% open.	NCC	Closed
49	M-49	07.28.15	AHU-2 sequence of operations	During the clg sequence, the outside air damper economized 100% open even though the outside air temp was > return air temp.	NCC	Closed
50	M-50	07.28.15	AHU-2 sequence of operations	AHU-2 outside air damper does not move to programmed minimum position of 25% and instead moves to 10% open.	NCC	Closed
51	M-51	07.28.15	AHU-1 sequence of operations	During the heating sequence, the outside air damper moved to 0% position and the heating valve never opened.	NCC	Closed
52	M-52	07.28.15	AHU-5 sequence of operations	During the cooling sequence, the outside air damper economized 100% open even though the outside air temperature was higher than return air temperature.	NCC	Closed
53	M-53	07.28.15	AHU-7 sequence of operations	During the cooling sequence, the outside air damper economized 100% open even though the outside air temperature was higher than return air temperature.	NCC	Closed
54	M-54	07.28.15	AHU-13 sequence of operations	During the cooling sequence, the outside air damper economized 100% open even though the outside air temperature was higher than return air temperature.	NCC	Closed

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ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Plumbing Issues						
55	P-55	07.28.15	Locker Showers	Water is not being kept within the stall and is pooling on the floor of the toilet creating a slipping hazard. The floor is not sloped from this area towards the drain.	Skanska	Closed
56	P-56	07.28.15	Gym Concessions stand sink	The sink nearest the roll up door has very little hot or cold water flow.	Eagle Harbor	Closed
57	P-57	07.28.15	Kitchen Scullery sink	The sink located next to the dishwasher drips when shut off.	Eagle Harbor	Closed
58	P-58	07.28.15	Kitchen spray hose temps	The hot water does not reach an appropriate temperature. 70°F is noted on temperature gauge in wall box even though mixing valve is set to full hot.	Eagle Harbor	Closed
59	P-59	07.28.15	Rm 1409 faucet	Do the sinks require a vacuum break because of the hose bib installed on the fixture in place of an aerator?	Eagle Harbor	Closed
Electrical Issues						
60	E-60	07.24.15	Admin phone room occupancy sensor	The occupancy sensor has been installed behind the door in the phone room. This installation may not offer the best coverage in the small space.	Advanced Electrical	Closed
61	E-61	07.24.15	Mezzanine occupancy sensors	Several occupancy sensors were not installed when compared to electrical drawing E2.32. A hazard is created in the darkened space.	Advanced Electrical	Closed
62	E-62	07.24.15	Electric keyed switches	Several of the keyed switches are not mounted to the wall properly. They don't appear to be fastened securely to the wall box.	Advanced Electrical / Skanska	Closed
General Issues						
63	G-63	07.24.15	Kitchen freezer control panel mount	The freezer temperature control panel is not mounted securely to the wall.	Skanska	Closed
64	G-64	07.24.15	Motorized shades switch programming	The 4 position switch for the motorized shades in the shared learning spaces are not programmed correctly. 25-50-75% position buttons are all programmed to close completely.	Skanska	Closed

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ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
General Issues						
65	G-65	07.24.15	Carpeting	Carpet has not been glued around most entry door thresholds and can be lifted up easily.	Skanska	Closed
66	G-66	07.24.15	Carpeting	The north main entry adjacent to the instrument lockers has been stained by what looks like mastic, noticed after threshold install.	Skanska	Closed
67	G-67	07.24.16	Landscaping	One head was leaking and 2 others are spraying to much concrete along the SE entrance. Also missing valve schedule at main controller.	Skanska	Closed
Mechanical Issues						
68	M-68	08.08.15	DDC system trends	CSG does not see trends or a history set up for the new High School as there is for the other schools in the district	NCC	Closed
69	M-69	08.08.15	DDC lighting interface graphics	The page doesn't seem to populate with data every time it's opened. Has the schedule been set up to the district's liking?	NCC	Closed
70	M-70	07.22.15	DDC alarms	During FPT's we noted that no alarms for the heating water or chiller water systems were being displayed on the DDC graphics	NCC	Closed
71	M-71	08.10.15	ERU-1 fire shutdown	While the rest of the school was in a fire alarm, the Stadium ERU did not cycle off. Is it tied into the system as is the rest of the HVAC system is?	NCC	Closed
72	M-72	08.27.15	Chiller alarm	The DDC system indicates the chiller is in a general alarm.	Eagle Harbor	Closed
73	M-73	08.27.15	Chiller LonWork communication points	The chiller interface with the DDC graphics is incomplete as the list of LonWork communication points has not been provided to NCC.	Eagle Harbor	Closed
74	M-74	08.27.15	ERU-1 DC-1	The electric resistance heater DC-1 is not functioning. NCC has stated there is nowhere to land their control wiring to on the panel.	Eagle Harbor	Closed

Please view Narrative sheets for a more in depth explanation of each issue as well as a chronological account of corrective measures.

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ID	Issue ID	Date Issued	Equipment ID	Issue	Assigned	Status
Electrical Issues						
75	E-75	08.27.15	Stadium Press box-lighting installation	What appears to be a photocell has been installed in Scorekeeper A203 that is not shown on the Electrical drawing. One half of the lamp in the space was dimmer than the other.	Advanced Electrical	Closed
76	E-76	08.27.15	Stadium Canopy light switch	The main switch for the stadium canopy lighting is not labeled.	Advanced Electrical	Closed

Please view Narrative sheets for a more in depth explanation of each issue as well as a chronological account of corrective measures.

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-01	**Exterior lights are on during daylight hours. As of 07.20.15--**CSG noted all exterior lighting around the main school building and the parking lots remained off. **06.09.15--**While on site, CSG has noted all light fixtures attached to the perimeter of the building are remaining on all day. We have also noted where a few pole lights remained on during daylight hours as well, although they seemed to be off the last two days we were on site, 06.12.15. The Cooper Controls programmer on site stated the photo cell had been properly adjusted but this does not appear to be the case.	Advanced Electrical and perhaps the LV lighting manufacturer needs to determine the correct photocell settings so that lights are cycled on and off at the appropriate light levels. During training we asked the programmer whether this had been executed properly and to provide a copy of the settings for future reference. Could there be an issue with the relays or controllers?	**08.27.15--**CSG verified over the course of several visits that exterior lighting was cycling on and off at appropriate ambient light levels. This suggests the lighting system is functioning in automatic mode. **06.22.15--**Bob with Advanced Electrical stated the lighting control panels had been left in an overridden state for testing purposes. They were trying to isolate a bad fuse. They have since been set to Auto and are functioning correctly.	08.27.15
E-02	**06.09.15-- The gang toilet rooms' occupancy sensors are cycling off lights too soon.** There is the possibility that lighting will turn off on someone seated in a stall as motion cannot be picked up with a seated occupant. We noted that lights cycled off within only five minutes from not sensing motion.	CSG suggests that all occupancy sensors be set to a specific time span agreed upon by the Woodland School District and High School administration. 10-15 minutes seems a more appropriate choice.	**06.24.15--**Bob with Advanced Electrical stated they have adjusted all gang toilet occupancy sensors to cycle off lights at approximately 15 minute intervals. CSG spot checked some toilets and verified lights remained on for a minimum of 15 minutes. Bob went on to say the occupancy sensors have a programmable mode whereby the sensor "learns" the occupancy characteristics of the space to help keep the lights from nuisance cycling off .	7.22.15
E-03	**06.09.15-- Classroom 2403 Occupancy sensors fail to cycle off lighting for over 1 hour.** CSG noted the lights in these spaces do not cycle off in an appropriate time frame after non-occupancy.	Advanced Electrical should verify the occupancy sensor works correctly and that all final settings are more uniform throughout the entire school.	**06.24.15--**Bob with Advanced Electrical stated all occupancy sensors have been adjusted to 30 minute spans as outlined in the electrical specifications. Although CSG does not agree the present setting offers the energy savings that can potentially be had by further limiting the hours of operation of lighting, we do agree the contractor fulfilled the installation per plans and specifications. Functional testing in all classrooms verified they worked accordingly. The Woodland School District has accepted the operation as well.	7.22.15
E-04	**06.09.15-- Classroom 2401 Occupancy sensors fail to cycle off lighting for hours.** CSG noted the lights in these spaces do not cycle off in an appropriate time frame after non-occupancy.	Advanced Electrical should verify the occupancy sensor works correctly and that all final settings are more uniform throughout the entire school.	**06.24.15--**Bob with Advanced Electrical stated all occupancy sensors have been adjusted to 30 minute spans as outlined in the electrical specifications. CSG verified this operation. As previously noted, the Woodland School District also accepted the settings as set.	7.22.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
E-05	**06.09.15--The 2nd Floor North Corridor lights do not cycle off.** While on site performing FPT's, CSG noted the lights never cycled off. As we remained within a classroom off this corridor, we were certain no other people were present for at least 15 minutes and noted the adjacent portion of the concourse corridor lights would cycle off, further indicating no one had passed through from that direction.	Advanced Electrical should verify the occupancy sensor works correctly and that all final adjustments are set up in similar corridors.	**06.24.15--**Bob with Advanced Electrical stated the corridor occupancy sensors were adjusted to Auto mode which allows them to learn the occupancy habits within the space and cycle off lights at various intervals. CSG noted corridor lighting was cycling off more regularly than previously noted. We can continue monitoring the lighting activity but consider this issue closed.	07.22.15
E-06	**06.09.15--The 1st and 2nd Floor South Corridor's occupancy sensor did not pick up motion while entering from the concourse until we were 20-25 feet inside the corridor.** An occupant must pass two classrooms before lighting is cycled on in the corridor, which when in total darkness, could present a hazard. In order to promote safety, automatic lighting should cycle on within a few feet from entering any space or corridor on campus.	Advanced Electrical should verify the occupancy sensor works correctly and that all final adjustments are set up in similar corridors. If the span limits of the sensor have not been taken into account with it's placement, then it may need to be moved closer to the entrances to the point it consistently detects motion a few feet from the entrance.	**06.25.15--**Bob with Advanced Electrical stated *"the corridor occupancy sensor's settings were adjusted; lights now turn on within a few feet of entering the corridor."* CSG verified lighting cycled on within 10-15' from the entry to the corridor which seemed more appropriate.	07.22.15
E-07	**Classroom occupancy sensors are picking up motion from the adjacent corridors when doors are left open. This needlessly turns on the lights, opens the outside air damper, and returns the thermostat to occupied mode temperature settings.** **07.14.16--** An 11-month warranty walkthrough and meeting was held this week at the High School. In attendance was; Michael Green, Scott Landrigan and high school administrators, Kelley Wilson, Steve Broback and members of the design team as well as CSG Cx and Sean Walker with Skanksa. We discussed the operation of the occupancy sensors and whether there were any reports of nuisance activities regarding the lights cycling on or off during the inaugural school year. The Principal and facilities staff reported there were no complaints and all felt the occupancy sensors and lighting operations presented no problems requiring additional adjustments. CSG agreed to close the item from the Cx issues log. **08.21.15--** Advanced Electric had the following response to BCE's email outlining their thoughts on how the occupancy sensors should be installed, adjusted and functioning per	08.21.15--Brian Maloney of BCE had the following response: **1.)** Sensors must be installed per manufacturer's recommendations per Specification section 265000- 2.12B. Locate the sensors at least 4' from supply air diffusers. **2.)** The ultrasonic portion of the sensors is the technology portion that best detects small movement. The sensitivity of this needs to be increased to maximum. **3.)** The walk-through option should be turned "on" to ensure that the lights turn off quickly if the sensor is inadvertently tripped (ie. Someone walking by in the hallway with the classroom door open).	Advanced Electrical Stated the following responses to BCE's remarks on 08.21.15**;** **1.)** Spec Section 265000-2.12B states *"Sensors shall be wired and installed per manufacturer's direction to maintain switching and circuits shown on drawings." As far as location is concerned, Spec Section 265000- 3.05 states " mount to the dimensions shown on the drawings. Mount at quarter points where no dimensions appear".* AET has installed all occupancy sensors as per specifications and drawings. **2.)** After hundreds of hours trouble shooting and adjusting sensors, AET has found that by turning down the ultrasonic portion to 20-25%, allows for the occupancy sensor to turn off after the initial 30 minutes with no movement. When the sensor had been turned up, AET had found that many rooms never turned off. Each classroom has been tested and verified that the occupancy sensors will shut off after 30 minutes with no movement. **3.)** AET found no information regarding the walk-	07.14.16

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E-07 Cont'd	**Classroom occupancy sensors are picking up motion from the adjacent corridors when doors are left open.** design: AET found no information regarding the walk-through option. Therefore, this option was not turned on. If this option will be utilized, AET will gladly set each occupancy to allow for the walk-through option. **08.17.15--** Brian Maloney had the following response via email to S. Broback regarding the classroom lighting controls: *"Scott briefed Ben and I on what was discussed at the on-site lighting control meeting on Fri. First of all, after digging deeper we did ultimately find the product data submittal for the classroom occupancy sensors buried in one of the 1000 page electronic submittal files. From here we offer the following direction to be issued to the Contractor in an attempt to achieve the design intent and give the Owner a functional system."* **08.14.15--** Steve Broback assembled BCE's design team along with Michael Green, CSG,, Skanska and Advanced Electric on site to review the lighting controls systems in classrooms. The occupancy sensor's settings were noted and will be reviewed by Brian Maloney. **06.09.15--** For many classrooms that are in the unoccupied mode with no one in the classroom, walking past the classroom in the hallway triggers the occupancy sensor in the This turns the lights back on, opens the outside air damper, and returns the thermostat to the more narrow occupied temperature band. This wastes lighting energy, extra energy to heat or cool the outside air, and extra energy for the boiler or chiller. Bob Breien with Advanced Electrical stated that occupancy sensors had been turned parallel to the door to eliminate or minimize this problem, but they have not been turned in all classrooms.	**BCE's More detailed direction:** Relocate all sensors that are currently within 4' of a supply diffuser to at least 4' away from a supply diffuser towards the center of the room to the maximum extent possible, orient the grills on the sensor cover towards the teacher. Ensure that both technologies need to activate before turning lights on and that only one technology is needed to keep lights on. Ensure that the walk through option is enabled. Turn the ultrasonic portion of the occupancy sensor to maximum to allow detection of small movements. **06.25.15--** Turning the sensors did not produce the desired result. The sensors are installed as per plan, the design team may want to evaluate the placement to prevent unwanted detection. **06.09.15--** If turning the sensor does not eliminate the problem, adjusting the sensor or relocating the sensor could be considered.	-through option. Therefore, this option was not turned on. If this option will be utilized, AET will gladly set each occupancy to allow for the walk-through option. **08.21.15--** AET's response to BCE's more detailed direction: *"All work has been completed per plans and specifications and was also approved through the mock up room walk through with the engineer. (CSG Cx was not invited to attend or witness) AET will not relocate occupancy sensors without a signed CCD or CO allowing the work to be done on a Time and Material basis. Also, clear directions stating exact settings from the engineer would be required to allow for the work to be completed one time only. Please note that after a phone conversation with Cooper tech support, it had been discussed that it may be possible to turn the occupancy sensors back to the original "auto" setting that they were shipped. (this had been changed to manual to allow for the 30 minute timed off called out in the spec) The auto setting will account for constant noise from the airflow, and will turn off after 10 min. This will only work if the air flow is constant."* **08.07.15--** A meeting is planned for August 15th on site to review the present installation and operation of the occupancy sensors. McGranahan, BCE, the WSD and CSG will be attending. Skanska and Advanced Electrical is requested to be present in case there are questions regarding the installation	07.14.16

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E-08	**06.09.15-- Classroom automatic daylighting harvesting controls are not working adequately.** The installation of some lamps need to be reviewed by Advanced Electric. In some cases, we noted two pairs of fixtures are wired together and both fixtures dim according to the photocell receiving the most light. The two fixtures wired together may include a fixture located completely within a daylighting zone along with a fixture that is only adjacent to, or partially within a daylighting zone. This creates a less-brightly lit area at the fixture that does not receive direct sunlight. This requires a compromise between not dimming much at the window, or getting too dim away from the window. In other classrooms where the fixtures are separately dimmed, each fixture can be adjusted with its rotating photocell shield to dim more appropriately. Having noticeably different light levels may be a nuisance.	CSG worked with Advanced Electrical to find a compromise in dimming functions between the two fixtures but the end result will be that the light completely within the daylighting zone will never dim as much as it could if it were being singularly controlled by its own photocell. BCE may need to review the lighting operations along with the district to determine whether the present installation is adequate. All areas within the classroom must meet the WAC requirements for foot candles which they don't presently do.	**06.25.15--**Bob with Advanced Electrical stated diodes were added to individual lights to prevent dimming in adjacent fixtures that did not have the required foot candles. This appears to have provided more light level consistency in the daylighting zones. CSG has re-tested and verified the daylighting controls functioned per design. The areas where lamps were not directly in front of a window proved to remain above the WAC minimum requirements for flight levels in classrooms. **06.17.15-** Bob called this AM to inform us the Cooper Lighting Regional Rep will be on site today at 10:30 to discuss the lighting issues and mentioned they may have a fix that they will try on one classroom and if it works, it will be applied to all rooms that are affected by the issue.	07.25.15
E-09	**The occupancy sensor motion detection coverage within classrooms is poor.** **07.14.16--** An 11-month warranty walkthrough and meeting was held this week at the High School. In attendance was; Michael Green, Scott Landrigan and high school administrators, Kelley Wilson, Steve Broback and members of the design team as well as CSG Cx and Sean Walker with Skanksa. We discussed the operation of the occupancy sensors and whether there were any reports of nuisance activities regarding the lights cycling on or off during the inaugural school year. The Principal and facilities staff reported there were no complaints and all felt the occupancy sensors and lighting operations presented no problems requiring additional adjustments. CSG agreed to close the item from the Cx issues log. **08.21.15--** Advanced Electric had the following response to BCE's email :*After hundreds of hours trouble shooting and adjusting sensors, AET has found that by turning down the ultrasonic portion to 20-25%, allows for the occupancy sensor to turn off after the initial 30 minutes with no movement. When the sensor had been turned up, AET had found that many rooms never turned off. Each classroom has been*	**08.29.15--** Prior to AET's final adjustments, CSG asked them specifically not to extend the time intervals beyond 10-15 minutes which the district understood would provide the best energy efficiency of not only the lighting but the HVAC system. Instead, we believe they were extended out to 30 minutes in order to mask the several that were mounted so close to supply registers that airflow was now being picked up and keeping the sensor from every moving to unoccupied. **06.09.15--** To better pick up the possible teacher's desk locations, the occupancy sensors appear to need to be adjusted in sensitivity or span or coverage, or relocated so teacher desk locations are more accurately sensed. BCE along with Cooper lighting controls and Advanced Electrical may need to determine different sensor.	After using the classrooms for an entire school year, the Woodland School District stated that no teachers or school administrators had any complaints regarding cycling on or off lighting at inappropriate times via the occupancy sensors. During the warranty meeting, everyone was in agreement this issue could be considered satisfactorily resolved. **08.07.15--** A meeting is planned for 08.15.15 on site to review the present installation and operation of the occupancy sensors. McGranahan, BCE, the WSD and CSG will be attending. Skanska and Advanced Electrical is requested to be present in case there are questions regarding the installation. **06.25.15--** Bob with AE stated *"the sensors have been adjusted to provide more infrared sensitivity. This has provided better coverage within the classrooms. However due to the size of some of the classrooms, the placement and quantity of the sensors may not provide 100% coverage within the room. There is a balance between inadequate coverage and too much sensitivity that is difficult*	07.14.16

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E-09 Cont'd	*tested and verified that the occupancy sensors will shut off after 30 minutes with no movement"* **08.14.15--** Brian Maloney had the following response via email to S. Broback regarding the classroom lighting controls: *"The ultrasonic portion of the sensors is the technology portion that best detects small movement. The sensitivity of this needs to be increased to maximum."* **06.09.15--** Lights are noted to consistently cycle off with the room still occupied while seated. CSG was set up in this room all day and when seated for longer than 10 minutes, the occupancy sensor would cycle the lights off. We then began working on a laptop in the corner near the whiteboard where the teacher's desk will likely be located. The occupancy sensor failed to detect us, and the lights turn off again. With the lights still off, we remained seated and waved our hands but they did not turn on. Standing, the occupancy sensor detected this us and cycled the lights on. If someone is sitting in the middle of this room at normal desk height, the occupancy sensor displays the same behavior. It appears the locations the occupancy sensors have been installed in, although they meet the drawings, are not within the range of the infrared minor motion's radius of coverage. This would account for when a teacher is working at their desk with no other occupants in the space. It is a typical nuisance that may not go unnoticed, particularly when the occupant must repeatedly stand up in order for the occupancy sensor to detect motion. Although we are using 2404 as an example, all classrooms should eventually be set up in the same manner.	locations if the sensitivity or the span cannot be adjusted. The timing of the occupancy sensors cycling off lights is a separate issue from the sensor sensitivity and spans. The timing as reported by Bob has been left set in AUTO mode. Adjusting the timing any further out will only lead to increased energy consumption by both the lighting and HVAC systems since the energy conservation sequences designed into the HVAC system will be compromised and rarely activated.	*to achieve with only two ceiling mount sensors in a large classroom. We have found that increasing the sensitivity too much causes the sensor to be triggered by airflow from the supply diffusers, and not enough may not provide adequate coverage. We recommend erring on the side of reduced coverage as this, when combined with a 30 minute cycle, should provide good results in an occupied space."*	07.14.16
E-10	**06.09.15--The photocells in every 2x2 RL3P light fixture do not sit flush in the factory bracket.** Manufacturing: The integrated stamped and bent bracket built into the fixture is not large enough for the photocell sensor to sit perfectly flush and level within it, necessitating that the photocell be angled in one direction or another. Because this orients the photocell towards or away from the window, this may have an effect on dimming capabilities. I cannot locate the photocell in the O&M's to determine the compatibility with the fixture. The two do not appear to be made for each other.	Advanced Electrical should provide the cut sheets for the photocell sensor depicting how it should be mounted to the provided fixture. BCE and the manufacturer may need to review and determine whether this is the correct application. Were the brackets not manufactured properly? Is this the correct photocell? No cut sheets found in the O&M's.	**06.25.15--** Bob with Advanced Electrical stated the photocells have now been properly seated in the brackets. This has produced much better lighting consistency in all locations. CSG verified daylighting operations in all classrooms was working per design. **06.17.15--** Bob called this AM to inform us the Cooper Lighting Regional Rep will be on site today at 10:30 to discuss the lighting issues. They were shown the fitment issue and were to provide further advice on a better installation.	07.22.15

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E-11	**06.09.15-- Light levels and daylighting in classrooms and labs are not working adequately.** The photocells on the daylighting fixtures are being influenced by feedback of light from the fixture itself, leaking into the photocell housing, in addition to any daylight, resulting in classroom light levels below the WAC minimum when there is no daylight available. Variations in how much light is leaking into photocell housings appears to be a major cause of differences in lighting levels from one classroom to another on the order of 10 foot-candles in daylight harvesting zones. This difference is primarily observed when the blinds are down, since this increases the influence of the leaking light vs. sunlight. A difference in light level of 10 fc (or even 5 fc) is very noticeable. Several of the handful of rooms measured so far have light levels below the WAC minimum of 30 fc for classrooms. Light is leaked from the fixture itself into two locations on the photocell housing. 1.) Light is transmitted through openings in the plastic housing of the photocell (this is evidenced by the fact that taping around the housing with black electrical tape results in less light feedback and higher light levels in the classrooms). 2.) Light is transmitted into the gap between the adjustment ring and the plastic housing (this is evidenced by the fact that taping around the gap between the ring and the housing, after taping the housing itself, results in even higher light levels in the classrooms). The result is that with the photocell eye shade at minimum opening and the window blinds closed, some classrooms reveal only 26 foot-candles (fc) of light in areas where desks could be located at a height of 30" above the floor. This is below the WAC requirement of 30 fc in classrooms at a height of 30".	Advanced Electrical taped over the bodies of the photocells in fixtures located in classrooms 2404 & 2405. After the body of the enclosure is taped over with black electrical tape, the fixtures are noticeably brighter, and after the gap between the adjustment ring and body is taped, the lights are even brighter. Typically, it was determined that taping both areas is necessary to achieve acceptable light levels ranging from 33 to 42 fc in the dimmest areas of the room in three classrooms tested, up from 26 to 37 fc at the same test locations before taping. The exact light level may be dependent on exactly where the tape is placed, the angle of the sensor in its bracket (see issue ID E-10) and the tolerances of the fixture. A.E. should engage the manufacturer as well as BCE to review the dimming operations of the present installation. Taping every photocell is not a permanent solution for the district as it will not last long term. It is our expectations that the daylighting functions of the installed lighting systems not only meets the WAC requirements but the components and their installation fulfills its life expectancy.	**06.25.15--** Bob with Advanced Electrical stated after correctly positioning the photocells in the mounting brackets as stated in Commissioning issue ID# E-10, it has reduced the amount of light entering the housing of the photocells. When all photocell- controlled fixtures in a classroom are positioned correctly, light levels have increased to meet or exceed the WAC requirements. CSG verified daylighting operations in all classrooms was working per design. The dimming levels from one lamp to another appears to be more uniform than before. **06.17.15-** Bob with Advanced Electrical called this AM to inform us the Cooper Lighting Regional Rep will be on site today at 10:30 to discuss the lighting issues. CSG plans on being there as well.	07.25.15
E-12	**06.09.15-- The lighting fixtures installed in ASB room 2503 do not match drawing E 2.24.** The RL3 fixture is noted on the drawings although a dimmable RL3P type is presently installed. Are these fixtures still dimmable? Is the photocell sensor still active? Dimmable switches are not installed in the space. Are they necessary here?	BCE should review the installation and determine, along with the district, whether it is acceptable as is.	The sensors have been disabled in the RL3P fixtures installed in the ASB room. AET received some RL3 fixtures with concealed freight damage and substituted with extra RL3P's that were on site. Excessive lead times from Cooper lighting did not allow replacements to be installed within the contract schedule. This was apparently approved by the designers and school district.	07.22.15

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E-13	**06.09.15-- The mechanical room has several disconnects and emergency buttons missing labels.**	Advanced Electrical was awaiting final labels and will be performing this work as soon as they are received.	CSG has verified the mechanical related electrical enclosures have been labeled according to specification.	07.22.15
E-14	**06.09.15--The Lab Prep rooms have volume control knobs located on walls that require labeling.**		CSG noted Ednetix was on site labeling. We will verify all have completed at our next site visit.	08.25.15
E-15	**The under sink vacuum pumps located at some Lab teacher's stations do not have an electrical switch mounted on the outside of the cabinet.** **07.11.16--** During the 11- month warranty walkthrough and meeting, Scott Landrigan with the WSD stated he wished to have a switch installed on the cabinet to provide an easy way to turn it on/off and reduce the possibility of a teacher leaving the pump running overnight. **09.11.15--** CSG is unaware of any movement regarding the addition of a switch for the lab vacuum pump. Further consideration should be taken regarding the need for the under-sink receptacle to be of the GFCI type. **08.14.15--** During the Cx meeting held with the designers and RSD, we discussed the lack of an end user switch for the vacuum pumps at various lab teaching stations with Steve Broback who would discuss with BCE. **06.09.15--** Presently, in order to turn it on, there is a small switch on the actual pump assembly beneath the counter space located at the back underside of the pump. Not only will it be difficult to locate, it is difficult to even access it. See Chemistry Lab 2401.	The entire team reviewed the issue in one of the labs on 07.11.16. The designers will put forth a sketch and possible COD. BCE stated we can add a simple switch on the cabinet by wiring into the half of the receptacle the vacuum pump is plugged into.	This issue was discussed during the 11-month warranty walk-through and meeting with the school district, facilities staff and the designers. It was determined that any additional work that may be performed, because this was not a part of the original design, would be handled outside the commissioning process and directly with the contractors. BCE did state they could put a quick schematic together showing how a switch could be installed between the vacuum pump and the J-box power is being pulled from for it. CSG was asked to consider this matter closed.	07.11.16
P-16	**06.09.15-- The emergency wash drain in Lab 2401 is being bypassed altogether and pooling in front of the doorway.** If the slope of the drain is not in the proper place for the water to reach the drain, perhaps the piping it dumps from can be directed closer to the drain, limiting the amount of water that bypasses it.	If the slope towards the drain cannot be improved, redirecting the stream of water may help to keep it from going elsewhere. BCE may need to review and comment.	Skanska mentioned re-sloping the floor would be nearly impossible at this point. On 07.08.15, Eagle Harbor did adjust the drain pipe so that the flow of water was redirected more towards the drain. This did help keep water from pooling beside it. CSG re-tested and found this to be acceptable.	07.22.15
P-17	**06.09.15-- Drawing M2.23 shows a gauge is to be plumbed to the vacuum pump.** This has not yet been completed.	Eagle Harbor should complete the installation per plans and specs.	**07.08.15--** CSG verified Eagle Harbor installed the pump gauge as shown on the drawings.	07.22.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
P-18	**06.09.15-- Air and gurgling noises are emanating from the drain of the Lab 2402 sink located at the most northeasterly work station.** The trap primer may not be working properly as the drain appears to be dry.	Eagle Harbor stated there are no trap primers installed on the NE corner workstations and only heard water as it drained into the dilution tanks.	**07.08.15--** Eagle Harbor stated they inspected the trap primers installed in the NW workstations and found them to be working normally. CSG re-inspected and could no longer hear the same noises at the lab sink.	07.22.15
P-19	**06.09.15-- The thermostatic mixing valve serving the emergency wash station in Lab 2402 groans whenever water is flowing.**	Eagle Harbor should inspect the valve to make sure it is functioning correctly. Please report back findings.	**07.08.15--** Eagle Harbor stated the temperature mixing valves worked normally and did not make any noises when tested. CSG re-inspected these valves and did not notice the same sounds as before.	08.25.15
P-20	**06.09.15-- CSG noted the main heating water line was leaking directly above AHU-40.** CSG notified Eagle Harbor immediately to limit any potential damage that may occur. The ductwork was noted as being wet and dripping down directly onto the differential pressure gauge mounted on AHU-40. NCC may need to ensure it has not been damaged and that it is reading accurately.	Eagle Harbor was made aware of the issue and a bucket was placed beneath it to limit any further damage. The insulation must be removed to determine the source of the leak and then repaired.	**07.08.15--** Eagle Harbor stated they replaced the gasket on the pipe saddle and repaired the insulation. CSG verified there was no evidence of further leaking.	07.22.15
M-21	**06.09.15-- EF-8 was not operational.** CSG discovered a section of ductwork was removed and the fan was disassembled. the casing looks like it has collapsed. Further inspection revealed the supports were run through the bottom of the cabinet which also happens to be the only access to the fan motor and squirrel cages. Will the maintenance staff be required to disassemble and remove a section of ductwork to gain access to the motor?		CSG verified the fan was re-assembled and working normally. In addition, the supports that had previously been installed through the bottom cabinet access was re-worked so that maintenance access can be had without having to drop the entire fan.	07.22.15
M-22	**06.09.15--The black handle on the end of the control valve rod attached to the actuator is missing on AHU-26.**	NCC can provide a handle to replace the one missing.	The contractors replaced the missing valve actuator indicator and CSG verified it was in place.	08.25.15
M-23	**06.09.15-- Both HRU's 7 & 8 chilled water bypass piping has not been insulated and sweats to the point it puddles beneath it.**		The contractors stated the work was completed. CSG verified the chilled water bypass piping was properly insulated.	07.22.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-24	**AHU-25 airflows serving the Stage is excessively noisy and may exceed WAC requirements.** **08.14.15--** Steve Broback, Michael Green, CSG, John Justice and Scott Zimbelman from BCE and Sean Walker with Skanska all met on the Stage to discuss the noise issues. All were in agreement the noise levels were well above the required 35 N.C for classrooms. The contractors had failed to properly line the inside of the ductwork per plans and specifications and were directed to do so. BCE's opinion is that it is fan noise reverberating down the ductwork and through the registers, exacerbated by the missing duct liner. **06.09.15--** Sound levels from the velocities present at the supply registers will cause a nuisance for performances on the stage. Drawing M4.24 shows 6-12x10 sidewall mounted registers however there are actually 8 registers installed which more than likely, made the situation worse. Also, two registers appear to be facing the west wall which does not match the direction indicated in the drawings.	**08.14.15--**Both BCE and Eagle Harbor are working together to install a sound attenuator in the ductwork in order to mitigate some of the fan noise. CSG is awaiting updates on progress. **06.09.15--** We encourage the district to have the Drama and Choir teachers listen to it to determine whether any additional measures need to be taken to mitigate the noise. If it is found to be a nuisance, BCE along with perhaps the TAB contractor will need to review this system as installed to determine what measures may be taken.	**11.24.15--** Contractors have installed the sound attenuator on the supply main ductwork that has mitigated the airflow noise on the stage. Prior to that, the contractors installed the duct lining in that ductwork closest to the fan, leading out to the stage per plans and specifications. The Woodland School District, School Administrators and teaching staff all agreed the air noise was reduced significantly and was not hindering performances or classes held on the stage. CSG agrees the noise levels are now within acceptable levels.	07.11.16
M-25	**HRU-9 airflows serving the Industrial Tech Lab are excessively noisy and may exceed WAC requirements.** **08.14.15--** Steve Broback, Michael Green, CSG, John Justice and Scott Zimbelman from BCE and Sean walker with Skanska all met in Tech Lab to listen to the return fan noise coming through the return grille. All were in agreement the noise levels were unusually high. Scott also noted the supply fan itself seemed unusually louder than most and wanted to engage the manufacturer to make a determination. **06.09.15--** Sound levels from the supply diffusers may be disruptive to the classroom environment. It is difficult to tell whether more noise is being transmitted down the ductwork from the fans, which may require a sound attenuator. If it is caused by the face velocities at the supply registers, cutting in additional registers or enlarging them can alleviate this type of noise by reducing velocities without slowing down the fan.	**08.14.15--** BCE stated they would have the AHU manufacturer review the fan motor to make sure it was functioning normally. CSG is awaiting further information regarding the outcome of that meeting. **06.09.15--** We encourage the district to have the Industrial Tech Lab teachers listen to it to determine whether any additional measures need to be taken to mitigate the noise. If it is found to be a nuisance, BCE along with perhaps the TAB contractor will need to review this system as installed to determine what measures may be taken.	The BCE engineers thought a high pitched noise could be heard at the ECM fan motor assembly itself. Air Reps was called to inspect it. A new fan assembly was to be provided to the school district via warranty. Previously, the manufacturer suggested straightening out the pattern of air flow at the inlet of the fan with the addition of some egg crate grid. Brian Wrigley with the WSD stated he felt this seemed to decrease the air noise significantly enough to no longer be an issue.	07.14.16

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-26	**06.09.15-- While at maximum speed, the paddle fans located in the Commons creates extreme drafts and turbulence at occupant level.** The speed of the paddle fans is directly tied to the position of the outside air damper associated with the HRU-13 serving the Commons. As the OSA damper moves beyond the minimum position for free cooling, the paddle fans are enabled on. As the OSA damper continues to the 100% open position, the paddle fans will be at their top speed. As the paddle fans approach this speed, the drafts they create at floor level are quite high. This would make 70°F air feel cold to some occupants.	We suggest scaling back the 2-10V signal between the OSA damper position and the paddle fans to limit them from reaching maximum speed. We encourage the district to experience the drafts while the paddle fans approach high speeds to determine whether they feel it would be a nuisance. Then we can ask BCE to issue a directive to NCC in order for Joe to alter the programming in order to set limits on the paddle fan speeds.	After discussing the issue with the Woodland High School Administrator's, they were in agreement the drafts were unacceptable. CSG slowed down the fan speed until it no longer blew papers off tables sitting below them. We then instructed Joe Barnes with NCC to limit the maximum speed to 70% which seemed to be reasonable. It will now modulate from 0-70% speeds based off room conditions and the associated heat recovery units mode of operation. The speed can always be adjusted down further if the school desires it to be.	07.25.15
M-27	**06.09.15-- The demand control ventilation (DCV) sequence did not modulate the outside air damper open beyond the adjustable minimum DCV position as programmed.** As CO2 levels rise beyond 1000 PPM in the classroom, the outside air damper (OSA) will begin opening beyond the minimum DCV damper position up to the minimum ventilation air position. As the CO2 levels begin decreasing, the damper will begin modulating back down to the DCV minimum position. As we simulated a high CO2 condition, the OSA damper remained at the DCV minimum position and did not modulate open.	Joe Barnes with NCC and I reviewed this sequence and he has already begun working to find the solution. He was expecting to have the corrected programming completed and downloaded throughout the school during the week of 06.15.15.	CSG re-tested the demand control ventilation sequence of operations and found it to be working normally. The outside air damper modulated open to flush the space with additional fresh air in order to reduce the CO2 levels within the space. As the CO2 levels approached more moderate levels, the OSA damper modulated back towards the minimum damper position setting, assuring the minimum ventilation rates were being provided. The effects of high CO2 concentrations in classrooms have been shown to have negative impacts on the learning process for children. By ensuring those levels are being limited below the design recommendation, the Woodland school district is providing learning spaces with ample amounts of fresh ventilation air while maintaining energy conscious modes of operation.	07.25.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-28	**06.09.15-- The non-occupied standby mode sequence did not modulate the outside air damper closed.** One of the energy saving HVAC control sequences designed into the system includes closing the outside air damper and widening the space temperature set point dead band by 12°F once the lighting occupancy sensor cycles off the lights. With no occupants, there is no need to ventilate the space nor condition the space in the same manner as when it's occupied.	Joe Barnes with NCC and I reviewed this sequence and he has already begun working to find the solution. He was expecting to have the corrected programming completed and downloaded throughout the school during the week of 06.15.15.	CSG re-tested the non-occupied stand-by sequence of operations and found it to be working normally. As the occupancy sensor indicated no motion in the space, the DDC controls system rightfully modulated the outside air damper closed and controlled the spaces to a wider temperature deadband in order to save energy by not overly heating or cooling empty spaces.	07.25.15
M-29	**06.09.15-- The Unoccupied night high limit sequence did not modulate the outside damper open for economizer cooling.** During unoccupied hours, the space temperature set point dead bands are widened significantly. As space temperature rises over 85°F, the associated AHU will be enabled on and modulate the outside air damper open when the outside air temperature is less than space temperature in order to cool the space down economically. Testing revealed that although the AHU did start, the outside air damper remained closed.	Joe Barnes with NCC and I reviewed this sequence and he has already begun working to find the solution. He was expecting to have the corrected programming completed and downloaded throughout the school during the week of 06.15.15.	CSG re-tested the unoccupied night high limit sequence of operations and found it to be working normally. As the space temperature rose above the night high temperature set point, CSG noted the associated AHU cycled on and the outside air damper modulated open to provide cool air in order to bring down the temperature. It is important to not allow the spaces to get too warm over a long weekend which could present difficulties for the system to get spaces to appropriate occupied temperatures by the time classes start.	07.25.15
M-30	**06.09.15-- During functional performance testing, the space differential pressure sensors were not measuring accurately.** Space pressure is being monitored and controls the amount of relief is provided to the space via modulating the exhaust air damper open or closed. As more ventilation air is introduced into a classroom during economizer cooling or CO2 functions, space pressure increases and as it moves beyond the set point of .02" W.C. the damper modulates to maintain the set point. The caveat is if the supply air requires conditioning, that energy is lost by simultaneously exhausting that air from the space. Testing revealed that in most cases, even though the OSA damper was at minimum position, and the exhaust damper was 100% open, that space pressure was still above the set point. We measured the differential pressure ourselves and noted a discrepancy between what the BAS displayed. Joe and I tested one of their differential pressure sensors and discovered they had not been zeroed.	Joe Barnes with NCC and I reviewed the space differential pressure sensors. After discovering they were not zeroed, he stated they would do so to all space pressure sensors. CSG will then re-test for accuracy. If this doesn't fully resolve the issue, the sensor's scale may need to be adjusted below the default setting in order to measure down to the hundredth, if not thousandth of an inch in W.C.	CSG verified that all space static pressure sensors had been properly zeroed. The result will be that as the system is functioning, the space pressure will not falsely move beyond the set point that drives the relief damper to open. Any time the relief damper is open, conditioned air is forced straight out of the building resulting in a loss of energy dollars. By limiting the point at which this sequence occurs to only those times actual space pressure becomes too high, the district will save energy dollars for the life of the building.	07.25.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-31	**07.28.15-- AHU-1 outside air damper does not move to the programmed minimum position of 25%.** Functional performance testing revealed the outside air damper will only move to 10% open position as it's minimum position. The damper economizes normally when free cooling is available so the actuator appears to be working normally.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics.	CSG verified the outside air damper moved to the correct minimum damper position upon start-up. Joe Barnes, the NCC controls programmer stated there was an override placed on the damper in the background of the program, limiting its ability to move to the correct position. All damper functionality worked according to design.	08.27.15
M-32	**07.28.15-- AHU-1 does not appear to move into the normal cooling sequence of operation.** With space temperature 2.8°F over the space temperature set point, AHU-1 did not move into cooling mode. The cooling valve remained closed. The discharge air temperature remained at 82°F.	NCC needs to review the programming for the cooling sequence.	It was determined the addresses of AHU-1's controller was crossed up with AHU-2. Any inputs from the room space temperature sensor were being relayed to the wrong AHU. NCC corrected the address names and along with CSG, re-tested the input from each space was appropriately matched with the correct AHU and controller.	08.27.15
M-33	**07.28.15-- HRU-8 CO2 sensor display is not an accurate representation of CO2 levels.** The DDC system graphics displays 64435 ppm.	NCC will verify and re-calibrate any room space temperature/CO2 sensors are properly calibrated within the tolerances allowed per the design.	Joe Barnes with NCC determined this was due to the wrong graphic display being used. This space does not have CO2 control as part of the design. CSG verified the display was corrected.	08.27.15
M-34	**07.28.15-- HRU-8 Space pressure display is not accurate.** With the entire HVAC system in unoccupied mode and off, the space static pressure is reading a -.50".		NCC determined the sensor was properly linked with the controller. CSG verified the space pressure being sensed in the space was accurately represented and the associated sequence of operations worked correctly for managing space pressurization.	08.27.15
M-35	**07.28.15-- We discovered the occupancy sensor source for AHU-12 was overridden to "Network".** Can NCC verify whether this is correct and report back what the setting should be?		Joe Barnes explained this was a setting from which a choice is made regarding the source for inputs from each room space sensor. He assured CSG the correct settings will be programmed into every AHU. CSG verified this to be true and they were all identical.	08.27.15
M-36	**07.28.15-- HRU-6 was discovered running at 10:28AM on Sat AM during unoccupied mode.** We noted on the Status display, the "scheduled time to next state" appears to have an override of 15 minutes entered. Can NCC verify whether this is correct and report back what the setting should be?	**08.14-15--** Joe has set up trends on this HRU to review whether this continues to be an issue or not.	NCC released all overrides. Trends for HRU-6 revealed it has been cycling on and off according to the Woodland School District's normal schedule of operation.	09.11.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-37	**07.28.15-- HRU-14 CO2 sensor display is not an accurate representation of CO2 levels.** The DDC system graphics displays 64435 ppm.	NCC will verify and re-calibrate any room space temperature/CO2 sensors are properly calibrated within the tolerances allowed per the design.	This was due to the wrong graphic display being used. This space does not have CO2 control as part of the design because the HRU always provides 100% fresh air. Graphic replaced.	08.27.15
M-38	**07.28.15-- HRU-15 CO2 sensor display is not an accurate representation of CO2 levels.** The DDC system graphics displays 64435 ppm.	NCC will verify and re-calibrate any room space temperature/CO2 sensors are properly calibrated within the tolerances allowed per the design.	This was due to the wrong graphic display being used. This space does not have CO2 control as part of the design because the HRU always provides 100% fresh air. Graphic replaced.	08.27.15
M-39	**07.28.15-- We discovered the cooling and heating set points overridden on HRU-11/Room 1707.** The occupied cooling set point has been overridden to 65°F while the occupied heating set point has been overridden to 60°F.		CSG verified all overrides had been removed from the DDC controls programming that may have ben placed by the TAB contractor while working. All operating set points were checked to match the contract documents as well as the wishes of the Woodland school district.	08.27.15
M-40	**07.28.15-- HRU-16 CO2 sensor display is not an accurate representation of CO2 levels.** The DDC system graphics displays 64435 ppm.	NCC will verify and re-calibrate any room space temperature/CO2 sensors are properly calibrated within the tolerances allowed per the design.	Joe Barnes with NCC determined This was due to the wrong graphic display being used. CSG verified the display was corrected.	08.27.15
M-41	**08.08.15-- AHU-22 Space pressure display is not accurate.** With the entire school's HVAC system in unoccupied mode and off, the space static pressure is reading a .01".		Referencing the corrective measures taken for Issue ID M-30, CSG verified the space pressure being sensed in the space was accurately represented and the associated sequence of operations worked correctly for managing space pressurization.	08.27.15
M-42	**08.08.15-- ERU-1 serving the Grandstands was found in occupied mode and running on Sat at 11:00 AM.** Has this equipment been placed on a normal occupied schedule yet?	**08.14-15--** Joe has set up trends on this ERU to review whether this continues to be an issue or not.	CSG verified through trend logs the ERU serving the grandstands was working normally per the school's schedule.	09.11.15
M-43	**08.08.15-- Although the chilled water system is off, the graphics reflect the condenser fans as running.**	NCC should ensure the graphic is appropriate for the run conditions.	Joe Barnes corrected the DDC graphical display so that it would only reflect movement as the chiller was actually on. CSG verified the graphics were actual representations of working components.	08.27.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-44	**08.08.15-- Have the temperature set points at which exhaust fans are triggered on been set to the design set point for every space?** Electrical room 2409C has a space temp of 75.3°F and the fan running while Electrical room 1201 has reached a space temperature of 84.1°F and the fan is not running. CSG prefers the set points to be higher than lower in order to keep the runtimes of the exhaust fans lower, saving energy by not having it run needlessly. We have found 85°F space temps in electrical rooms rarely poses any harm to equipment and is a good temperature to attain before providing mechanical relief in the form of the exhaust fan.	Can NCC please ensure the design set points have been set in all spaces with reverse acting thermostat control over the exhaust fan?	After NCC notified us that all temperature settings were adjusted to the design criteria, CSG verified this to be true. All spaces that only use an exhaust fan to provide some temperature relief via a reverse acting thermostat have had their set point set to 85°F.	08.27.15
M-45	**08.08.15-- EF-8 serving the Drama/ Band area was found enabled On during unoccupied hours.** On Saturday morning, we noted this exhaust fan status was enabled on when the school's schedule was in unoccupied mode.	NCC identified an override was enabled in the background of the programming that kept this exhaust fan from following the schedule.	CSG verified that once the override was removed, the EF enabled on and off along with all HVAC equipment and per the High School schedule of occupancy.	08.27.15
M-46	**08.08.15-- EF-15 serving Laundry room 1610B was found enabled On during unoccupied hours.** On Saturday morning, we noted this exhaust fan status was enabled on when the school's schedule was in unoccupied mode.	NCC identified an override was enabled in the background of the programming that kept this exhaust fan from following the schedule.	CSG verified that once the override was removed, the EF enabled on and off along with all HVAC equipment and per the High School schedule of occupancy.	08.27.15
M-47	**08.08.15-- The space differential pressure set point of .02" appears to be too low.** During functional performance testing, we noticed in most cases, the relief dampers are opening well before the outside air damper is open enough to drive the space pressure high enough to warrant it. In some cases, the room pressure is at .02" during standby mode when the outside air damper is closed which in turn by design, drives the relief damper 100% open. CSG determined actual pressure was well below what was being displayed. NCC ensured they are zeroed properly and has been verified by CSG. Our testing of several different classrooms has revealed the DDC system's sensors can read .05" and the actual space pressure is well below it. Limiting the amount of conditioned air to be relieved straight out of the space will save the district energy over the life of the building. Because the entire building remains below the industry wide .05" of pressure, there is no threat of over pressurizing the space.	We ask that NCC increases the space differential pressure set points to .05" in all classrooms with the exception of the Labs. This will also serve to keep those spaces with a negative pressure requirement to remain so.	CSG and NCC determined the specified space pressure sensors did not have the ability to adequately measure extremely low pressure readings that were present in the spaces. They consistently read above actual space pressure readings CSG recorded during testing. Joe Barnes stated *"installing new sensors throughout every space is possible. Unless there is a setting that allows the pressure sensors to read on such a small scale from .009-.051" with high accuracy, we recommend simply increasing the set point at which the relief damper will control to."* Together, we determined a .05" set point would maintain appropriate space pressurization while offering the district the benefits of no longer relieving conditioned air from the building unless absolutely necessary.	08.27.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-48	**07.28.15-- AHU-39 outside air temperature damper does not move to the programmed minimum position of 18%.** Functional performance testing revealed the outside air damper will only move to 10% open position as it's minimum position. The damper economizes normally when free cooling is available so the actuator appears to be working normally.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics.	CSG verified the outside air damper moved to the correct minimum damper position upon start-up. Joe Barnes, the NCC controls programmer, stated there was an override placed on the damper in the background of the program, limiting its ability to move to the correct position. All damper functionality worked according to design. We then re-tested the sequence of operations to ensure the AHU was working correctly.	08.27.15
M-49	**07.28.15--The cooling sequence of operation for AHU-2 is not acting according to design.** During FPT's of the cooling sequence, we noted the outside air damper opened to 100% to economize even though the outside air temperature was 80°F which is well above the return air temperature, where the outside air damper should not be opening beyond the minimum damper position. The CO2 levels in the space measured 451 ppm which would not drive the outside air damper open regardless of the lockout temperature.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics. Is it possible the temperature being referenced for lockout is incorrect?	It was determined the addresses of AHU-1's controller was crossed up with AHU-2. Any inputs from the room space temperature sensor were being relayed to the wrong AHU. NCC corrected the address names and along with CSG, re-tested the input from each space was appropriately matched with the correct AHU and controller. We then re-tested the sequence of operations to ensure the AHU was working correctly.	08.27.15
M-50	**07.28.15-- AHU-2 outside air temperature damper does not move to the programmed minimum position of 25%.** Functional performance testing revealed the outside air damper will only move to 10% open position as it's minimum position. The damper economizes normally when free cooling is available so the actuator appears to be working normally.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics.	It was determined the addresses of AHU-1's controller was crossed up with AHU-2. Any inputs from the room space temperature sensor were being relayed to the wrong AHU. NCC corrected the address names and along with CSG, re-tested the input from each space was appropriately matched with the correct AHU and controller. We then re-tested the sequence of operations to ensure the AHU was working correctly.	08.27.15
M-51	**07.28.15-- The heating sequence for AHU-1 did not function correctly.** CSG simulated a space temperature of 60°F to force it to move to heating mode. The outside air damper moved to the fully closed position instead of the minimum damper position it should not move below with the occupancy sensor in occupied mode. After waiting for over 10 minutes, the heating coil control valve failed to open in order to increase the discharge air temperature.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics as well as determining why the control valve did not open as expected.	It was determined the addresses of AHU-1's controller was crossed up with AHU-2. Any inputs from the room space temperature sensor were being relayed to the wrong AHU. NCC corrected the address names and along with CSG, re-tested the input from each space was appropriately matched with the correct AHU and controller. We then re-tested the sequence of operations to ensure the AHU was working correctly.	08.27.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-52	**07.28.15--The cooling sequence of operation for AHU-5 is not acting according to design.** During FPT's of the cooling sequence, we noted the outside air damper opened to 100% to economize even though the outside air temperature was 77.6°F, above the return air temperature, which is when the outside air damper should not be opening beyond the minimum damper position. The CO2 levels in the space measured 413 ppm which would not drive the outside air damper open regardless of the lockout temperature.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics. Is it possible the temperature being referenced for lockout is incorrect?	Joe Barnes with NCC stated the programming includes a changeover deadband of 1.2°F in which the economizer damper may modulate within with regards to the outside air temperature set point and return air temperature. This would sometimes allow the damper to move when the outside air temperature is above or below the set point. CSG re-tested the sequence and determined it functioned per design and specifications and within the capabilities of the programming.	08.27.15
M-53	**07.28.15--The cooling sequence of operation for AHU-7 is not acting according to design.** During FPT's of the cooling sequence, we noted the outside air damper opened to 100% to economize even though the outside air temperature was 77.6°F, above the return air temperature, which is when the outside air damper should not be opening beyond the minimum damper position. The CO2 levels in the space measured 414 ppm which would not drive the outside air damper open regardless of the lockout temperature.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics. Is it possible the temperature being referenced for lockout is incorrect?	Joe Barnes with NCC stated the programming includes a changeover deadband of 1.2°F in which the economizer damper may modulate within with regards to the outside air temperature set point and return air temperature. This would sometimes allow the damper to move when the outside air temperature is above or below the set point. CSG re-tested the sequence and determined it functioned per design and specifications and within the capabilities of the programming.	08.27.15
M-54	**07.28.15--The cooling sequence of operation for AHU-13 is not acting according to design.** During FPT's of the cooling sequence, we noted the outside air damper opened to 100% to economize even though the outside air temperature was 78.4°F, above the return air temperature, which is when the outside air damper should not be opening beyond the minimum damper position. The CO2 levels in the space measured 446 ppm which would not drive the outside air damper open regardless of the lockout temperature.	NCC should review the programming to determine why the damper moves to a different position than appears as the minimum setting on the DDC graphics. Is it possible the temperature being referenced for lockout is incorrect?	Joe Barnes with NCC stated the programming includes a changeover deadband of 1.2°F in which the economizer damper may modulate within with regards to the outside air temperature set point and return air temperature. This would sometimes allow the damper to move when the outside air temperature is above or below the set point. CSG re-tested the sequence and determined it functioned per design and specifications and within the capabilities of the programming.	08.27.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
P-55	**Locker room showers do not keep the water from spilling onto the floor of the toilet area. This is a slipping hazard.** **07.11.16--** During the 11-month warranty walkthrough and meeting, we noted longer curtains had been installed by Skanska but they still were not long enough to rest below the shower stall thresholds. Water still escapes the shower and collects on the adjacent floor. **09.11.15--** CSG has had no real updates on the issue from the contractors. Kelley Wilson with CSG noted longer curtains had been installed but still did not keep water from pooling on the floor. The floor is not sloped properly towards the only drain in the area. **07.28.15--** Upon turning on the water, the stream hits the shower curtain and flows directly onto the adjacent toilet floor. Because the nearest floor drain is several feet away and closer to the toilets, the water collects into a large pool which definitely creates a slipping hazard. We believe if the curtain was longer to the point it hung below the raised lip of the shower, water would remain in the stall and off the adjacent floor of the toilets.	**07.28.15--** Install curtains long enough to hang below the raised lip of the showers. Presently they are at least 6" above the raised lip of the shower.	During the warranty walk, Steve Broback noted that different, low-flow shower heads have been ordered and will be installed. In addition, plans were being presented to help any water pooling on the toilet area floor to more easily drain by possibly sloping the floor or cutting in trench drains. BCE is reviewing these options. It was agreed by the team that this issue is being covered via the warranty process and can be removed from the commissioning issues list.	07.11.16
P-56	**07.28.15-- The Gym concessions stand sink has very little hot or cold water flow.**		Eagle Harbor stated they found a closed shut off valve. CSG re-tested the fixture and noted the water flows and temperatures were normal.	08.27.15
P-57	**07.28.15-- The kitchen scullery sink nearest the dishwasher drips.**		Eagle Harbor stated they cleaned the strainer and replaced an O-ring and the fixture no longer drips.	08.27.15
P-58	**07.28.15-- The kitchen spray hose water temperature is not very hot.** The second spray hose to the right of the sink spray hose, does not get hot. CSG wonders whether the mixing valve is working properly. The temperature gauge reads 70°F even though the mixing valve's hot water is fully open and the cold water is mixed together in equal proportions.	Eagle Harbor should inspect the valve to make sure it is functioning correctly. Please report back findings.	Eagle Harbor notified us they corrected the water temperature flow to the fixture without relaying what corrective measure was taken. CSG did re-test the faucet and verified the correct water temperature was present per the WA State Health codes.	08.27.15

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ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
P-59	**07.28.15-- The faucet fixtures located in both sinks in classroom 1409 have hose bib attachments in place of aerators.** Does code require vacuum breaks when hoses are attached to protect against contamination?		Eagle Harbor stated the vacuum break is included in the fitting itself.	08.27.15
E-60	**07.24.15-- The occupancy sensor has been installed behind the door in the phone room. Occupant must close the door in order for it to work.**		Advanced Electrical Stated there weren't many choices left regarding which ceiling tile to install the sensor in such a small space. They chose the most sensible one and re-tested and noted at the very least, the sensor would pick up the movement of the door as someone entered it.	08.27.15
E-61	**07.24.15-- The mechanical mezzanine had several missing occupancy sensors installed when compared to drawing E2.32.** During testing, we noticed having to walk several feet inside the entry door before lighting would be cycled on. Far enough in that one might encounter hazards such as piping and HVAC units.	Advanced Electric was made aware of the issue and was in the process of adding those missing sensors according to the drawings. CSG will verify at next site visit.	After receiving notice from Advanced Electric they had completed the installation of all occupancy sensors per plans and specifications, CSG verified the installation and operation of all sensor was satisfactory.	08.27.15
E-62	**07.24.15-- Several of the electronic lock switch plates have not been secured to the electrical box inside the wall.** This causes the switch to shift within the enclosure, and across the wall.	Switches need to be fastened securely to the wall boxes.	CSG re-inspected several of the keyed switch installations and verified they were all tightened flush in their boxes.	08.27.15
G-63	**07.24.15-- The kitchen freezer temperature control panel is not mounted securely to the wall.**	08.14.15--Sean with Skanska said the new control module has been ordered and they are awaiting delivery. CSG will verify it has been corrected once it's installed.	Once Skanska notified us the new control module was delivered and installed, CSG verified the installation was satisfactory and the control module functioned per plans and specifications.	09.07.15

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Project: Woodland High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
G-64	**The5 position switch for the motorized shades in the shared learning spaces/commons are not programmed correctly.** **On 08.14.15--** Sean with Skanska reported to CSG the specs did not identify that all the buttons on the control panel were to be specifically programmed as we requested and only the UP and DOWN buttons would be operable. However, CSG has verified that the buttons in question meant to control the 25%, 50%, 75% positions have in fact been incorrectly programmed to close the shades only. This goes against what the contractors explained would occur. **07.24.15--** Each of the 4 buttons should be programmed so that the shades automatically move to a pre-determined position with one touch of a particular button. Each should represent 25%, 50%, 75% and 100% shade position, respectively. In addition, the shades are not set to stop at a position that is level with the adjacent shade. There is no reason the shades should not be uniform as they all move to a given position together.	**08.27.15--**After verifying the 25%, 50%, 75% position buttons actually have been programmed (incorrectly) we feel they either have to be de-programmed to not function as the contractor has maintained it should be per specs or they should simply do what is correct; program the buttons to do what the images on the switches themselves suggest they do. **07.24.15--** The installing contractor needs to re-program the low voltage automatic shade control panel.	Steve Broback stated the following via email; *"The Draper roller shades were approved during bidding as a substitution. The motor control information indicates that the default setting for the switches will be up, down and 20, 40,60 and 80 percent. Since this is what the substitution approval was based on, Draper is required to provide this feature. Scott – Please add this to the final warranty list."* During the 11-month warranty meeting on site, the designers and the Woodland School District determined this could be closed out on the Commissioning issues log and it will be picked up in the final warranty process.	07.12.16
G-65	**07.24.15-- The carpeting is lifting up around all entry door thresholds.** The carpet has not been glued down and can be pulled up easily.	Contractor should ensure it has been glued and fastened to the floor correctly.	Skanska noted the carpet installation was owner furnished and not a part of this contract.	08.14.15
G-66	**07.24.15-- The north main entry adjacent to the instrument lockers, flooring has been stained by what looks like mastic used to glue down the thresholds.**	If this section can't be cleaned, it may need to be replaced as this damage was noted prior to turnover.	Skanska noted the carpet installation was owner furnished and not a part of this contract.	08.14.15
G-67	**The irrigation system was tested for coverage.** **09.08.15--**One head was leaking and 2 others are spraying too much concrete along the SE entrance. Contractors were aware of the 3 we noted with issues. Also, because there are 80 zones, we asked the contractors to provide a laminated list of zone ID's for manual operations since they are only identified on the controller by number. **07.24.15--** Landscaping is not yet completed. CSG will verify automatic sprinkler system and coverage.	**09.02.15--**Skanska has identified 09.08.15 as the date for final testing of the irrigation system.	**07.11.16--** During the 11-month warranty walkthrough, the designers and contractors were still working with the school district to finalize landscaping and the irrigation system. Because this work was being tracked via the warranty process, CSG was asked to close out the issue on the Commissioning log. **11.19.15--** Skanska responded with the following; *"I believe so but I have not witnessed either item. We've been told verbally."*	07.11.16

CSG
Specialists in School Buildings

Commissioning Issues List

Project: Woodland High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-68	**08.08.15-- CSG does not see trends or a history set up for the new High School as there is for the other schools in the district.** In order to provide historical accounts of how various HVAC systems are functioning, trendlogs for individual pieces of equipment need to be created.	NCC needs to complete setting up trendlogs in the DDC system.	Joe Barnes with NCC spent time setting up the pertinent trendlogs for the HVAC system. We both spent time reviewing the important aspect of operation that should be saved in the historical trends so to aid in future trouble shooting.	08.27.15
M-69	**08.08.15--The lighting control interface DDC page doesn't seem to populate with data every time it's opened.**	Has the schedule been set up to the district's liking?	Joe Barnes with NCC stated it has to do with lag in the system regarding reporting data. In most cases, refreshing the page seemed to correct the issue.	08.27.15
M-70	**07.22.15-- Alarms are not being displayed for the chilled or heating water systems.** During FPT's and TAB verification of the hydronic systems, we noted as equipment failures were forced, alarms were not being brought forward to the end user's DDC's graphic displays.	While on site, we discussed with Joe who stated he would make the necessary changes to allow them to be logged. CSG will verify at next site visit.	Joe Barnes stated that although the DDC system was providing alarms when called to, they were not being pushed forward to the graphics screens. After programming changes were made, CSG re-tested various alarms throughout the project and noted them being displayed per plans and specifications throughout.	08.27.15
M-71	**08.10.15-- ERU-1 fire shutdown;** While the rest of the school was in a fire alarm, the Stadium ERU did not cycle off. Is it tied into the system as is the rest of the HVAC system is?		Joe Barnes stated the ERU was indeed tied to the fire system, though it may not have been during our initial test. The Fire marshal is the final AHJ that would certify the life safety system.	08.27.15
M-72	**08.27.15-- The DDC system indicates the chiller is in alarm.** While reviewing the HVAC and DDC systems with NCC, we noted the chiller was in alarm while still functioning. Because the list of available communication points available for the Arctic Chill Chiller has never been provided to NCC, it is unknown what type of alarm it is in. The chiller is able to communicate with the DDC system to provide specific alarm annunciations aside from a "general" alarm in order to provide a building operator more useful information for troubleshooting. CSG suggests the manufacturer provides NCC and the district with a list of the LonWork points available that NCC can interface with to provide more data at the DDC graphics display.	Eagle Harbor should engage the chiller technician to review the operation before the weather changes for good and we are forced to deal with this potential problem next cooling season.	Skanska responded with the following; *"The chiller had and issue with the master module. One of the plugs on the controller was not connected properly. it is reconnected now and this module is working."* CSG re-tested the chiller as part of the normal functional performance testing of the chilled water system. No further alarms were present at the time of testing. Trendlogs of the system operation were reviewed as apart of the 11-month warranty review. Joe Barnes with NCC received the list of LonWork alarm points and will work with the district facilities department to bring forward those they find to be the most important to the staff.	11.19.15

CSG
Specialists in School Buildings

Commissioning Issues List

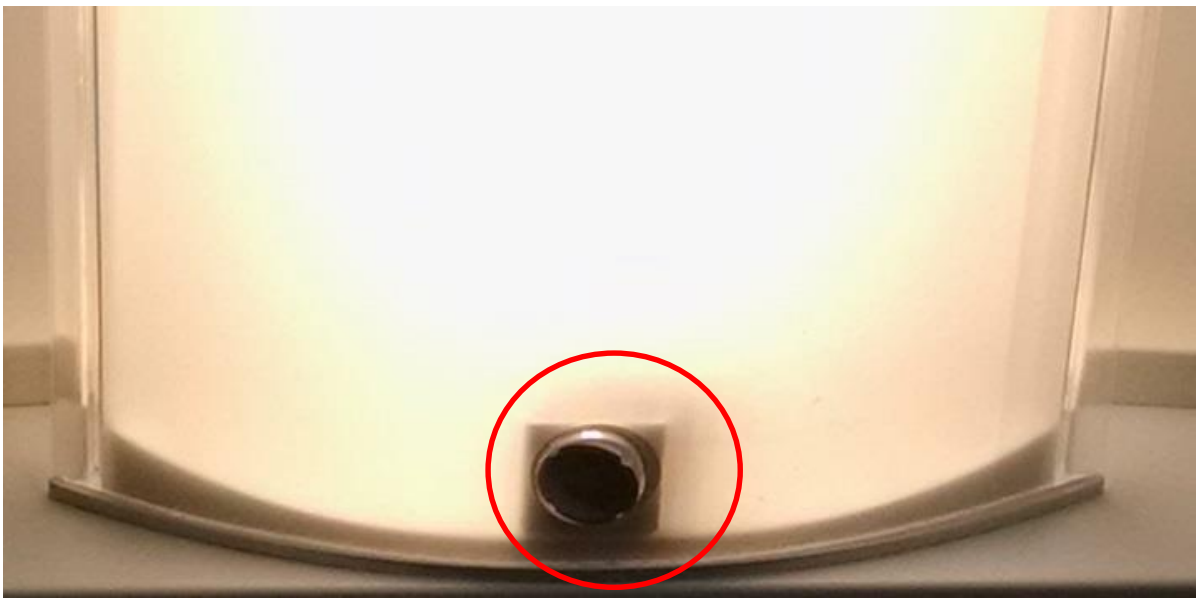
Project: Woodland High School

ID	Summary	Proposed Resolution	Actual Resolution	Date resolved
M-73	**08.27.16-- The list of identifiable LonWork points from the chiller that are available to view on the DDC system have never been provided to NCC.** The result is only a limited amount of operational information is available to the maintenance staff to be used in trouble shooting and for day to day viewing. Joe with NCC has stated this was requested long ago but has never been provided.	Eagle Harbor needs to have their manufacturer provide the complete list of available chiller LonWork points for DDC interface so that NCC can complete their contracted work.	Joe Barnes with NCC received the list of LonWork alarm points and will work with the district facilities department to bring forward those alarms they find to be the most important. CSG has agreed this is sufficient.	11.19.15
M-74	**08.27.17--The electric resistance heater DC-1 is not functioning..** NCC has stated there is nowhere to land their control wiring to on the panel.	Contractor's should review with the manufacturer to see if there is a simple solution. If not, they need to write an RFI to the designers requesting additional direction.	Joe Barnes with NCC notified us they received information from the manufacturer with regards on how to terminate their wiring. CSG re-tested the duct heater to ensure it worked per plans and specifications.	09.07.15
E-75	**08.27.15--What appears to be a photocell has been installed in Scorekeeper A203 that is not shown on the E drawing. One half of the lamp in the space was dimmer than the other.**		Skanska stated the sensor came as a part of the "package" for the press box and was not contractor furnished. Upon a subsequent visit, we noted the light levels were even on the fixture.	09.07.15
E-76	**08.27.16-- The main switch for the lights mounted to the underside of the stadium canopy is not labeled. Could it also stand to have a protective cover over it to limit accidentally shutting off the lights?**		Advanced Electric provided a label for the switch in question. The contractors stated a protective cover would be an add if the district wishes to install one as it was not a part of the contract drawings.	09.07.15

WOODLAND HIGH SCHOOL CX OPEN ISSUES

Issue ID #E-01— Exterior lighting is on during daylight hours. Photocell may not be set up correctly.

Issue ID #E-08—Dimming fixtures sharing a common light sensor, dimming light below WAC minimum requirements in areas of the space with no windows.



Issue ID #E-10—the photocell cannot sit flush in any fixture thereby causing it to be angled towards or away from daylight. It also allows the fixture light to affect the sensor

Issue ID #E-11—with the blinds closed, all lights should be at their full bright levels. Here one can see the fixtures with photocells (within the box) are more dimmed than the fixture with no photocell sensor (circled) even though the blinds are drawn, indicating another light source is affecting the photocell. We believe this to be the light from the fixture itself.


Issue ID #E-13—emergency pushbutton and disconnects located in the mechanical room require ID labeling.


Issue ID #E-15—an end user switch has not been provided for the vacuum pump located in Chemistry lab 2401. A local switch integrated with the pump is located in the back, underside of the pump motor, but is not easily accessible.

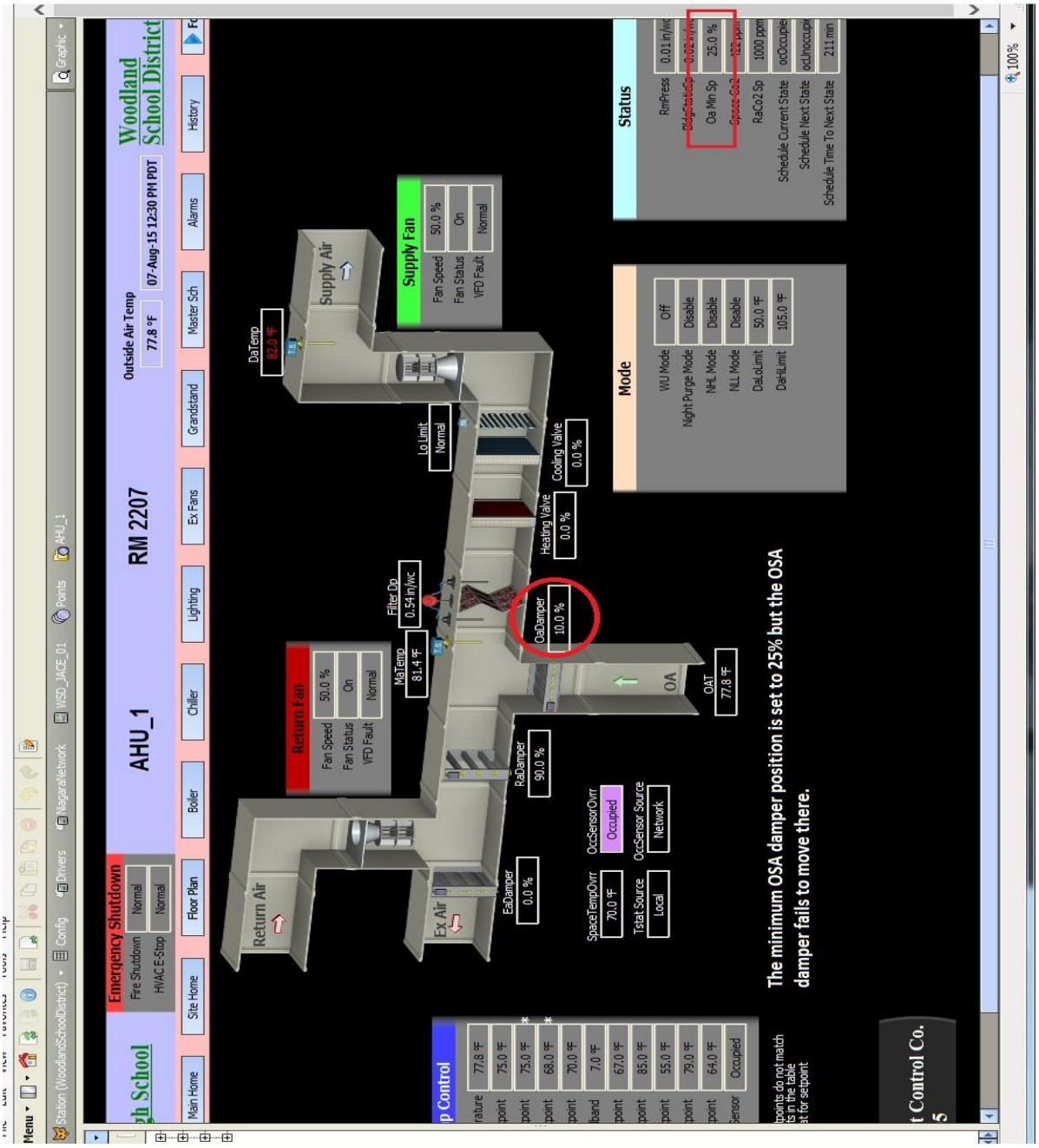

Issue ID #P-16—The drain is not adequately sloped to capture the flow of water from the the emergency wash station. On the right is residue from previous operations. On the right you can see a fresh stream of runoff bypassing the drain and pooling in front of the entry door.

Issue ID #P-20—leak over Δp sensor

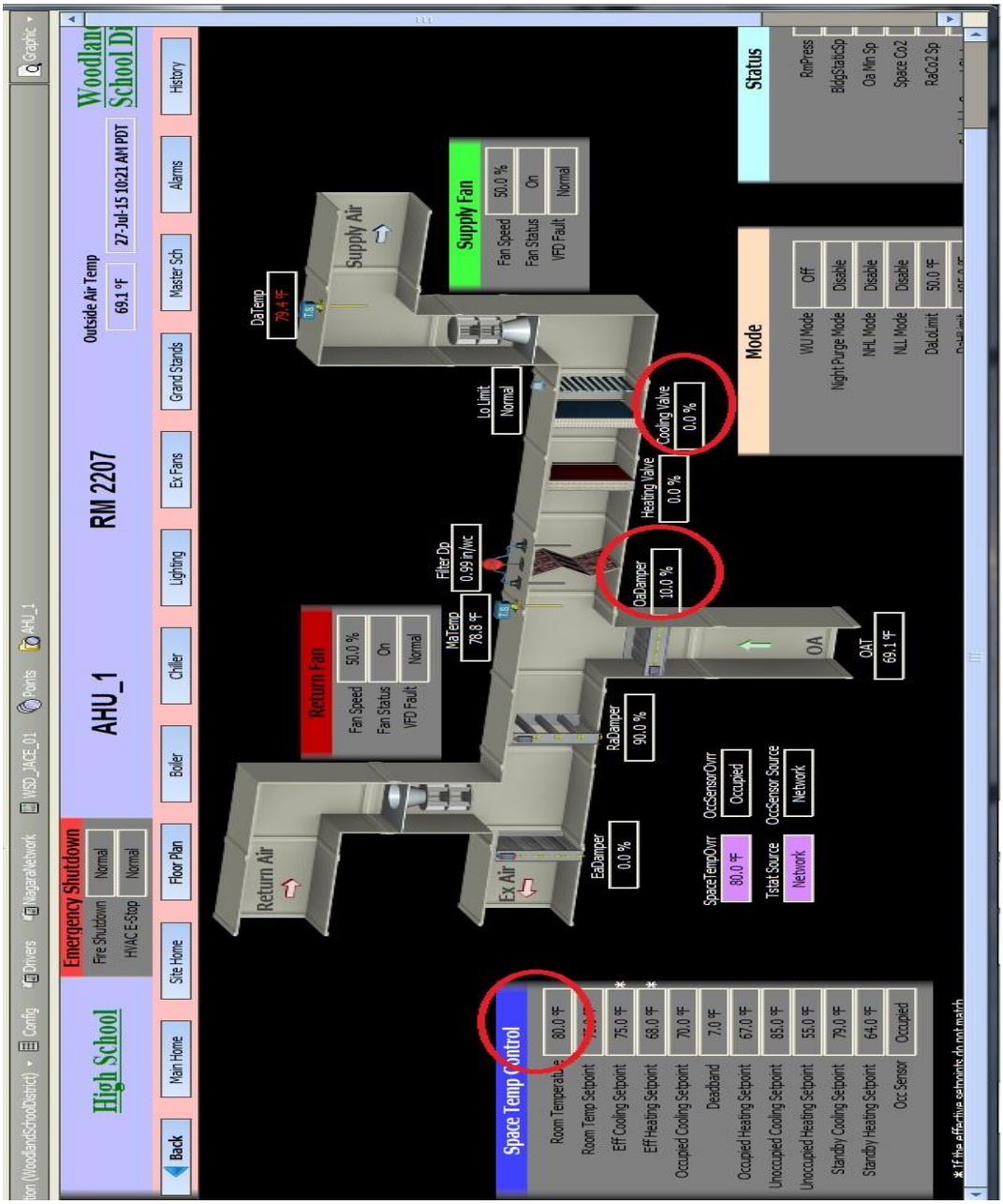
Issue ID #P-21- EF-8 is diassembled

Issue ID #P-23—bypass piping insulation

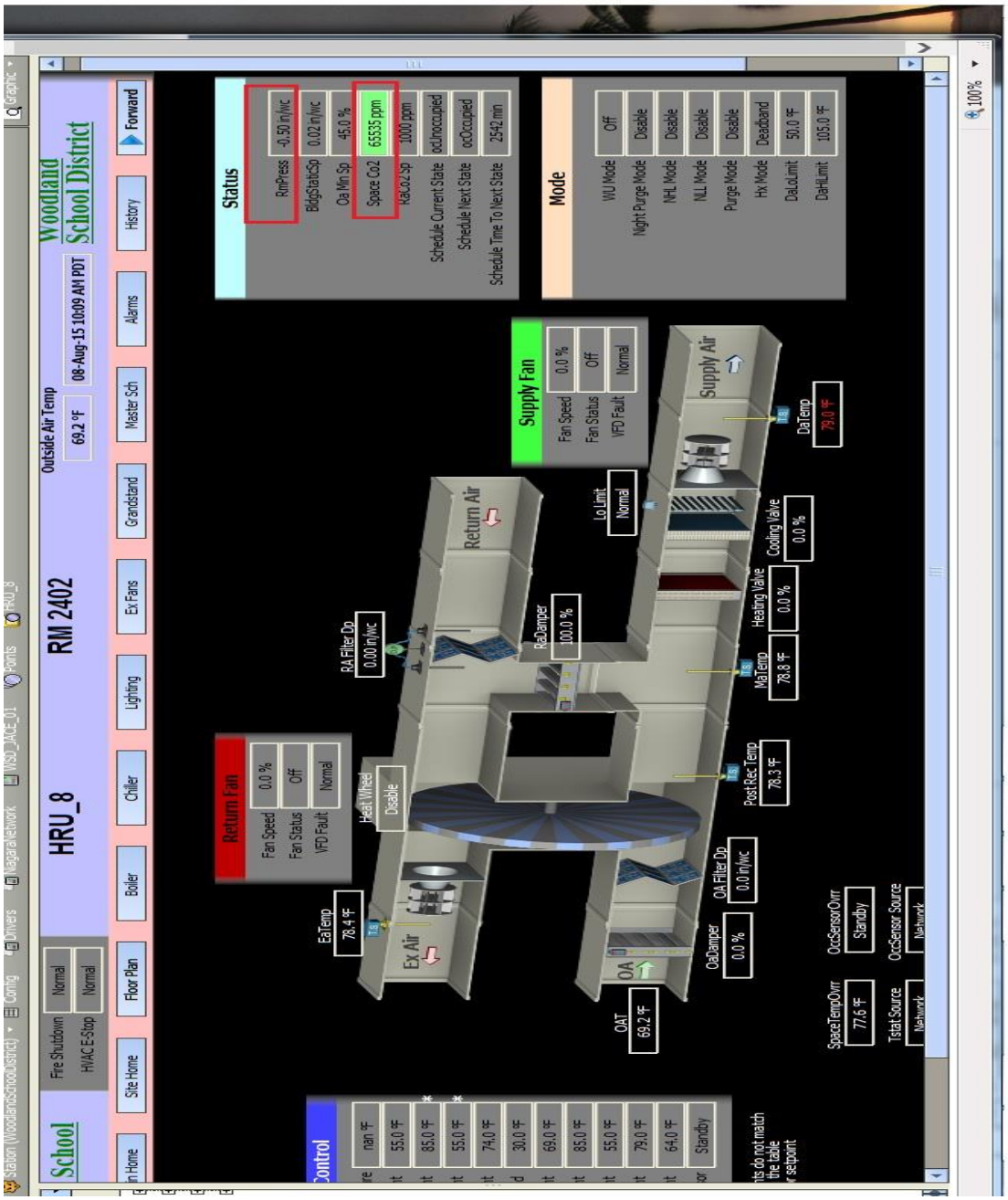
WOODLAND HIGH SCHOOL CX OPEN ISSUES



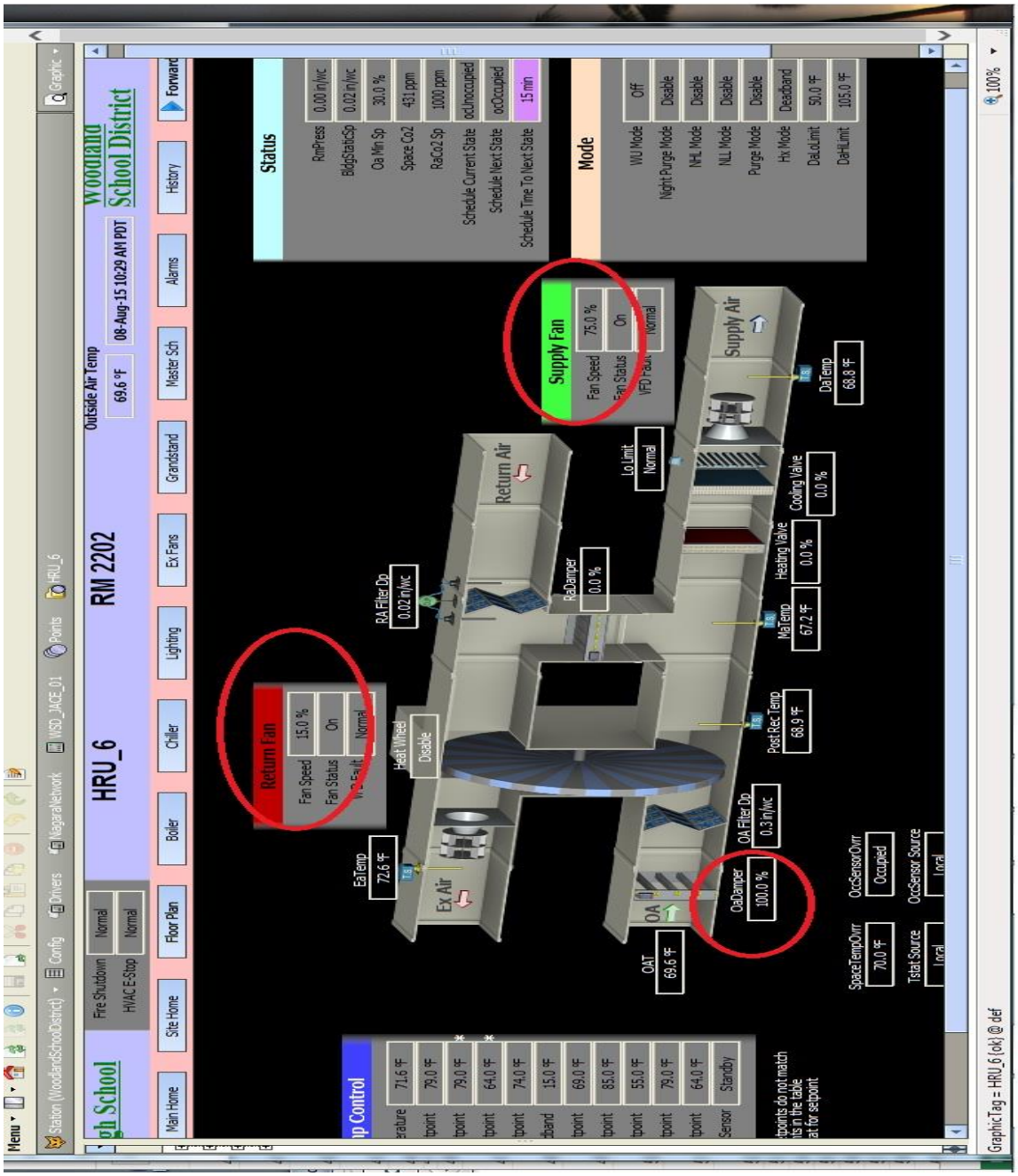
Issue ID M-31—AHU-1 moves to incorrect minimum damper position.



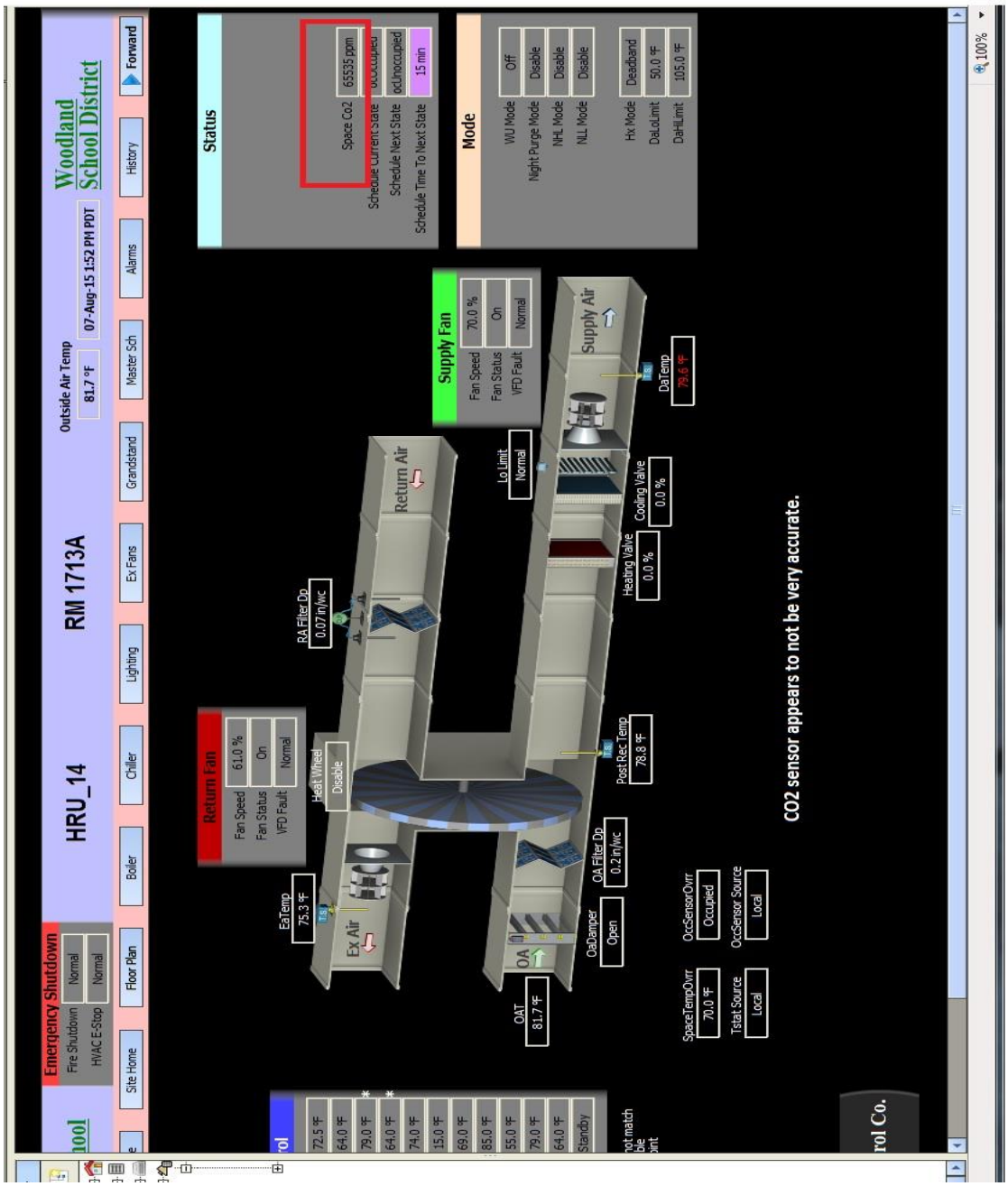
Issue ID M-32—AHU-1 did not include opening the cooling valve as part of it’s cooling sequence of operations.



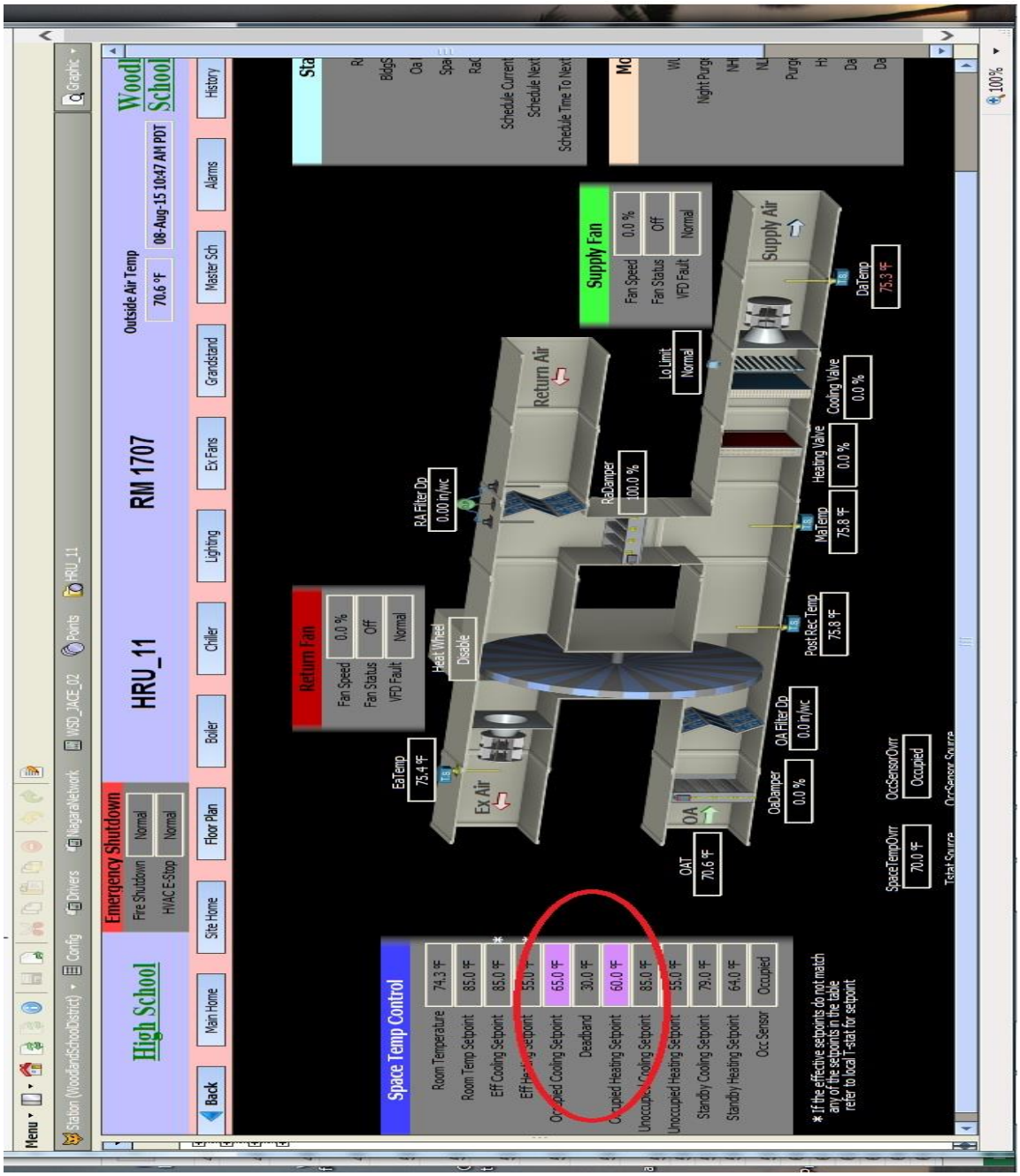
Issue M-33 and M-34—HRU-8 room static pressure reading is -.05” with all equipment off. The CO2 reading is not being displayed accurately.



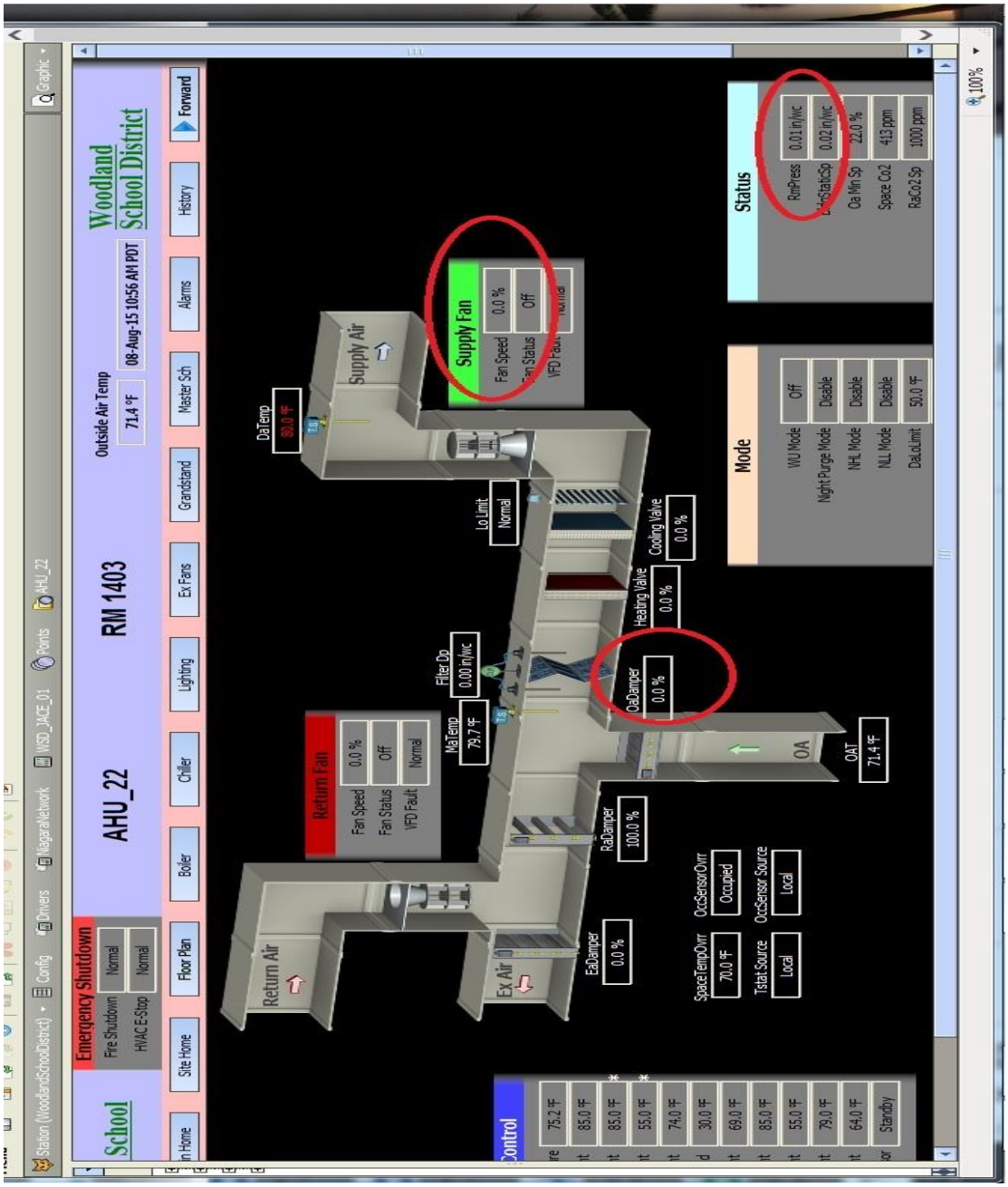
Isue ID M-36—HRU 6 was found running during unoccupied hours on a Sat morning. We notice an override is on regarding the next change of state.



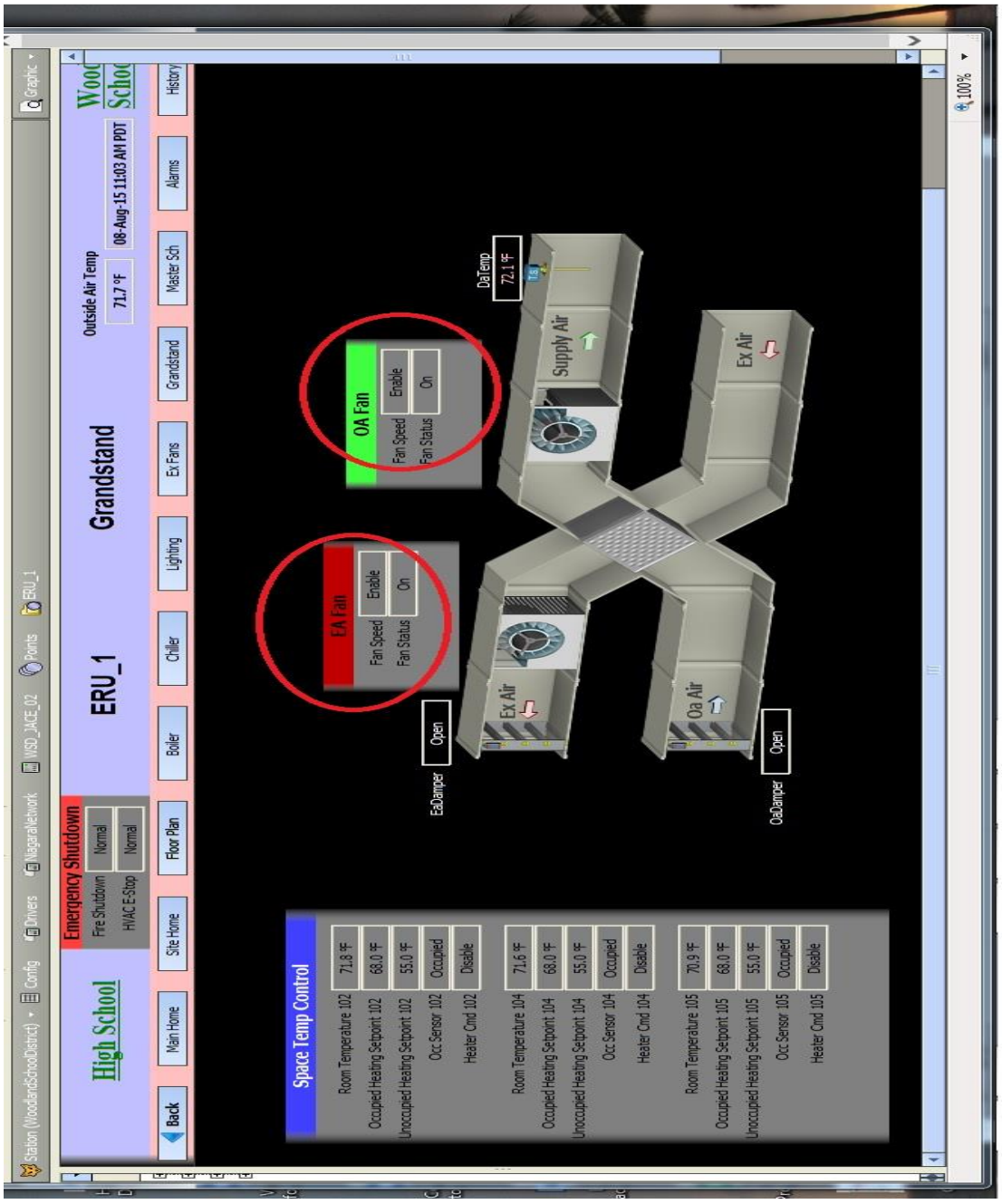
Issues ID M-37 & M-38—HRU-14 CO2 sensor is not being displayed accurately.



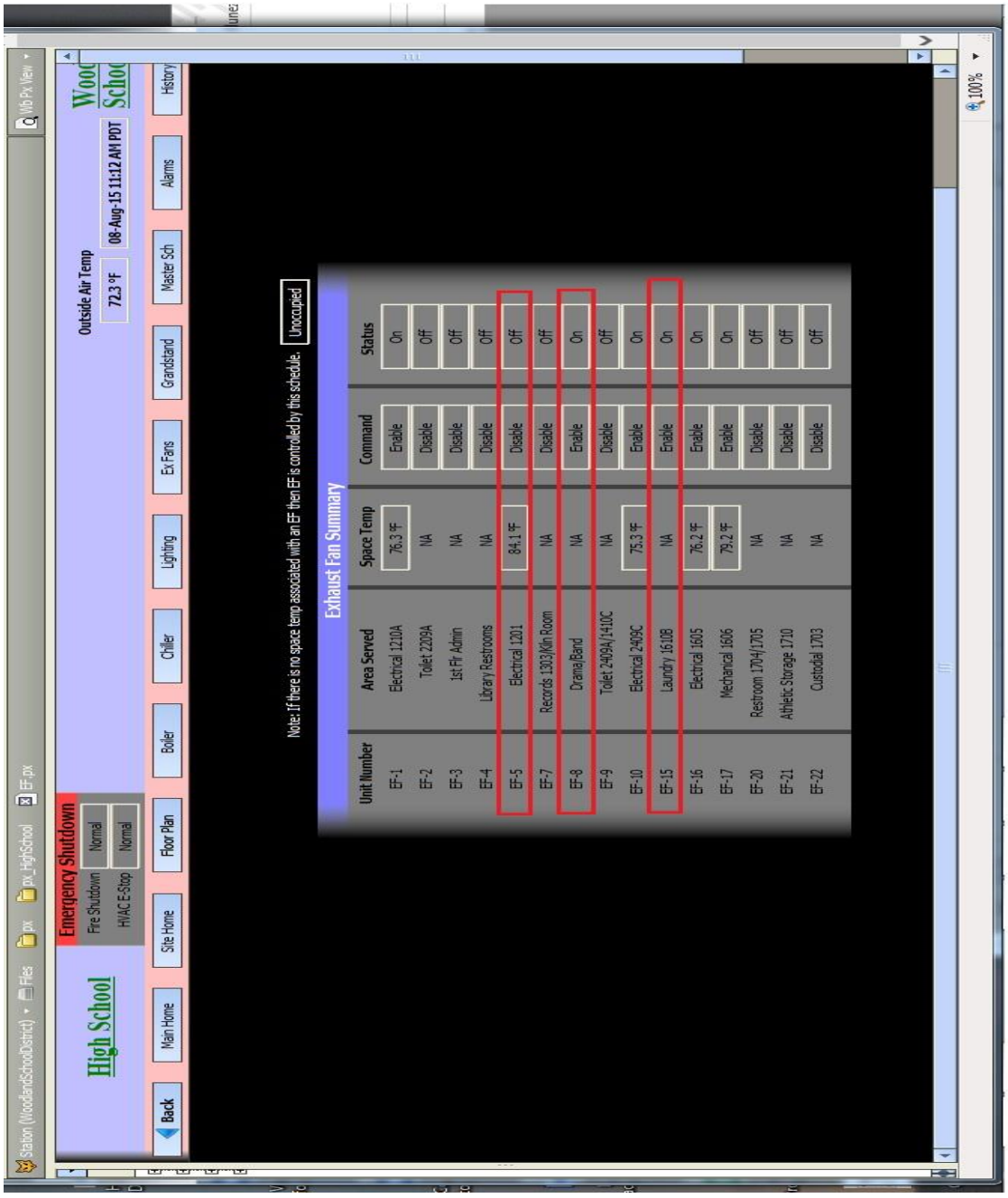
Issue M-39—HRU 11 heating and cooling set points have been overridden.



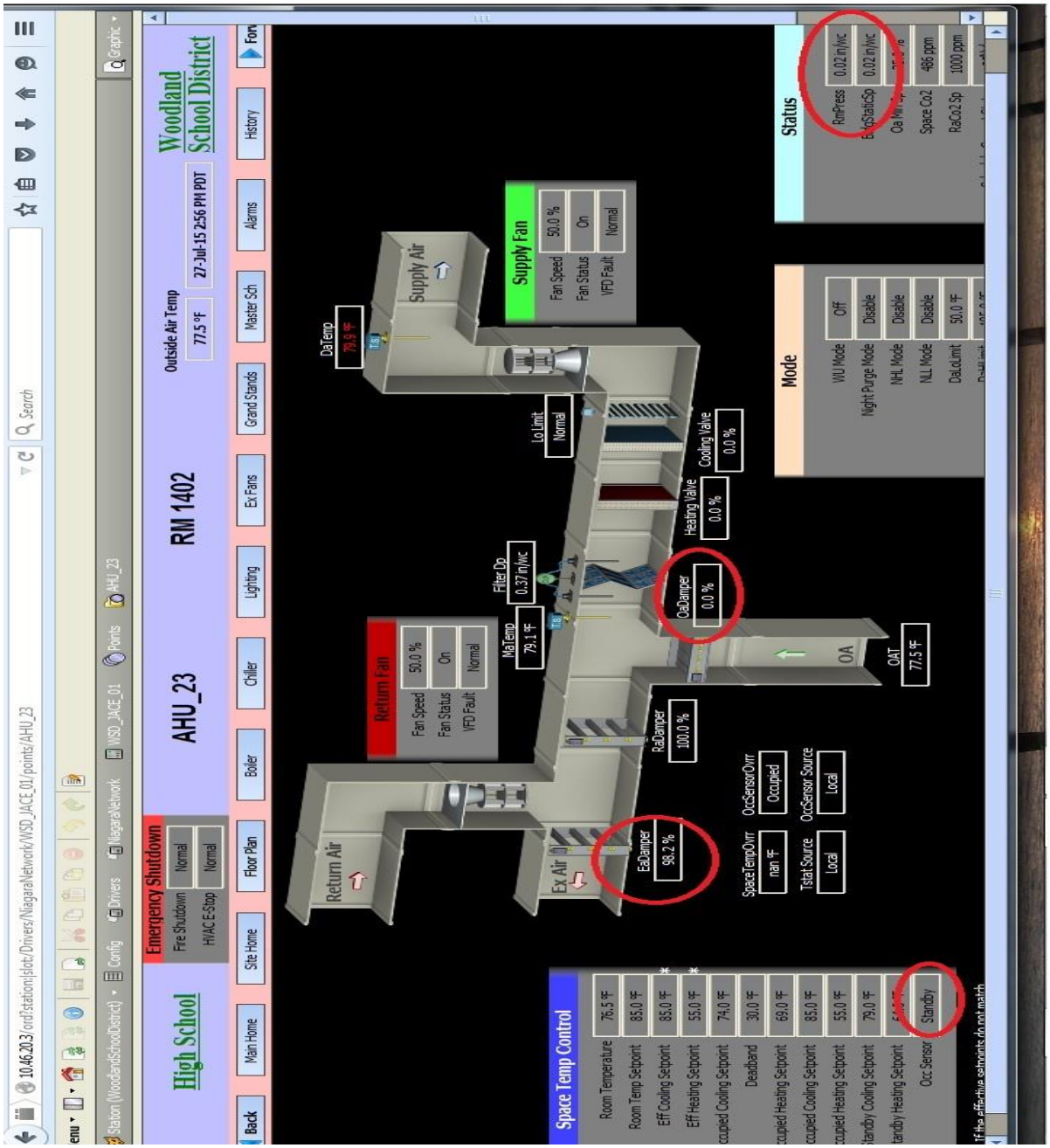
Issue M-41—AHU-22 space pressure is reading .01” with all HVAC equipment in unoccupied mode and not running.



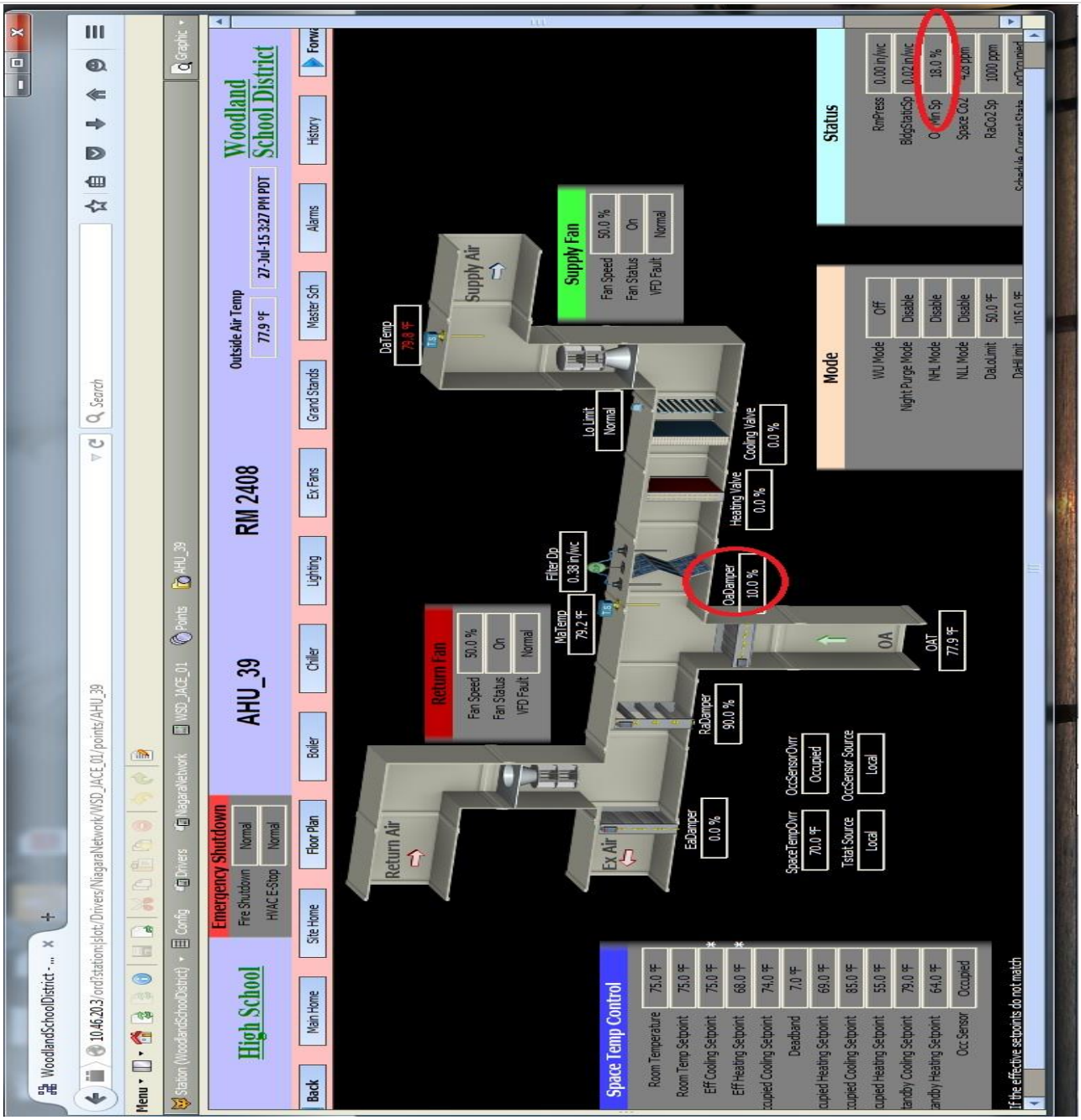
ISSUE M-42—ERU-1 serving the Stadium was running during unoccupied hrs on a Sat AM.



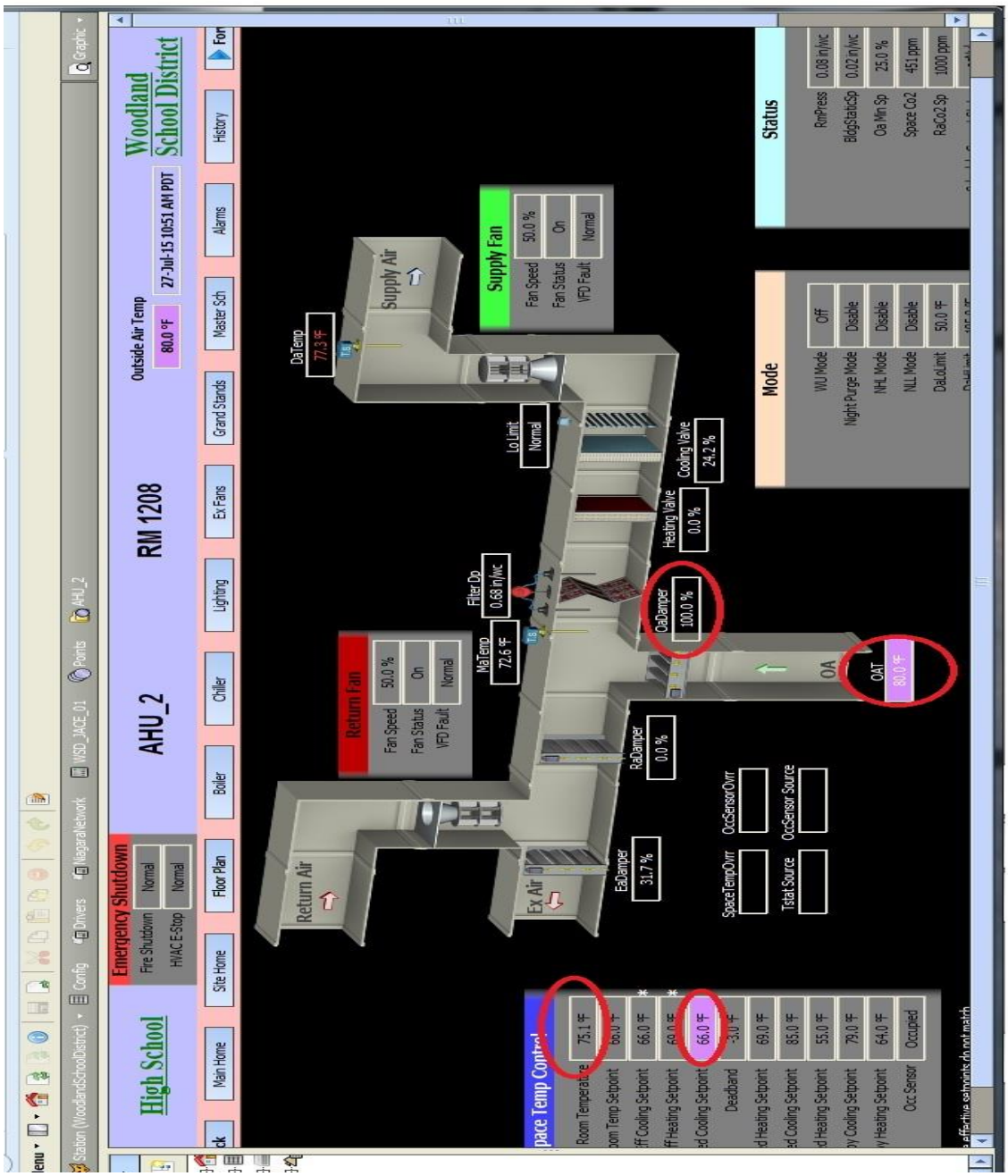
Issue M-44 thru M46—EF's operating from reverse acting T-stats are functioning at different space temps. Have set points all been set accordingly? There are a few EF's that run off the building schedule that were still running Sat AM during unoccupied mode.



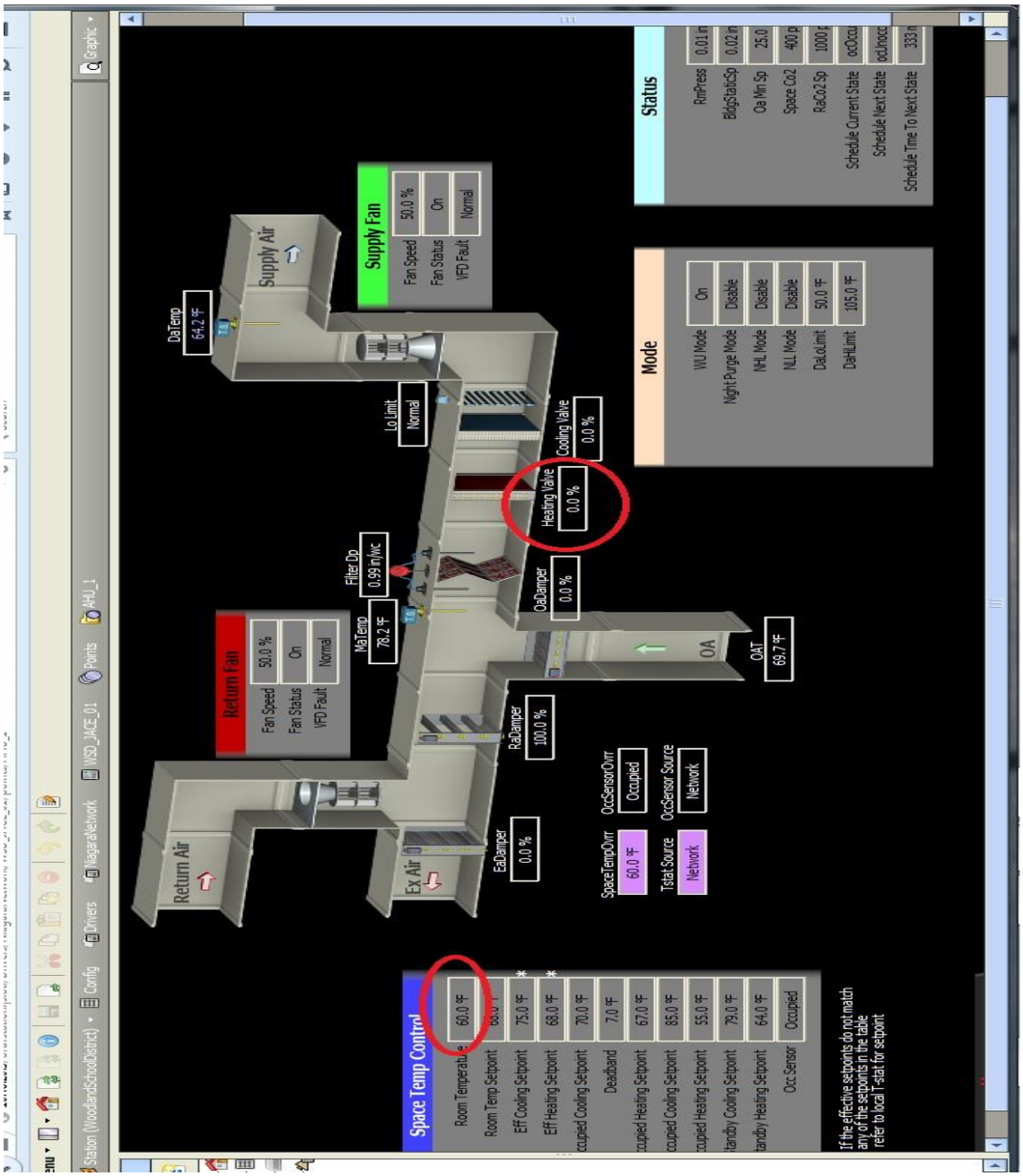
ISSUE M-47—This is a good reason to increase the space pressure set point. With the OSA damper closed, and the relief damper 100% open, the space pressure has already reached the set point.



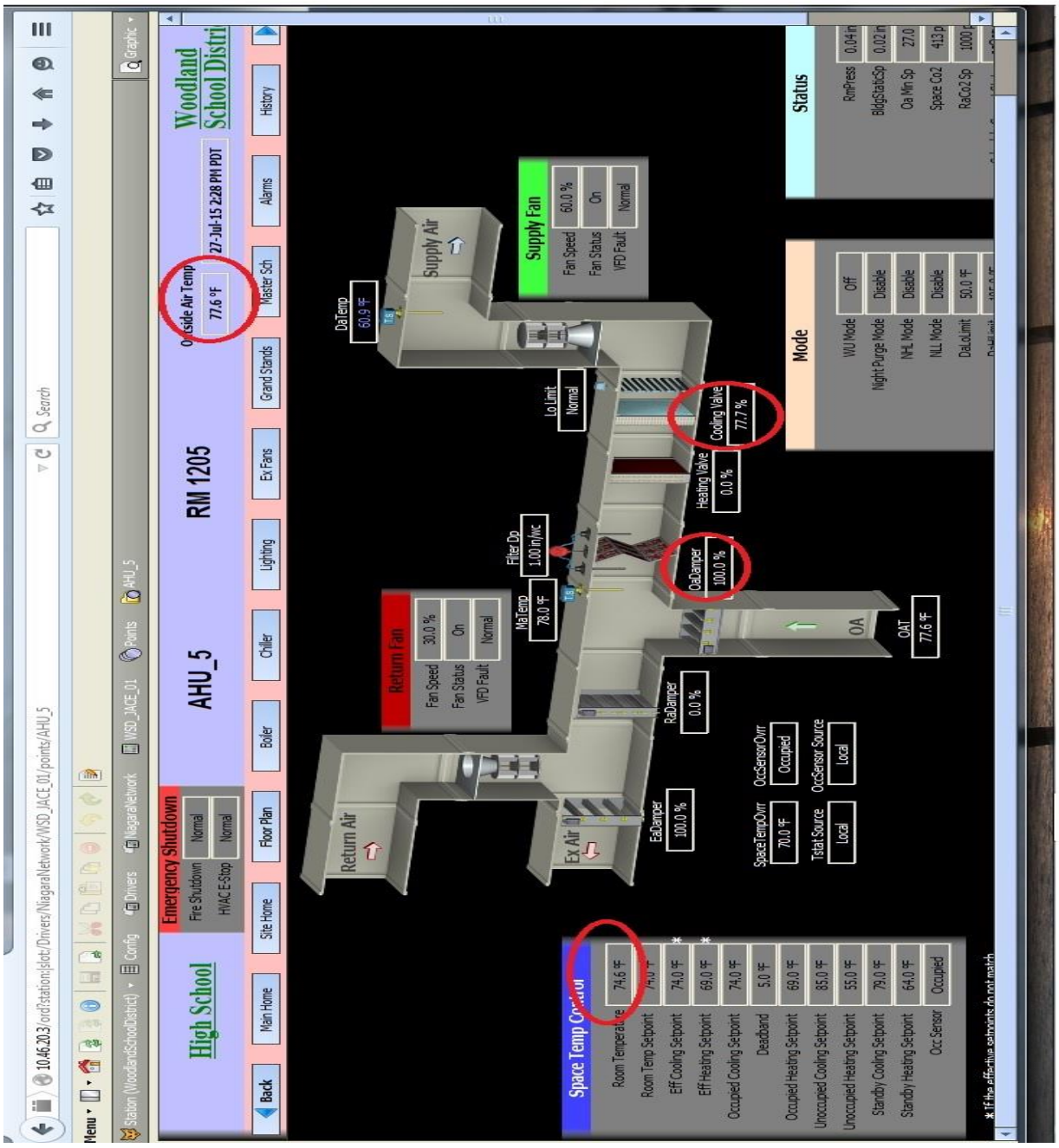
ISSUE M-48- AHU-39 OSA not moving to programmed minimum damper position.



ISSUE M-49-- AHU-2's OSA damper opened during it's cooling sequence even though the OSA temperature is greater than return (space) temperatures.



ISSUE M-51—AHU-1 did not include opening the heating valve as part of it's heating sequence of operations.



ISSUE M-52 thru M-54-- AHU-5's (AHU's 7 & 13 as well) OSA damper opened during it's cooling sequence even though the OSA temperature is greater than return (space) temperatures.

WOODLAND HIGH SCHOOL CX OPEN ISSUES

Issue ID #E-15—an end user switch has not been provided for the vacuum pump located in Chemistry lab 2401. A local switch integrated with the pump is located in the back, underside of the pump motor, but is not easily accessible.

Issue ID #P-55—water spills and pools up outside showers. Slipping hazard

Issue ID #G-64—the 5 position control panel has not been programmed correctly and according to the diagrams on the switch itself. The arrow up and down buttons should send the shades 100% open and closed. The other buttons should index the shades to the 25-50-75% positions. Skanska originally stated the three center buttons were not to be programmed, however, CSG discovered they have all been programmed to move the shades fully closed. CSG believes if they are to be programmed, they should be done so to not only match the configuration of the diagrams on the control panel but also matches typical industry standards.

Issue ID #E-75—Scorekeeper A203

Issue ID E-76—Main stadium light switch?

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Commissioning Field Report

Date: 11.04.14
Site: Woodland High School – Woodland School District
Spoke with: David Franke; Skanksa, Jacob Struck; Skanksa,

Activities: Performed construction site inspections.

Inspections:

Construction of the school continues. Work on the exterior shown here.	
The rood is mostly complete on the Auxiliary Gym.	

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Commissioning Field Report

Here is a view from the commons. Fire sprinkler piping has been installed.	
Here, domestic water heaters are adequately protected while awaiting installation.	

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Commissioning Field Report

The fire riser piping has been installed.	
Here, the various CWS and HWS circulation pumps are properly stored out of the elements.	

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Commissioning Field Report

The Heat recovery unit has been set in the mezzanine and kept protected from dust and debris until ductwork and piping is installed.	
Skanska provided mock-ups of various wall sections, enabling the building envelope specialist to review and advise prior to final construction.	

Deficiencies: None noted

_____
Steven Nunez
Commissioning Manager

CSG
Specialists in School Buildings

Commissioning Field Report

Date: 12.18.14
Site: Woodland High School – Woodland School District
Spoke with: David Franke; Skanksa,

Activities: Performed construction site inspections.

Inspections:

Exterior work being completed on a classroom wing.	
Plumbing for laboratory work stations has been installed.	

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Commissioning Field Report

Laboratory workstation piping is being leak tested.	
A typical classroom HVAC fan coil is set and awaiting ductwork and piping to be connected to it.	

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Commissioning Field Report

Installed ductwork and fire sprinkler hose kits are properly protected from construction dust and debris.	
Ductwork is being hung in the mechanical mezzanine that will eventually be mated to the HRU's in the gym and commons.	

Deficiencies: None noted

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Steven Nunez
Commissioning Manager

CSG
Specialists in School Buildings

Commissioning Field Report

Date: 03.12.15
Site: Woodland High School – Woodland School District
Spoke with: David Franke; Skanksa, Jacob Struck; Skanksa, Joe B; NW Controls

Activities: Performed a site inspection with Geert Aerts.

Inspections:

The chiller has been set on its housekeeping pad.	
The boiler room has boilers and associated pumps and piping installed. All work looks to be professionally completed.	

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Commissioning Field Report

Ductwork and exhaust fans have been installed in the Industrial Tech Shop.	
The domestic hot water system.	

AHU's and HRU's have been installed. Some installations are ongoing, particularly in the gyms and common spaces.	
Ductwork sections await final installation.	

Commissioning Field Report

The laboratory hoods have been installed. A question has been raised regarding the calibration of the Guardian airflow monitors.	
The project specifications do not identify who will ensure these airflow meters are calibrated to alarm an end user the velocity across the open sash is adequate to provide the necessary protection to the end user. Because face velocities must be measured, either the TAB contractor or manufacturer seems to be the appropriate party.	

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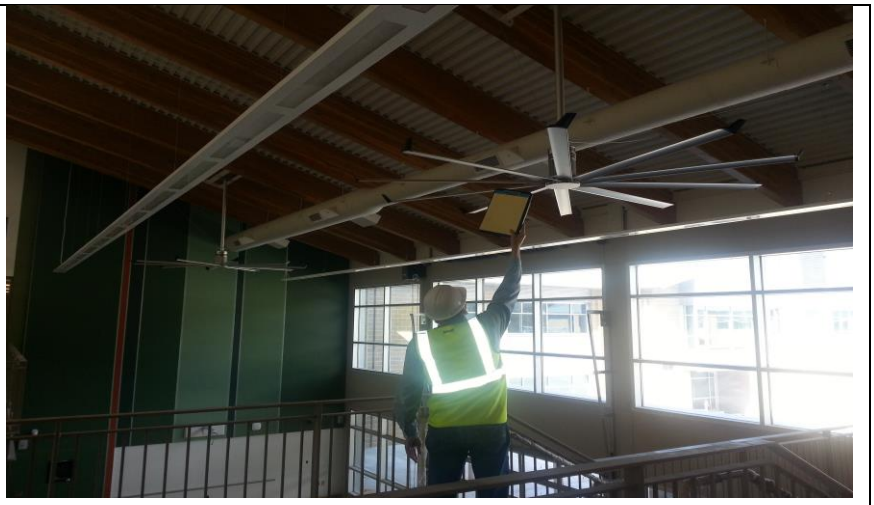
Commissioning Field Report

Here one can see the proximity of the paddle fans to the deck height at the top of the stairs. Does the school district have concerns with the ability to reach the blades while it is operating? Is the PF's effectiveness of limiting stratification inhibited by the stairs? Does the installation meet the required minimum clearance of 10' above floor?	

Deficiencies: None noted

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Steven Nunez
Commissioning Manager

CSG
Specialists in School Buildings

Commissioning Field Report

Date: 05.29.15
Site: Woodland High School – Woodland School District
Spoke with: David Franke; Skanksa, Joe Barnes; NW Controls, Cooper Controls,

Activities: Witnessed preliminary lighting controls training. Performed construction MEP inspections.

Inspections:

The Stadium construction is ongoing.	
The Stadium domestic hot water heater and piping system.	

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Specialists in School Buildings

Commissioning Field Report

The Kitchen is mostly complete with all equipment installed. The freezer was noted as having condensation build-up all around the door.	
Low voltage lighting controls system training occurred on this day. CSG witnessed and helped the Woodland school district maintenance staff identify areas that were not yet ready for programming or training so that it could be later identified on a return trip by the manufacturer's representative.	

Deficiencies: None noted

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Steven Nunez
Commissioning Manager