



## **SCHOOL BOARD ACTION REPORT**

**DATE:** August 2, 2019  
**FROM:** Denise Juneau, Superintendent  
**LEAD STAFF:** Fred Podesta, Chief Operations Officer  
206-252-0636, [fhpodesta@seattleschools.org](mailto:fhpodesta@seattleschools.org)

**For Introduction:** August 28, 2019  
**For Action:** September 4, 2019

### **1. TITLE**

BEX IV: Resolution 2019/20-5: Acceptance of the Building Commissioning Report for the Loyal Heights Elementary School Modernization and Addition project

### **2. PURPOSE**

The purpose of this action is to accept the building commissioning report for the Loyal Heights Elementary School Modernization and Addition project, in accordance with [WAC 392-344-165](#), as required to complete the Office of Superintendent of Public Instruction (OSPI) Form D-11 Application to Release Retainage. Approval of the resolution meets identified requirements.

### **3. RECOMMENDED MOTION**

I move that the School Board adopt Resolution 2019/20-5, accepting the building commissioning report for the Loyal Heights Elementary School project.

### **4. BACKGROUND INFORMATION**

#### **a. Background**

Commissioning is a systematic process of documentation and verification to demonstrate that the building mechanical and electrical systems have been installed and function properly and efficiently and can be maintained to operate and satisfy the engineer's design intent and the district's operational requirements. The commissioning consultant, Wood Harbinger, has satisfactorily completed the commissioning process.

The district's Capital Projects Mechanical/Electrical Coordinator, Mike McBee, has been involved throughout the commissioning process concerning the Loyal Heights Elementary School project located at 2511 NW 80<sup>th</sup> Street, Seattle WA. Mr. McBee recommends the acceptance of this effort.

The Office of Superintendent of Public Instruction (OSPI), through the School Construction Assistance Program (SCAP), provides funding assistance to school districts that are undertaking a major new construction or modernization project. The primary documents that form the basis of any agreement between OSPI and the district are the “D-form” documents. These documents, when properly completed and signed by all parties, form the official notices of agreement and intent on behalf of the district and OSPI.

As noted above, the acceptance of the commissioning report is required for Form D-11 for the release of construction retainage bond. Approval of this motion meets the requirements of OSPI to receive state funding assistance.

**b. Alternatives**

Not accepting this motion could put the district in a position subject to litigation and if state funding requirements are not met, the district will not receive state funding assistance that is available for this project. Therefore, this alternative is not recommended.

**c. Research**

- Office of Superintendent of Public Instruction, Form D-11 Application to Release Retainage
- Loyal Heights Elementary School Final Commissioning Report, Wood Harbinger

**5. FISCAL IMPACT/REVENUE SOURCE**

Action helps to secure approximately \$1,900,000 million dollars in state funding assistance. This motion does not represent a specific expenditure.

Expenditure:  One-time  Annual  Multi-Year  N/A

Revenue:  One-time  Annual  Multi-Year  N/A

**6. COMMUNITY ENGAGEMENT**

With guidance from the District’s Community Engagement tool, this action was determined to the following tier of community engagement:

Not applicable

Tier 1: Inform

Tier 2: Consult/Involve

Tier 3: Collaborate

The selection of projects in the BEX IV program went through an extensive community vetting process and ultimately received more than 72% approval from voters in February 2016.

**7. EQUITY ANALYSIS**

This motion was not put through the process of an equity analysis. The selection of projects in the BEX IV program was designed to provide equitable access to safe school facilities across the city.

**8. STUDENT BENEFIT**

This project helps ensure a safe, secure learning environment for every student.

**9. WHY BOARD ACTION IS NECESSARY**

- Amount of contract initial value or contract amendment exceeds \$250,000 (Policy No. 6220)
- Amount of grant exceeds \$250,000 in a single fiscal year (Policy No. 6114)
- Adopting, amending, or repealing a Board policy
- Formally accepting the completion of a public works project and closing out the contract
- Legal requirement for the School Board to take action on this matter
- Board Policy No. \_\_\_\_\_, [TITLE], provides the Board shall approve this item
- Other: OSPI requires Board acceptance of this report.

**10. POLICY IMPLICATION**

School Board approval of the commissioning report is consistent with Board Policy No. 6100, Revenues from Local, State and Federal Sources, which states “It is the policy of the Seattle School Board to pursue systematically those funding opportunities that are consistent with district priorities from federal, state and other governmental units, as well as from private and foundation sources,” and “The Board agrees to comply with all federal and state requirements that may be a condition for the receipt of federal or state funds...”.

**11. BOARD COMMITTEE RECOMMENDATION**

This motion was discussed at the Operations Committee meeting on August 15, 2019. The Committee reviewed the item and moved the item forward for consideration by the full Board.

**12. TIMELINE FOR IMPLEMENTATION**

Upon approval of this motion, the D-11 Application to Release Retainage will be completed and submitted to OSPI

**13. ATTACHMENTS**

- Commissioning Completion Letter dated, April 30, 2019, Wood Harbinger (for reference)
- Loyal Heights Elementary School Final Commissioning Report dated April 22<sup>nd</sup>, 2019 (Executive Summary attached, the full report is available in the Capital Projects and Planning Office)
- Resolution 2018/19-29 (for approval)



# Final Commissioning Report

## Commissioning Issues Log, Letter of Recommendation

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While Seattle Public Schools endeavors to only post documents optimized for accessibility, due to the nature and complexity of some documents, an accessible version of the document may not be available. In these limited circumstances, the District will provide equally effective alternate access.

For questions and more information about this document, please contact the following:

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Commissioning report, Letter of Recommendation and Commissioning Issues Log for Loyal Heights Elementary School.



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Bellevue, WA 98004  
425.628.6000  
woodharbinger.com

July 18<sup>th</sup>, 2019

Eric Becker  
Seattle Public Schools  
PO BOX 34165, MS 22-331  
Seattle, WA 98124-165

Project: Seattle Public Schools  
Loyal Heights Elementary School  
WH# 16017

Subject: Recommendation for Acceptance

Dear Mr. Becker:

Wood Harbinger, Inc. has completed deliverable documentation and recommends their acceptance as completing the Commissioning process for the Loyal Heights Elementary School.

See the Final Commissioning Report for further details.

~~Rev 1: The Final Commissioning Report referenced few remaining open warranty issues. Wood Harbinger supported SPS in monitoring the resolution of those issues. The detailed log of those and all closed Cx issues is attached.~~

Issue resolved 08/22/2019. No open  
Commissioning issues.  
E. Becker 08/23/19

WOOD HARBINGER, INC.  
Mechanical and Electrical Engineers

Shaun D. May,  
Commissioning, Electrical Engineer

SDM/NRB

Enclosures: July 18, 2019 Closed LHES Cx Issues Log

## Loyal Heights Elementary School Commissioning Issues Log

*Note: Shaded items reflect completed tasks and will be removed from next issues log, **Bold text indicates updates to existing items.***

This issues log pertains to commissioning-related subject matter discovered during functional testing and the trend log performance period. It is not a comprehensive list of warranty items, punch items or outstanding work.

Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
1	Hydronic Pumps PU-01 & -02 Differential Pressure Control / CW-1- 2 (1.8)	Both pumps were found running 100% with outlet pressure approximately 100 psi (inlet pressure approx. 50 psi). Pumps were under automatic control, modulating to maintain worst case differential pressure which was measured at the highest point DP sensor approximately 12 psi. 12 psi was the setpoint per design. Recommend inspect pump strainers for build-up. No issue found with DP#3 sensor hardware: located at the end of the loop across the AHU-14 coil. Trended normal system operation at 1 minute intervals to better diagnose issue. TAB had recommended 17 psi setpoint per JCI. JCI temporarily implemented a ceiling on the pump speed control to prevent this condition while this issue is resolved to protect the piping from excessive pressure. Does DP#3 sensor need replacement? PU-1 inlet pressure 50 psi, outlet 70 psi (4/10). PU-1 speed 60%, PU-2 off, DP was 11.9/12 psi. DP reading is based off of lowest value from DP#1, 2 or 3. DP#1, 2, & 3 readings were 12, 12 and 13 psi respectively.	CC / ME	Pump strainers inspected; no visible build-up nor debris found (4/23). Metrix: Keep at 12 psi until DP sensor#3 is operating correctly, and recheck pressure when 3 is back on. JCI: Worst-case DP sensor (#3) has been temporarily placed "Out of Service" and the other two DP sensors have maintained at approximately 12 psi while the hydronic pumps were running with no abnormal system pressures observed. With system operating at 12 psi DP#1 = 12.0 psi, DP#2 = 13.6 psi, DP#3 = 11.7 psi. With AHU-14 valve 0%: DP#1 = 12.0 psi, DP#2 = 12.6 psi, DP#3 = 10.8 psi With system operating at 14psi: DP#1 = 14.0 psi. DP#2 = 14.6 psi. DP#3 = 12.6 psi. The DP#3 sensor consistently had the lowest reading and causes the pumps to modulate to full speed under certain conditions. JCI review with Metrix (6/19) RFI007; submitted 6/20. See RFI 0738 response: verify no software issue with sensor and pump controls. 60 second trend setup as discussed in Cx meeting. Review data with ME and consider replace or delete sensor.	04/18/18	04/10/19

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2	Boiler B-01 Emergency Shutdown	The emergency shutdown button in the boiler room is reversed: the boiler was enabled to run when the button was pushed in.	MC / CxA	Done (RMI); ready for backcheck.	04/16/18	05/17/18
3	Domestic Water Heater WH-3 / MS-4-1 / M0.05	WH-3 was not yet programmed and therefore not ready for commissioning/functional testing. The space (penthouse) CO sensor was not installed. Note: WH-3 (kitchen) tank setpoint is 140 degrees F per MC; document modified setpoint. Increase DDC alarm temperature accordingly and verify. WH-3 was disabled on 5/3; is it OK to enable and test? Yes, OK to test (MC). Graphics found with temperature setpoint of 125°F and supplying 129°F in alarm. Status was on while commanded off. Checkout controls before functional testing WH-3.	CC / ME	Programmed 4/24. Issue ASI for revised WH-3 tank setpoint. Control relay for the circ pump was found to be in hand; set to auto. Successfully functionally tested.	04/18/18	05/30/18
4	Kitchen Emergency Gas Shutdown Solenoid / MS-4-1 (1.27)	Clarify which gas solenoid valve is wired to the kitchen range hood fire protection system control panel and shut off switch per the kitchen drawings. Does this affect the Domestic Water Heaters? Who will test this?	GC	No gas to Ansul system for kitchen; does not affect water heaters.	04/18/18	05/03/18



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5	WH-3 Circ. Pump DCP-03	The circulation pump was loud while operating; recommend investigate pump to ensure it is not damaged. DCP-01 was reported loud separately, but upon investigation its operation sounded normal. Are the domestic water lines flushed and clear?	MC	Pumps checked; lines flushed and clear; pump is still noisy, is this sound level expected? No additional concerns raised.	04/18/18	05/30/18
6	Pumps (PU) VFD DDC monitoring	Point mapping was incorrect, DDC values did not match actual.	CC	Point mapping was corrected 4/23; review 5/7.	04/18/18	05/08/18
7	WSHP-03 Source Pump PU-11 DP sensor	Differential pressure reading was 0 psi while estimated actual pressure was approximately 5-7 psi; troubleshoot DP sensor.	MC / CC	Working as of 4/24, reading is 9.8 psi @ 60 Hz. Review 5/7.	04/18/18	05/08/18
8	Makeup Water Meter	Meter was not calibrated; reading unreliable. See Condenser Water page (CWW).	CC / MC	Ready per JCI. Check with Robison to flow makeup water to verify sensor reading. JCI reviewed with Robison and meter did not count up last week. Robison working with rep (6/20). Replacement meter expected to arrive 6/26 -Robison Install this week (7/2) -Robison Installed, JCI to verify prog. (7/10)	04/18/18	07/12/18
9	WSHP DDC Graphics	WSHP graphics were not loaded.	CC	All graphics loaded 4/23.	04/18/18	05/03/18
10	DDC Alarms	Alarm pop-ups did not display on temporary server. Alarm pop-ups verified on temporary server.	CC	Review alarm pop-ups when connected to server (final config.). Hold until end of FT when DDC is connected to WAN.	04/18/18	06/27/18

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11	Hydronic BTU Monitoring / CW-1-2 (1.32)	Flow meter installation incomplete; not setup.	CC	Flow meter installed 4/23. Review 5/7, verify BTU reading.	04/18/18	05/08/18
12	WSHP Low Supply Temp. Alarm / CW-2-2	"The BAS shall generate an alarm if HP water supply temp is less than 90°F." Confirm this alarm is for heating mode only. What time delay should be implemented before the alarm triggers? Note: WSHP internal compressor stage on delay is 10 minutes.	ME / CC	Sent to Air Tec. Metrix: Correct, this is for heating only; set initial delay at 15 minutes. JCI reported ready, backchecked and not ready 5/17: simulated system in heating (OAT=60, WSHP HT enabled) and DTW-S-T = 85°F for 40 minutes with no alarm. CxA review with JCI. Alarms are setup for the individual WSHP temperature sensors; not the main sensor. Verified.	04/18/18	05/30/18
13	WSHP Alarms	WSHP-1 went into (internal) alarm during cooling unexpectedly, WSHP-2 alarmed unexpectedly during heating; error code 8. WSHP were reset to clear alarms. Troubleshoot WSHP alarm cause. All WSHP went into internal alarm during cooling, which was reset by Air Tec, retest 5/7.	MC / CC	Increased cooling setpoint to 50°F. Alarm was high evap. (load side) water temp., revised SP by Mike (Air Tec); verify alarm does not recur. Scheduled testing 5/7. Alarms recurred on 5/8 but appear to be non-persistent per JCI/Air Tec. Verify alarms do not recur in trend data and system consistently stages on cooling automatically per demand without fault interruption. No alarms during trend period.	04/18/18	08/16/18

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14	WSHP Cooling Stages	Unable to verify full staged WSHP cooling due to ambient temperature and unexpected WSHP alarms (see CIL#13 above). Verify full stage WSHP cooling during warmer ambient conditions after alarms are resolved.	MC/ CC / CxA	Attempted 5/3, retry 5/7. Cooling staged on successfully. Seasonal test system for full staged cooling (only 3 compressors staged on today OSA 70°F).	04/18/18	05/08/18
15	Boiler B-01 & PU-05 Low Flow Alarm	The boiler control panel annunciated a low flow alarm any time PU-05 was switched off, regardless of whether B-01 was (DDC) enabled or not.	MC / CC	Boiler tech. to troubleshoot. Replacement part install scheduled 6/14. Boiler replacement relay did not work; Robison rescheduling (6/19). Robison troubleshooting 6/26. Reported fixed 7/2. - Robison JCI verify (7/10)	05/17/18	07/12/18
16	WSHP Temp. Changeover cooling to heating / CW-1-2 (1.8)	WSHP transitioned to heating immediately; control sequence calls for 10 minute delay with bypass valve open and pump running before transition.	CC / CxA	Fixed 4/23; ready to backcheck.	04/18/18	06/14/18

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17	WSHP DP Alarms / CW-2-2	WSHP differential pressure (DP) alarms were not set up. JCI needed recommended differential pressure/flow from manufacturer (Geotech).	MC / CC / CxA	Recommend DDC monitors DP alarm points from WSHP BACnet. WSHP pumps to run at fixed speed (DDC should not modulate WSHP source/load pump speed via DP) per Air Tec. JCI coordinate with Air Tec. Pump programming revised for fixed speed. DPs added to system. Mat will set alarm thresholds 5/24. Low pressure alarms have been added with alarm setpoints of 2.5 psi; ready for backcheck. Verified alarms setpoints are input and BACNET readings are valid. Cannot safely simulate alarm without mfr rep.	04/18/18	06/20/18
18	Carbon Monoxide (CO) Monitoring / MS-4-1	JCI needed alarm SP for carbon monoxide sensors from the engineer. Add monitoring point to floor plan graphics.	CC	Metrix: CO alarm setpoint is 35 ppm (adj) per 230993 1.19.E.2. Verified alarms at sensors and on DDC. Backcheck graphic.	04/18/18	06/06/18
19	AHU Graphics	Add second (common/envelope) outside air and exhaust air dampers to AHU graphics for applicable units (AHU-1, 2, 8, 9, 11, 12, 13, 14 ...) Alex (JCI) was adding to graphics.	CC	Done; ready for backcheck.	04/23/18	06/01/18

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20	Zone Heating Temp. Alarm Setpoints / Global Control Sequences / NR-4-1	Design calls for zone heating alarm at 45°F. Does this apply to all zones with zone temp. sensors? Is 45°F too low? Please clarify, this global alarm has not yet been implemented.	CC	Metrix: Yes, applies to all zones with temp sensors. This is 10 degrees less than unoccupied zone heating setpoint. Setpoint is adjustable if SPS deems it too low. Verified implemented (sampled VAV zone).	04/23/18	05/30/18
21	Freeze Stat (LLT) / AHU Safeties	AHU-1&2 did not reliably resume normal operation after (single) freeze-stat shutdown. JCI offered to review sequence before other AHUs were tested. Alex (JCI) was troubleshooting.	CC	JCI: Timer adjusted. Verified.	04/23/18	05/30/18
22	Global Freeze Protection Override / NR-4-1 (1.41)	Sequence was not yet implemented. Implemented BAS operator interface point 5/30, added AHUs.	CC	Fixed 5/8; ready for backcheck. Await complete AHU controls (fully ready for FT). Test with unocc. JCI requesting a sequence clarification from Metrix (6/11); response received (6/19); see confirming RFI005. Programming updated per RFI(0736) response; ready for backcheck. Review in final graphics.	04/23/18	07/12/18

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23	Phase Failure Protection / NR-4-1 (1.43)	Design called for BAS to shutdown 3-phase controlled loads under phase imbalance. OR reviewed the VFD datasheets and noted that the VFDs appear to be capable of performing the safety shutdown and that this method would be acceptable. Implement, document, and verify phase failure protection safety sequence. Provide recommendation for how to safely verify VFD protection. Sample verified: motors operated in phase loss condition, VFDs provided balanced 3-phase output, 2 of the sampled units' VFDs generated phase loss alarms upon sufficient voltage and current, 3 ran without alarm. UH ran in single-phase with fan on; power monitoring is upstream of circuit breaker.	CC	JCI verify VFDs are configured and DDC monitoring setup. CxA coordinate with JCI/Elcon to schedule test. Test sample each VFD type scheduled with JCI/Elcon on 5/24 8:00AM. JCI implementing protection of non-VFD 3-phase loads (i.e. UH). Verify 6/1. VFD manufacturer provide additional information about phase loss operation and verify settings are consistent for all drives. JCI has received information from the vendor and is providing information in a separate email; information received shared with SPS and will be included in O&M.	04/23/18	06/18/18
24	AHU Temp. Alarms / (e.g. AH-4-2)	Temperature alarms appeared to not yet be implemented in AHUs generally (i.e. low mixed air, low supply air, AHU-1&2 tested). Add mixed temp (heat recovery) alarm to AHU-3&4.	CC	Done 5/8; ready for backcheck. Await complete AHU controls (fully ready for FT).	04/23/18	06/01/18

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25	Unoccupied Zone Heating Temp. Setpoints / NR-4-1 (1.6A[1])	Linear reset input capability based on OAT not visible in graphics.	CC	Reset parameters have been added to the Main building graphic.	04/23/18	06/11/18
26	Unoccupied Zone Heating Temp. Setpoints / NR-4-1 (1.6A[1])	Linear reset input capability based on OAT not visible in graphics.	CC	Duplicate issue, verified for each AHU.	04/23/18	06/11/18
27	AHU Fire Alarm Shutdown	AHU-1&2 fire alarm shutdown was not yet integrated (look for flashing green light on module). Recommend verify all AHUs in one scheduled sweep test; coordinate with EC.	CC	Verified AHU shutdowns (5/8) with EC. CxA verify 'Fire Alarm Shutdown' (global point) signal on DDC once integrated by JCI. Global fire alarm software shutdown has been implemented and tested by JCI. CxA test with JCI; 7/12.	04/23/18	07/12/18
28	AHU-3 SF VFD fault	"Fieldbus fault W34" displayed on VFD. AHU-3 SF-FREQ DDC reading was "???" 0 Hz" while fan was running.	CC	JCI: fault corrected 5/8. Reported resolved but AHU-3 SF graphics still display error. Recurred 5/30. Ceased.	04/23/18	06/07/18
29	AHU-3 damper control / AH-2-2	Outside air face damper did not modulate open for HX (OFO-D=0%) despite OAT < RAT and a call for heating.	CC	Fixed; ready for backcheck.	04/23/18	05/30/18

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30	AHU-3 damper control / AH-2-2	Outside air face damper did not modulate open for HX (OFO-D=0%) despite OAT > RAT and a call for cooling. AHUs will not go into HX cooling unless hydronic system in cooling.	CC	Fixed; ready for backcheck. Verify HX cooling.	04/23/18	06/18/18
31	AHU-3 supply static pressure reset / AH-2-2	The supply static pressure setpoint did not reset for 10 minutes despite pressure requests.	CC	Fixed; ready for backcheck.	04/23/18	05/17/18
32	AHU-3 supply air temp. setpoint reset / AH-2-2	The supply air temperature setpoint did not reset for 10 minutes despite cooling requests.	CC	Fixed; ready for backcheck.	04/23/18	05/17/18
33	AHU-3 supply static alarm / AH-2-2	The supply static pressure did not alarm despite simulated pressure ("Out of Service" override in DDC) at 200% of setpoint.	CC	Fixed; ready for backcheck.	04/23/18	05/17/18



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34	AHU-8 duct pressure high limit	Graphics duct static pressure reading was "???". AHU shut fans shut down due to duct pressure high limit safety. JCI reported the duct pressure unit was faulty and a replacement was ordered. RH-3 offline: clarify component; is this an additional damper and is it under control? Duct pressure was in alarm, 0.38"/0.15" (actual/SP) both SF and RF at minimum speed 15 Hz with SC 0.2% (5/24). RH-3 status point was 0% open and not displayed on graphics; applicable?	CC	Sensor to be replaced on 5/22. Minimum setpoints updated to .5" w.c. (adj.). Fan and duct pressure control verified. See CIL#112.	04/24/18	06/06/18
35	AHU-11 & 12 / AH-6-1	(Envelope) outside air dampers were found physically closed but the units were running. These units are equipped with two outside air dampers but only one is depicted on the control diagram.	CC	Fixed; ready for backcheck.	04/24/18	06/06/18
36	AHU-11, 12, & 14 / AH-6-1 / Kitchen, Music Platform, Receiving / M3.12	AHU-11, 12, & 14 were not equipped with exhaust ducts/dampers. Are exhaust air dampers located in the respective spaces? Locate exhaust air dampers and verify dampers are added to respective control graphics. AHU-11 & 12 exhaust air dampers appear to be deleted from project, confirm and removed from graphics.	CC / ME	Fixed; ready for backcheck. Verify AHU-14 EAD operation. AHU-11, 12, & 14 do not have dedicated exhaust air dampers. Air will relieve through commons relief louver. -Metrix Remove EADs from graphics (6/15/18). Graphics updated 6/20; ready for backcheck.	04/24/18	06/22/18

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37	AHU-11 / AH-5-2	No fan alarms despite fans commanded on and status off.	CC	Fixed 5/9; ready for backcheck.	04/24/18	05/18/18
38	AHU-5 return air damper	Return air damper does not fully close when at 0%; it stays open about 1/2". JCI confirmed 6/20 that this is not a Foy issue. Damper doesn't physically close with control actuator removed. There's a very small gap between the blades. Robison querying supplier CMS (6/26). I found the damper fully open and the AHU not running. I placed the VFD's in hand to keep them from running and removed the lead for the actuator from the ATS control panel to force the damper to shut. I watched the actuator go fully shut and found that the damper was still 10% open after full stroke of the actuator. I removed the actuator from the damper shaft, and was able to fully shut the damper manually. That indicates that that actuator was installed with the damper partially open. The damper was functioning perfectly from the factory. -CMS	MC	<del>Fixed 5/9; ready for backcheck.</del> <del>Backchecked and not fixed 5/17. JCI: re-checked, done. Not fixed 5/31, damper does not fully close mechanically, recommend adjust linkage. Sent an email to Foy to repair (6/19).</del> I situated the actuator properly on the shaft of the damper, and reinstalled the brackets. After reinstalling the actuator, I placed the wire back on the terminal for the ATS control panel, and watched the damper cycle from fully shut to fully open back to fully shut again. I placed the VFD back in AUTO and cleaned up my work. -CMS-Ready for backcheck.	04/25/18	07/12/18

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39	AHU-5 exhaust air damper	Exhaust air damper (over south commons vestibule) control is reversed: status was 100% when shut and 0% when open.	CC	JCI: polarity of the damper was reversed 5/9. Backchecked and not fixed 5/17. JCI: re-checked, done.	04/25/18	05/31/18
40	AHU Occupancy Schedule	Generally AHUs reverted to "Not Set" when Occupancy Schedule overrides were released. Recommend placing AHUs on a schedule.	CC / SPS	SPS provide (final) 'Bell Schedule' to JCI. JCI: Schedules added to all AHUs and VAVs 5/9; ready for backcheck. Await complete AHU controls (fully ready for FT).	04/25/18	05/31/18
41	AHU-6 CO2 sensor	Zone CO2 reading was 0ppm (invalid).	CC		04/25/18	05/18/18
42	AHU-7 return air damper	Return air damper was non-responsive to commands and remained 100% open.	CC	JCI: couldn't duplicate 5/9. Await complete AHU controls (fully ready for FT).	04/25/18	05/31/18
43	Classroom HVAC: VAV FTR CF OCC not ready	Occupancy sensors and ceiling fan switches were not installed, impeding controls integration and functional testing of classroom systems. Review occupancy controls in First Floor Admin and surrounding area (see CIL OS issues), verify DDC integration. Are all spaces equipped with occ sensors including contacts for DDC?	EC / CC	All sensors installed per EC and integrated per JCI (5/8). Admin area was incomplete 5/17. See Occupancy Sensor (OS) CIL items.	04/23/18	06/05/18
44	VAV-53 Occupancy Sensor (OS)	OS was not installed.	EC	Ready for backcheck.	05/01/18	05/17/18
45	VAV-51 OS	OS was not installed.	EC	Ready for backcheck.	05/01/18	05/17/18

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46	VAV-49 Finned Tube Convactor (FTC)	No heating was provided at 100% valve status.	CC	Ready per JCI; backchecked and not fixed 5/17, waited 5 minutes with no temperature rise. Fixed.	05/01/18	05/31/18
47	VAV-49 Airflow	Airflow reading was 0 CFM despite airflow (invalid reading). JCI was aware and provided list of units beforehand with known issues.	CC	Fixed, ready for backcheck.	05/01/18	05/31/18
48	VAV-45 DDC Mislabeled Graphic	Graphic display name in window was VAV-46 (light blue navigation bar said VAV-45).	CC	Fixed 5/9; ready for backcheck.	05/01/18	05/17/18
49	VAV-42 & 40 DDC Htg/Clg Setpoints	Actual cooling and heating setpoints set to $\pm 6^{\circ}\text{F}$ of thermostat input; other rooms are set to $\pm 4^{\circ}\text{F}$ . JCI: All of the rooms I looked at had an adj setpoint range of 1 deg. CxA: Agreed, thermostats can be adjusted from 72 to 73 degrees. This issue refers to DDC setpoints, i.e. if thermostat input is 72, actual clg is typically 76, and actual htg is 68. Verify deadband is consistent throughout spaces, including VAV-42 & 40.	CC		05/02/18	05/18/18
50	VAV-40 Primary Air Damper (PAD)	PAD creaks loudly while operating.	MC / CxA	NWMA reviewed 6/15 and had JCI ramp it up and they heard nothing, he believes the issue is coming from the elevator. CxA review: no noise 6/20.	05/02/18	06/20/18
51	VAV-39 Airflow	Airflow reading was 0 CFM despite airflow (invalid reading).	CC	Done; ready for backcheck.	05/03/18	05/31/18

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52	VAV-36 Electric Reheat Coil (ERC)	ERC did not provide heating after being commanded to 100% for 15 minutes. Still an issue 5/31.	CC / MC	JCI verified voltage to board; MC troubleshoot factory heating control board. Sent NWMA email to have factory rep come to site to resolve (6/19). VAV-36 is working now (6/22)-Robison	05/03/18	06/27/18
53	VAV-35 Controller	VAV controller was found torn apart; could not test.	CC	Controller replaced 5/12.	05/03/18	05/18/18
54	VAV-34 Airflow	Airflow reading was 0 CFM despite airflow (invalid reading).	CC	Controller replaced 5/12.	05/03/18	05/18/18
55	VAV-33 Controller	VAV controller was found torn apart; could not test. Airflow reading was unreliable (e.g. 500 CFM when damper was full closed). 0 CFM on 5/31 with damper 100%.	CC	Controller replaced 5/12. Fixed.	05/03/18	05/31/18
56	VAV-28 Zone/Room Temperature Sensor and Controller	Room temperature sensor was not installed. Fault observed on unit controller.	CC	Fault light is caused by SA Bus alarm from missing Tstat. Tstat to be installed 5/15.	05/01/18	05/18/18
57	VAV-26 FTC	Finned tube convactor control valve (CCV) did not operate.	CC / MC	Fixed; ready for backcheck.	05/01/18	05/31/18

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58	VAV-23 Location? Rm 210	Unable to locate VAV-23; unit was noted with electric heating and airflow issues by JCI; review unit together. JCI review unit and notify CxA when ready. Unit provided no heating and OS was non-responsive. Lighting plan shows only OS wall switch no additional motion sensor for DDC integration. Provide additional motion sensor or remove VAV occupancy control interlock?	EC / EE / MC / CC	Located next to VAV-22. JCI verified voltage to board; recommend MC troubleshoot VAV factory heating control board. Sent NWMA email to have factory rep come to site to resolve heating control (6/19). JCI to send RFI006 (6/20) regarding OS. Occ sensor monitoring deleted per RFI response; ready for backcheck.-JCI New (heating) board ordered on rush shipment.-Robison New board to be installed 6/27. New board installed (7/2).	05/01/18	07/12/18
59	VAV-22 Service Access Panel Latch	Service panel door latch stuck shut. Door swing prevents easy opening (must reach around to open door from behind).	GC	Fixed. GC to loosen door for access. Access door easy open now. -SKA	05/01/18	06/27/18
60		not used (accidental duplicate)				
61	VAV-20 OS	OS was not installed. Occupancy sensor interlock not required. CC verify occ interlock sequence is disabled.	CC	Ready for backcheck. Not ready; OS was not installed (5/18). Not operational 6/1/18. Room does not have an occ sensor for monitoring. We have removed it from the programming and graphic (6/11). -JCI	05/02/18	06/15/18

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62	VAV-19 & 20 Heating Coil Actuator / Admin Health Rm 100A & 103	HC actuators were very noisy (continuous sound). MC: No debris in piping, sounds like noise is coming from flow control.	MC	Troubleshoot heating coil actuator; recommend repair or replace. Fixed ready for backcheck.	05/02/18	06/06/18
63	VAV-19 OS	OS was not installed.	EC	Ready for backcheck.	05/02/18	05/18/18
64	VAV-19 ERC	ERC provided only 5°F delta T after 20 minutes at 100% command; unexpectedly low heat provided, recommend troubleshoot heating coil.	CC	Ready for backcheck.	05/02/18	06/06/18
65	VAV-18 OS	OS was not installed. Occupancy sensor interlock not required. CC verify occ interlock sequence is disabled.	CC	Ready for backcheck. Not ready; OS was not installed (5/18). Not operational 6/1/18. See CIL#61 above.	05/02/18	06/15/18
66	VAV-17 OS	OS was not installed. Do the installed sensors have contacts for DDC integration? Occupancy sensor interlock not required. CC verify occ interlock sequence is disabled.	CC	Ready for backcheck. OS installed but not integrated to DDC. Not operational 6/1/18. See CIL#61 above.	05/02/18	06/15/18
67	VAV-16 OS	OS was non-responsive.	CC	Ready for backcheck. Admin area was not complete. Admin area will be complete by 5/24 per EC.	05/02/18	05/31/18
68	VAV-15 OS	OS was non-responsive.	CC	Ready for backcheck. Admin area was not complete. Zone was occupied could not test 5/31.	05/02/18	06/01/18



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69	VAV-13 OS / TU-1-1	OS was not installed. Occupancy sensor light switch installed (no contacts for DDC?); no additional occ sensor installed. Occupancy sensor interlock not required. CC verify occ interlock sequence is disabled.	CC	Ready for backcheck. Admin area was not complete. Zone was occupied could not test 5/31. Not ready 6/1. See CIL#61 above.	05/02/18	06/15/18
70	VAV-05 OS Rm 109	OS was non-responsive.	CC	Ready for backcheck. Zone was occupied could not test 5/31.	05/03/18	06/01/18
71	VAV-05 Graphic Mislabeled	Unit serves Rm 109; graphics display said Art 116; revise graphic title/name to match actual room served.	CC	Fixed; ready for backcheck.	05/03/18	05/18/18
72	VAV-04 OS / Rm 110	OS was non-responsive. Trend value appears to have not changed since 6/11 (seen 6/15). JCI double-checked occ sensor wiring. This appears to be an issue with the occ sensor. Trend indicates space has remained occupied 6/25-6/27. Occ sensor will require additional testing with Elcon and myself. We have previously tested the wiring and Elcon replaced the sensor. The only other thing I can come up with for troubleshooting is to wire in a light switch temporarily and record the on and off states. -JCI (9/5)	CC/ EC	Ready for backcheck. Zone was occupied could not test 5/31, 6/6, 6/14, 6/15. Loose connection, fixed 6/25. Review 7/12 with JCI. Elcon troubleshoot 7/12. Unable to resolve. Control wire has been tested and the occ sensor was replaced by Elcon. Still shows status occupied consistently. -JCI Occupancy sensor replaced and verified fixed with trend data received 10/5/18.	05/03/18	10/05/18



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73	VAV-04 Airflow	AF pickup read 0 CFM despite airflow (invalid reading)	CC		05/03/18	05/18/18
74	VAV-03 Airflow	AF pickup read 0 CFM despite airflow (invalid reading)	CC	Fixed 5/12.	05/03/18	05/18/18
75	VAV-03 Finned Tube Heating Coil / Art Rm 115	The CCV was 100% open for 10 minutes with only 4°F rise in temperature; hydronic temp was 117°F. Recommend troubleshoot heating coil and/or valve. Space OS was installed but not integrated to DDC.	CC	Fin tube valve actuator has failed. A new one is on order for replacement. Fin tube valve replaced (6/20). OS to be investigated. -JCI OS ready for backcheck.	05/03/18	06/22/18
76	VAV-01 Htg/Clg Setpoints	Actual cooling and heating setpoints set to ±1.5°F of thermostat input; other rooms are set to ±4°F.	CC	See CIL#49 above.	05/03/18	05/18/18
77	AHU-3 DDC overrides	AHU-3 repeatedly and unexpectedly entered into Unoccupied Override multiple times every few minutes. SAT-SP was observed at 85°F during unoccupied mode. Unit found in Unoccupied Mode (5/8). JCI review unit and notify CxA when	CC	Fixed 5/9; ready for backcheck. See CIL 28, 29, 30: await AHU-3 completely ready.	05/03/18	05/30/18
78	WSHP common load side 3-way mixing valve	Mixing valve was installed incorrectly and cut off hydronic loop supply flow completely when the control valve sequence was enabled, this caused the WSHP to alarm due to no flow. Normal operation with new valve configuration was observed.	MC / CC	Valve removed and reinstalled (6/12); return to automatic operation. Ready for backcheck. Review in trends. Previously closed 8/16/18, valve control wire is not connected 4/10/19; issue reopened. Reported closed via email with pictures 7/8.	05/03/18	06/14/19

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78a	UH-12	Broken solder connection; repair or replace unit.	MC	To be replaced 5/22.	05/08/18	06/01/18
79	KF-01	Makeup fan did not come on. Was it prevented by a DDC relay? JCI notify CxA when KF-01 and EF-11 Kitchen Range Hood and Exhaust are ready for FT.	CC	<del>Remove RIB, refer to A9.3G.</del> Tom-(Skanska) reported fan operated as expected with Ansul fire system. JCI: done and ready for testing.	05/08/18	06/07/18
80	CU-1 & 2 / AHU-1 & 2	Condensing Units 1 & 2 did not turn on for DX cooling despite being commanded on by the operator; disconnects were on. Cycled power to the units but they did not turn on.	CC	Relay wiring fixed; contactor closes. CU-1&2 cooling verified.	05/09/18	05/30/18
81	CU-1 & 2	Units are located on the roof, north of mezzanine. Water was collecting by the units in the service access area (appears to be poor drainage).	GC	Reviewed by the roofing manufacturer and building envelope consultant and found to be acceptable.	05/09/18	05/11/18
82	Freeze Protection Mode AHU-1 / NR-4-1 (1.5-B[5])	AHU-1 ventilation dampers remained open despite OAT below 38°F. Equipment should stay on with ventilation dampers closed per sequence. Central Plant Status displayed "Low OA Temperature".	CC	Clarifying sequence with Metrix prior to making any modifications (6/11). -JCI RFI see related CIL#22 above. Programming revised per RFI(0736) response; ready for backcheck. Review in final graphics. Sequence 1.5 B.5. delted per RFI.	05/09/18	07/12/18

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83	AHU-4 Return Fan / AH-1-2	Building pressure was not displayed in DDC graphics or points list. Return fan should track supply fan to maintain building pressure per design sequence.	CC	AHU-4 does not include a building pressure sensor in control drawings. Sequence states, return fan tracks the supply fan on a linear scale as set by TAB... disregard "to maintain building pressure at 0.25 in wc" (from sequence) because building pressure sensor is not included.	05/09/18	05/14/18
84	AHU-4 Pressurization / AH-1-2	AHU-4 was found in DP alarm with the unit shut off two days in a row. AHU-4 was high DP was reset, and unit maintained 0.2 in wc which was above the 0.15 in wc setpoint and therefore entered and remained in alarm. Still in alarm 5/24.	CC	It sounds like fire smoke dampers may have been closed if unit was operating above static setpoint at minimum speed. Will re-check on 5/13.	05/09/18	05/31/18
85	AHU-4 Roof Hoods RH-1 & 2 and Louvers / AH-1-2	Roof hoods 1 & 2 were not shown on the AHU-4 graphics. Exhaust louvers were not shown on graphics.	CC	Done: RH-1 serves AHU-1&2, RH-2 serves AHU-3&4. Added to graphics.	05/09/18	05/30/18
86	AHU-4 Supply Air Temp SP / AH-1-2	AHU-4 SAT-ASP did not reset from 66°F for 5 minutes despite HT-DMD overridden to 3 and CL-DMD overridden to 0. SP should reset every 2 min per cooling demand per design sequence.	CC	Supply temperature reset fixed and ready for backcheck.	05/09/18	05/31/18

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87	AHU-7 FT readiness	AHU-7 was reported as ready for functional testing but the unit had outside air and return dampers overridden shut with the fans on. Room temperature and setpoint displayed ??? on graphics.	CC	JCI notified controls ready for CxA FT; phase loss shutdown to be witnessed 5/24. Room temperature integration fixed. See CIL 111.	05/09/18	05/31/18
88	AHU-9 FT readiness	AHU-9 was reported as ready for functional testing but the unit DDC status displayed EA and OA dampers proof (PF) closed with command (SS) open, the unit was in occupied mode but the fans were off. Only one alarm was active for OA damper (OD) despite the condition. RH-04 ED closed, OD2 closed (in alarm) and RH-04 0% open while unit was in occupied operation (5/24).	CC	JCI notified controls ready for CxA FT.	05/09/18	05/31/18
89	Lighting (LTG) Room 216	Space illumination was too dim; measured 15 fc work surface illumination at center of room, at least 35 fc expected.	EC	Ready per EC (6/19). Illuminaition verified increased.	05/17/18	06/20/18
90	LTG Room 220 / E6.22	One photocell was installed; two were shown on the plans.	EC	Ready per EC (6/19). Both zone dimming verified.	05/17/18	06/20/18
91	LTG Room 220 / E6.22	Occupancy sensors turned off the lights within 1-2 minutes; recommend match to typical configuration (10 minutes?).	EC	Ready per EC (6/19).	05/17/18	06/20/18

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92	LTG Room 261 / E6.23 / mech pent stair	Regular on/off switch was installed in stairway rather than occupancy sensor switch shown on plans. Normal on/off switch still installed 6/20. Normal on/off switch to remain.	EC	<del>Ready per EC (6/19).</del> Install OS switch 7/2.- Elcon Reported complete (7/10) OS switch does not make sense for mech. penthouse application. OS would not sense person up in the penthouse during work and would turn lights off while still occupied.	05/17/18	07/12/18
93	LTG Room 056 / West Entrance Vestibule / LTG in corridors by Commons/ Gym/ Courtyard	Photocell was not installed. This item was identified during Owner's Training as not ready (6/12). Integral photocell? Vestibule luminaires did not respond to flashlight light on integral photocells (small bulb right side of luminaire) nor being covered. No other photocell visible. Checked with Elcon, integral photocells were non-responsive.	EC	Ready per EC (6/19). Review luminaire O&M and/or check with manufacturer. Luminaires must be programmed by separate controller. -Elcon Programmed (7/10). Luminaires are programmed to very slowly (nearly imperceptibly) adjust dimming accordingly to photocell input.	05/17/18	07/12/18
94	LTG Room 178A / south restroom next to 101A	Lights turned on automatically with occupancy sensor. Lights should not turn on automatically per energy code; lights should turn off automatically for vacancy. Not ready 6/20; lights turned on automatically.	EC	<del>Ready per EC (6/19).</del> Fixed 6/26.	05/17/18	06/26/18
95	LTG Room 094A service yard / E6.13 / E0.03F	Lighting occupancy sensor was not installed. OS not installed 6/22.	EC	<del>Ready per EC (6/19).</del> Design does not call for integration of OS per E0.03F.	05/17/18	06/26/18

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96	LTG Room 055 commons vestibule	Lighting control photocell was not installed.	EC	Ready per EC (6/19). Verified installed. Programmed (integral photocell).	05/17/18	07/12/18
97	LTG Room 001	(2) gym luminaires were off in the south row. The SE luminaire did not turn on and does not appear to be dimmed for daylighting (6/20). All other gym luminaires switched on with OS (audible when walk beneath), this one did not.	EC	Verify luminaires are not off due to normal auto photocell control (6/19). One of the luminaires that was an issue turned on as triggered by OS (6/20). SE gym luminaire reported on in dark ambient light (integral photocell was holding light off) (6/26).-Elcon Glare in SE corner was holding luminaire off with daylighting control; operating correctly.	05/17/18	07/12/18

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98	AHU-9 fan speed / DSP minimum setpoint	DSP was in high alarm 0.24"/0.15". Fans did not decrease speed to maintain SP. Question for ME: Should the DSP minimum setpoint be increased? 0.15" setpoint seems to be too low. See CIL#34, 84, & 107.	CC / ME	DSP minimum setpoint can be increased. The range provided in the specification is adjustable and recommended starting point only. The duct static pressure setpoint should be coordinated with the balancer to ensure design airflow is being maintained at all times (low and high flow conditions). The low supply air static pressure alarm is specified to be 25% less than balanced setpoint, but is also adjustable. It appears the duct static pressure has not been correctly set if it is in high alarm at only 0.38". DSP min setpoints increased to 0.5".	05/24/18	05/31/18
99	Building Static Pressure / AHU ctrl	Reading was 'unreliable' in DDC.	CC	Sensor not applicable; not required per Contract Drawings.	05/24/18	05/30/18
100	AHU-9 heat recovery HX	HXOFD outside face damper did not modulate open for HX cooling despite RAT<OAT & DAT>SP, also did not open for HX heating when RAT>OAT (htg valve opened) HXOFD = 0%.	CC	Heating HX verified. Cooling HX when hydronic system in cooling.	05/24/18	05/31/18

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101	AHU-7 economizer mode	AHU-7 heating valve was opened 1% for heating while the unit was in economizer cooling mode, DAT was below setpoint and outside air damper was modulating open for cooling (OD 74%). OAT 64° and DAT 67°F	CC	Updated COV, status fixed.	05/24/18	05/31/18
102	AHU-7 mech htg	AHU-7 outside air damper remained open 52% and did not modulate to minimum position 14% despite unit operating in mechanical heating (OAT < RAT).	CC	Verified htg at min OSAD pos.	05/24/18	05/31/18
103	AHU-8 heat recovery HX	HXOFD-O was 0% despite RAT>OAT & call for heating, mechanical heating turned on before heat recovery was utilized.	CC	Verified, needed sufficient OAT-RAT differential.	05/24/18	05/31/18
104	AHU (with VAV) Unoccupied Heating/Cooling	JCI requested direction from ME: should the AHU run for unoccupied heating and cooling? Does one zone box in unocc heating or cooling turn on the AHU? (i.e. AHU-4 VAV-12)	ME / CC	Yes, AH-04 has to run for unoccupied heating/cooling as it is a conventionally designed overhead VAV system. No heat can effectively make its way into the space without airflow. Please command unit to engage unoccupied heating or cooling if two (adj) or more zones are not at unoccupied setpoint. Implemented: AHU on if (2) zones call unocc htg/clg.	05/24/18	06/11/18



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105	AHU-11 fan speed	Supply fan speed increased to 60Hz during heating mode. Fan operated at 30Hz during cooling mode. OAT was below DAT SP. Fan to run at fixed speed set by TAB per sequence. Running at 53 Hz fixed.	CC	Fixed per JCI.	05/24/18	06/06/18
106	AHU-12 heating fan speed	Supply fan speed increased to 65Hz during heating mode (mech htg valve 27%). Fan to run at fixed speed set by TAB per sequence. Running at fixed 65 Hz.	CC	Fixed per JCI.	05/24/18	06/06/18
107	AHU-13 duct pressure	Supply duct static pressure was 0.32"/0.15" and in alarm; fans running at minimum speed.	CC	Setpoint adjusted to 0.5".	05/24/18	06/06/18
108	Phase Loss Protection	Phase loss protection not witnessed 5/24 as scheduled. JCI to implement protection of non-VFD loads (i.e. UH).	CC / EC	Sample test run; see CIL#23 above.	05/24/18	06/01/18
109	AHU fan speed offsets / HX units AHU-3, 8, 9, 13	JCI coordinate with TAB to set fan speed offsets to maintain building pressure per sequence of operations. Then, CxA backcheck fan speeds.	CC / MC	Coordinating a meeting with TAB for week of 6/18. NEI/JCI coordinated on 6/20. CC implement offsets per TAB and then CxA verify. AHU EF speed offsets set with Neudorfer. All EF speeds set to a maximum of 80% except for AHU-3 which is 56%. Review in trends. Offsets verified in trends.	05/30/18	08/16/18

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110	AHU w/ HX	HR-DIFF EN SP heat recovery enable was set to 11°F and could not be changed. This differential seems to high. What is the minimum recommended differential (from return air temp to outside air temp) to recover heat?	CC / ME	Recommend 3°F differential to maximize heat recovery. - Metrix HR offsets have been adjusted from 11F to 3F as requested. -JCI	05/31/18	06/15/18
111	AHU-7 SF VFD (DDC)	SF VFD did not maintain speed (nor sync with DDC); fan speed ramped up and down between approx. 0-10 Hz unexpectedly. DDC status did not match (PF was off, then later showed 60 Hz SF FREQ). RM-SP was observed to intermittently flash "???" on DDC.	CC	Fixed per JCI (added wrap to CT for fan pickup) 6/1. JCI set TAB fixed speed for fan, fan proof was previously unreliable when fan speed was approximately 0% SC which prevented unit from operating normally (6/18).	05/31/18	06/18/18
112	RH-3, 4 & 5 / AHU-8, 9 (&13?)	JCI coordinate with ME regarding RH sequence of operation.	ME / CC	Open RH-3, 4, & 5 when OSA temp is 74F (adj) or above. Do not interlock with AHUs. -Metrix RH programming has been modified based on OA-T. Dampers added to floorplans.-JCI	05/31/18	06/14/18
113	VAV-43 OS	OS status has not changed for weeks; non-responsive.	CC	Fixed ready for backcheck.	06/01/18	06/15/18
114	RH-5 seal and RH-4	Visible (light/air) leakage around unit.	GC	Reported fixed RH-5 twice (recurring); ready for RH-5 check. Both are set, review envelope sealing. Caulk seal added, ready for backcheck (6/19). Roof hood sealed around units, small gaps visible through damper seal.	06/01/18	06/21/18

## Loyal Heights Elementary School Commissioning Issues Log

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
115	Basement/ Courtyard Existing Bldg. Door	Door was not sealed.	GC	Waiting on door threshold to arrive (6/19). Threshold installed.	06/01/18	06/22/18
116	VAV-10 CO2	Min and Max CO2 setpoints were offline. Could not test CO2 airflow control. Max setpoint was "???? ?????" (6/6), min and OA SP also "????" (6/11).	CC	<del>Fixed per JCI.</del> Graphic corrected 6/20.	06/01/18	06/22/18
117	VAVs (all)	Occupied heating sequence does not maintain DAT at -2°F from zone heating SP (displacement ventilation). VAV-22 sampled	CC	VAV Programming corrected 6/6.	05/31/18	06/11/18
118	VAV-27 CF / Rm 216	Ceiling fan switch did not operate with OAT>65°F.	EC / GC	Verified CF relay toggles on/off; troubleshoot wall switch, fan did not turn on when DDC was enabled. Reported fixed by Skanska (6/12).	05/31/18	06/15/18
119	VAV-31 OS / Small Group 209 / E6.21	Room does not have occupancy sensor, but setback for this VAV is controlled by Occ sensor. VAV will remain off to "vacant" room without an occ sensor. Lighting plan shows only OS wall switch no additional motion sensor for DDC integration. Provide additional motion sensor or remove occupancy interlock?	EC / EE / CC	JCI issued RFI006 (6/20). Occ sensor monitoring removed per RFI(0737) response.	05/31/18	06/27/18

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
120	VAV-32 Airflow	Sporadic air flow readings with shut and open damper (0 to 330cfm). Still an issue 6/15: airflow was 362 while damper was 0% open.	CC	<del>Ready to check.</del> Re-checked 6/20 and velocity pressure tube had come loose from the flow ring. Fixed and ready for backcheck.-JCI	05/31/18	06/22/18
121	VAV-02 CF / Art 116	No power to ceiling fans.	EC	Fixed (6/15).	06/01/18	06/15/18
122	VAV-03 CF / Art 115	Troubleshoot CF wiring from wall switch, fans ran despite DDC disable.	EC	Fixed per JCI.	06/01/18	06/15/18
123	VAV-04 CF / Rm 110	Troubleshoot CF wiring from wall switch, fans ran despite DDC disable.	EC	Fixed per JCI.	06/01/18	06/15/18
124	VAV-05 CF / Rm 109	Troubleshoot CF wiring from wall switch, fans ran despite DDC disable.	EC	Fixed per JCI.	06/01/18	06/15/18
125	VAV-11 OS / Small Group 114E	No occ sensors in room. Unit is programmed to receive input from occ sensor and remains in "unoccupied" mode.	CC/EC / EE	Occ sensor has been removed from database & graphic.	06/01/18	06/15/18
126	VAV-12 OS / TU-1-1	No occ sensors in room. Unit is programmed to receive input from occ sensor and remains in "occupied" mode. Occupancy sensor interlock not required.	CC/EC	Occ sensor has been removed from database & graphic.	06/01/18	06/15/18

Loyal Heights Elementary School  
**Commissioning Issues Log**

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
127	CF DDC	Verify CF enable when OAT > 65° per CCD 043. 230993: Revise paragraph 1.20.B.1 to "Disable ceiling fans when space is unoccupied." And revise paragraph 1.20.B.2 to "Disable ceiling fans when OAT is less than 65F (adj.)"	CC	Programming has been corrected and change will be noted in JCI as-builts.	06/05/18	06/11/18
128	AHU-13 RR damper	RR 275/276 damper status was "???" Close"	CC	Point was offline during VAV re-programming. Now back on-line.	06/06/18	06/21/18
129	DTW / WSHP / HWS / CW-1-2	Dual Temp hydronic system was enabled for heating despite OAT > 65°F. Current differential is set to 4°F recommend set to 2°F.	CC	Differential has been adjusted to 2F as discussed. Heating enabled below 65F and disabled above 67F.	06/06/18	06/18/18
130	AHU-3 Unoccupied Mode / AH-2-2	AHU-3 did not turn on in unoccupied mode despite two zones (VAV-1 & 2) calling for heating (zone temperatures simulated to 50°F which is below 55°F unocc htg SP). AHU-3 did not turn on in unoccupied mode despite two zones calling for cooling.	CC	Tested 6/7 and couldn't replicate issue. Set VAV-1 & 2 to 53F and heating demand requests were sent to AHU-3. AHU remained in unoccupied mode and ran the supply fan in full return mode.	06/06/18	06/11/18
131	DDC Graphics	Main page graphic displays "?? ?? ??" next to each Floor Plan link button.	CC	Fixed graphic.	06/06/18	06/14/18
132	SAC-06 DDC	"???" temperature reading on floor plan graphic.	CC	Fixed graphic link, sensor was working correctly.	06/06/18	06/07/18

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
133	EF-5 & 6	Not ready for commissioning.	CC	EF-5 ready; verified operational. Awaiting EF-6 fix (6/21). EF-6 relay replaced 6/22.	06/07/18	06/27/18
134	EF-4 / Library Toilet 175 by 114A	Fan and HOA (RIB) were inaccessible for service due to a wall in the way behind the access panel. Fan and damper passed automatic controls FT. Manual fan control could not be tested. EF-4 can be accessed by removing grill face above toilet Rm 175. Damper access from 114A access door.-Robison Fan control RIB is inaccessible even when grill face is removed in toilet room.	GC / ME	Review 7/12 with Jake of NWMA. Fan relay cannot be safely accessed as installed; fan operates normally under DDC control, manual on/off will not be tested.	06/07/18	07/12/18
135	AHU-3 Unoccupied Heating Initial SP	Initial unocc. heating setpoint was 72°F. Recommend set to 82°F per sequence (higher end of reset range). Reset range is 72-85. Initial unocc. Clg SP was 74°F (last value).	CC	Fixed.	06/11/18	06/11/18
136	CF / VAV-46 / Rm 226	DDC enabled CF but they did not turn on; black box control modules install was incomplete (covers off).	GC		05/30/18	06/14/18

Loyal Heights Elementary School  
**Commissioning Issues Log**

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
137	Common Envelope Damper / EF-1 & 2 / basement mech rm	Envelope exhaust air damper did not close when EF-1 & 2 and AHU-1 & 2 were off.	CC / CxA	The interlock for the envelope damper also references the associated occupancy modes. If fans are occupied but overridden off, the damper will remain open. Verified via trend damper closes at night when spaces are unoccupied; not an issue.	06/07/18	06/22/18
138	EF-1 damper	Fan started when EAD was approximately 10% open. Recommend increase delay timer before fan starts after damper opened to prevent fan motor from running with obstructed airway.	CC	There is no timing that can be adjusted but Foy will review wiring 6/22. Actuator end switch adjusted 6/22; ready for backcheck.	06/07/18	06/27/18
139	EF-1 temp alarm	Temperature was simulated to 130°F with no alarm.	CC	Alarm corrected 6/20. Verified fixed.	06/07/18	06/22/18
140	EF-2 damper	Fan started when EAD was approximately 10% open. Recommend increase delay timer before fan starts after damper opened to prevent fan motor from running with obstructed airway.	CC	There is no timing that can be adjusted but Foy will review wiring 6/22. Actuator end switch adjusted 6/22; ready for backcheck.	06/07/18	06/27/18
141	EF-2 temp alarm	Temperature was simulated to 120°F with no alarm.	CC	Alarm corrected 6/20. Verified fixed.	06/07/18	06/22/18

Loyal Heights Elementary School  
**Commissioning Issues Log**

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
142	EF-3 damper	Fan started when EAD was approximately 10% open. Recommend increase delay timer before fan starts after damper opened to prevent fan motor from running with obstructed airway.	CC	There is no timing that can be adjusted but Foy will review wiring 6/22. Actuator end switch adjusted 6/22; ready for backcheck.	06/07/18	06/27/18
143	EF-10 Dishwasher Fan	Could not control dishwasher to test fan enable.	CxA	Dishwasher does not control fan. Fan operates via wall switch next to dishwasher.	06/07/18	06/21/18
144	SAC-2, 3, 4, 5, 6 (All)	Controller indicated filter was dirty at each unit. Recommend clean filters and reset filter in room controller.	MC	Filters cleaned but controllers not yet reset (6/15). Reset and ready 6/26.	06/07/18	06/27/18
145	Ceiling Fans	CF were reported by JCI to not turn on (6/11): potential issue with fan hardware/wiring. Rooms: VAV-16, 19, 44. Cross referenced with CIL above to avoid duplicates. SKA requested DDC override to check Rm 224 CF.	GC	<del>VAV-44 fixed.</del> VAV-16 & 19 fixed (6/18). Ready for backcheck. VAV-16 & 19 verified fixed. VAV-44 CF in Rm 224 not fixed (6/22).	06/11/18	07/12/18
146	UH-10	Room heating setpoint was "?????" on graphics.	CC	Graphic point mapping fixed. Review in final graphics (6/27).	06/14/18	07/12/18



Loyal Heights Elementary School  
**Commissioning Issues Log**

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
147	EF-8	Exhaust air damper was not connected to the actuator. Actuator responded to commands but did not move damper blades. There appears to be no end switch installed; verify fan turns on after damper is fully open. Damper remained full open; check actuator-damper connection.	CC	<del>Fixed damper.</del> Check with JCI regarding end switch. Actuator end switch adjusted; ready for backcheck. Fan turned on at end of actuator action (end switch OK); however damper never closed when fan was off. JCI fix anticipated 7/6.-Robison Review 7/12 with JCI.	06/14/18	07/12/18
148	Irrigation Flow / MS-3-2	Cannot calculate current flow (for operator interface) from consumption pulse meter. Pinpoint which meters are installed (make/model).	CC / ME	The irrigation water meter displays the accumulated gallons as opposed to flow rate.-JCI Skanska to issue RFI (6/26)-JCI to implement approximate flow calculation reading from pulse meter.	06/15/18	07/12/18
149	Irrigation Layout / MS-3-2	Irrigation zone layout graphic not ready. Provide screen shots of final graphics for verification.	CC	JCI to implement 7/11, 7/13. Irrigation zone graphic completed and screenshot verified.	06/15/18	04/09/19

Loyal Heights Elementary School  
**Commissioning Issues Log**

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
150	LTG Old Schoolhouse Luminaires	(3?) dim schoolhouse luminaires in north corridor 2nd floor. Dimming correctly for daylighting (uneven corridor appearance)?  1 luminaire was off at the NE entry door and 2 luminaires at the bottom of the entry east stair were off.	EC	This is the correct operation of the daylighting zone dimming control. The dimming of the individual fixtures is based upon the natural light that is coming through the windows. All corridors/stairwells and entry areas will dim more especially on a sunny bright day. The uneven appearance is because only selected luminaires are within the daylight harvesting perimeter for energy savings conservation. -Elcon/LGNW Luminaires verified on in low light.	06/18/18	06/22/18
	AHU Cooling	AHU DTV opened for mechanical cooling despite the hydronic loop temperature above supply air temperature setpoint (simulated test). Recommend lockout AHU DTV cooling while DTW-S-T > AHU SAT-ASP.	CC	System will never operate in this condition because mechanical cooling is locked out for 4 hours after mechanical heating. Hydronic loop will have time to cool down first. Hydronic temp will be below setpoint in this condition.	06/18/18	06/18/18
151	Irrigation Leak Alarm	Irrigation leak alarm observed but not expected (Monday). No simulations were run earlier today.	CC	Based on the trends, the alarm hasn't re-occurred since Monday. I've increased the buffer after the main irrigation valve closes. No alarms since 6/19.	06/18/18	06/27/18

Loyal Heights Elementary School  
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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
152	Hydronic Cooling operation per zone heating demand (morning cool down)	<p>Mechanical cooling is locked out when a single zone calls for heat. Today outside air temperature was 79°F at 1PM and 1 zone was calling for heating, therefore cooling was locked out. Consider increasing the limit such that cooling will be enabled if 4 or less zones are calling for heating. JCI concurs with recommendation.</p> <p>Recommend implement selectable software override in DDC graphics to enable switch of Hydronic system into cooling if 4 (adj.) or less zones are calling for heating.</p> <p>Provide as-built documentation and screen shots of final BAS graphics showing implementation.</p>	ME	<p>We indicate to provide capability to select certain zones to ignore for the mechanical cooling run condition (230993 1.8.A.1.b.1)), but I'd be ok with having an adjustable number of zones ignored to go into cooling. That way we're not chasing those zones.-Metrix</p> <p>We fought this scenario just this week at another school with a changeover system. Yes, make is an adjustable number, put it on the graphic.</p> <p>We also need to ensure we have the same functionality during morning cooldown.- SPS Programmed; JCI to verify 7/12, JCI to program. Complete: heating request setpoint has been increased to 4 and is adjustable from graphic.-JCI (9/5) CxA to backcheck. Verified via screenshot of BAS.</p>	06/20/18	04/09/19
153	Irrigation Zone 1	Coverage was spotty, sprinklers were missing spots in lawn and areas of grass were not growing.	GC	<b>Alerted the landscaper to findings; they will be taken care of. The landscaper has a Maintenance Agreement with SPS to make adjustments that are required to maintain healthy grass for two years.-SKA</b>	06/15/18	06/22/18

Loyal Heights Elementary School  
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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
154	Irrigation Zone 2	Watering coverage was spotty; four sprinkler heads were clogged and were not delivering full spray. Recommend inspect sprinkler heads for plastic shavings disrupting flow.	GC	<b>see CIL#153 above</b>	06/15/18	06/22/18
155	LTG Exterior Covered Play area	(2) luminaires were missing from the NE corner of this area. Provide photo and/or statement of completion.	EC	To be installed last week of July.-Elcon Installed by Elcon (8/28). CxA backcheck. Verified installed and operational.	06/21/18	04/10/19
156	LTG Exterior C18 (DDC)	Control zone could not be identified. Commanded on/off and no exterior lights changed state.	CC	Wire had come loose at the relay. This contactor controls exterior lum. at the South entrance to the Commons vestibule. Fixed 6/22 -JCI	06/21/18	06/27/18
157	LTG Exterior luminaire control	(2) exterior luminaires just South outside the Commons vestibule and (2) luminaires outside the East entrance vestibule remained on while all exterior zones were commanded off. Are these (4) luminaires controlled by C18? (2) emergency luminaires outside East entrance remained on all the time.	CC / EC	(2) South of Commons vestibule controlled by C18 see CIL156 above. Design team will need to confirm which contactors control the luminaires. I don't see them referenced on the contract drawings.-JCI Elcon review luminaire wiring; ensure luminaires switch off with schedule and have emergency backup power. Corrected; switch leg wire added. East entrance luminaires controlled by C-04 verified.	06/21/18	07/12/18

## Loyal Heights Elementary School Commissioning Issues Log

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
158	LTG Exterior photocell	(2) exterior photocells mounted on West Mezzanine did not respond to being covered. DDC status remained 262 foot candles despite PC's covered for 5 minutes. When photocell setpoint was overridden, the photocell enable status turned on, but the exterior luminaires did not turn on.	CC	Photocell was working correctly however the incorrect reading was linked to the graphics. Corrected. Also, the photocell won't activate the exterior lights unless they are also scheduled on. -JCI One photocell was redundant.	06/21/18	06/22/18
159	Meter EM-5	No label for graphic. Meter serves Panel MA1; Located in Electrical Room 095; Category HVAC/Mechanical	CC	Graphic label for EM-5 corrected. Backcheck with final graphics.	06/21/18	07/12/18
160	Meter EM-15	Unable to locate meter and not in graphics.	<b>EC</b>	EM-15 isn't included in our control drawings and doesn't appear to be installed. I don't know the history of this item but will need to review with Elcon.-JCI Electric meter M-15 is for Panel CIA-this was an alternate that was not taken.	06/21/18	06/25/18
161	LTG NW entry	Old schoolhouse style luminaire was off. Area was dim, adjacent fixtures were off. Luminaire was not off due to OS or PC control.	EC	Inverter circuit breaker was off. Fixed.	06/22/18	06/26/18

Loyal Heights Elementary School  
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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
162	LTG Room 094A service yard / loading dock	Luminaires inside the loading bay (interior) zone were controlled by LT-C17 exterior relay. Recommend move this control relay to interior lighting graphics page. <del>Also see CIL#95, these luminaires should be controlled by occupancy sensor (closed).</del>	CC	DDC graphic fixed; backcheck on final graphics. LT C-20 interior verified.	06/21/18	07/12/18
163	LTG Rm 114 Library	(5) emergency luminaires remained off while all library switches were turned on.	EC	Inverter circuit breaker was off. Fixed.	06/21/18	06/26/18
164	AHU-8 EF VFD	EF VFD was not labelled.	CC	VFD label replaced.-JCI	06/22/18	07/12/18
165	AHU-11 (&12, 14) LLT	When low limit thermostat of AHU-11 was activated the common envelope damper closed which starved AHU-12 & 14 fans of outside air, the ductwork flexed in response to the vacuum pressure. Recommend envelope damper remains open in LLT. Provide documentation/statement of successfully executed test by CC.	CC	Fixed per JCI (6/22). Not ready 7/12. Wiring issue resolved (JCI). CxA to backcheck. Will test Wednesday 4/10 -JCI.	06/22/18	04/10/19
166	AHU-12 Duct insulation	Insulation near outside air damper on unit was peeling off; retape.	MC	Resolve this week (move to punchlist).	06/22/18	07/10/18
167	Meter EM-17	Electric meter 17 Boiler B01 was not listed in the DDC graphics.	CC	EM-17 not in Controls Drawings but added by JCI to graphics free of charge.	06/22/18	06/22/18

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Item No	System/ Reference	Comment	Action By	Resolution	Review Date	Closeout Date
168	AHU-7	Return fan (RF) was reported to have been faulted due to the fan spinning backwards.	MC / CC	JCI to investigate. Reported closed via email 7/8.	04/10/19	07/08/19
169	Commons Area Lighting Control	Program momentary switches to enable them to turn lights off as well as on in the Commons.	CC	JCI to implement	04/10/19	06/17/19
170	Gas Meter	Domestic hot water gas meter trend indicated zero consumption. Warranty issue.	CC	Meter installed 8/14/19. JCI confirmed operational recording pulses 8/22/19	04/10/19	08/22/19
171	Domestic Makeup Water Meter	Domestic water consumption was fixed at 41 gallons and no alarming was setup. System to alarm if any sustained usage between 12am and 4 am.	CC	JCI to fix. Reported closed via email 7/8.	04/10/19	07/08/19

Abbreviations: Owners Representative (OR), Architecture Representative (AR), Mechanical Engineer (ME), Electrical Engineer (EE), General Contractor (GC), Mechanical Contractor (MC), Electrical Contractor (EC), Controls Contractor (CC), Commissioning Agent (CxA)

# Loyal Heights Elementary School (LHES)

Final Commissioning (Cx) Report

**Seattle School District No. 1**

April 22<sup>nd</sup>, 2019

**SUBMITTED TO:**

Eric Becker  
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Appendix B – Executed Installation Checklists (IC)

Appendix C – Executed Functional Tests (FT)

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Appendix F – Field and Progress Reports, Cx Tracking, Controls Review

Appendix G – Meeting Records



## 1) Introduction

### A. Commissioning Process Overview

The commissioning (Cx) process is a requirement for Seattle School District No.1 *Loyal Heights Elementary School* project, and the agreed-upon scope of work between the Seattle School District and the Commissioning Provider (CxP), Wood Harbinger, Inc. to perform WSSP compliant commissioning services.

The Cx process is a proactive element that occurs during the design and construction of the project. The Cx process started with a design review of the ARS design drawings. This is followed by the Installation Checklists and onsite installation verification which documents the installation of the equipment, including factory start-up. This documentation is collected and constitutes a prerequisite to the functional testing phase. Functional testing is performed onsite in real time following Functional Test scripts which document the operation of the installed equipment on an individual and then system-wide level. Following the conclusion of successful Functional Testing, a performance trend log period is established to document normal system operation.

*Loyal Heights Elementary School* commissioning is complete. Mechanical, electrical, and controls installations are operational with no major functional issues remaining open. The controls contractor is actively working to resolve minor open warranty issues.

### B. Project Summary

The Loyal Heights Elementary School project included modernization of the existing 37,841 square foot building and construction of a 54,185 sq ft addition to increase school capacity to 660 students. The project included all new mechanical, electrical, and life safety systems.

The project included a sustainably designed mechanical solution intended to meet an Energy Use Index (EUI) target goal of 20kBtu/sf/year while appropriately balancing maintenance, budget, architectural and educational project goals. The project included a large ground loop heat exchanger with water to water heat pump to serve a two-pipe changeover hydronic loop for the facility supplemented by a small electric “pony” boiler to provide auxiliary heat on peak load days. Some air handling units include enthalpy heat recovery. The classrooms and office spaces include central dedicated outside air heat recovery units that serve Variable Air Volume (VAV) terminal units providing displacement ventilation for each space; such displacement zones heating source is supplemented by a wall mounted fin tube convector. A new



BAS provides control, scheduling and monitoring of the building mechanical, lighting and irrigation systems.

#### Systems Commissioned

1. Central building automation system (BAS) including front end and onsite controllers
2. All equipment of the heating, ventilating and air conditioning (HVAC) systems
3. Domestic HW heating equipment
4. Scheduled, occupancy sensor, and automatic dimming lighting controls
5. Controlled Receptacles
6. Irrigation controls
7. Utility metering

## **2) Design Review and Consultation**

The Commissioning Provider (CxP), Wood Harbinger, met with the District and the design team in the summer of 2016 to discuss the agency review set (ARS) and continue developing the project approach to provide a product consistent with District standards and District staff expectations.

The CxP reviewed the mechanical and electrical controls contractor submittal and provided comments, see Appendix F.

## **3) Verification of Installation**

Installation Checklist (IC) forms were originated by Wood Harbinger, based on the project documents related to the Cx subject matter. The IC volume was then submitted to Seattle School District who then provided to the prime contractor (Skanska Construction) for the administration and execution by the installers during the construction phase.

The commissioning provider visited the site during construction to witness equipment installation progress and startup activities. Field and progress reports are provided in Appendix F.

IC forms are complete and provided in Appendix B. Construction is complete.

## **4) Functional Testing (FT)**

The functional test forms were originated by Wood Harbinger, based on the projects documents related to the Cx subject matter. The testing forms are developed in detail to direct the inspection of the physical installation and verification of the controlled operations of the equipment, such as air handler(s), pumps, etc. The CxP used the



functional testing exercise to ensure that the installed systems operated in a complete, operable, and stable manner.

The FT verifications are executed by the CxP on-site in real time. This testing provides a validation of the controls installation and evaluates other aspects of operation, such as stability and start/stop behavior. This testing constitutes a pre-requisite to the performance trend log period, as functional testing frequently identifies issues to be corrected prior to trending. Issues found during FT are brought forward to the Commissioning Issues Log for action by the team.

Functional Testing is complete. The executed Functional Test forms are provided in Appendix C.

Commissioning meetings were held throughout the process, records are provided in Appendix G.

#### **5) Testing and Balancing (TAB) Review**

The CxP reviewed the Preliminary TAB report and provided comments. Comments were reviewed and resolved with the TAB contractor and Mechanical Engineer. The CxP backchecked 10% of TAB readings with the TAB contractor to verify compliance with the Final Report values and for verification of best practices.

The Cx TAB Review is provided in Appendix D.

#### **6) Owner Training and Record Documents**

Owner training occurred in June 2018. The commissioning team reviewed the training plan schedule and agendas to ensure that all commissioned systems were included as required by the project specifications. The CxP participated in Owner training of the commissioned systems to help ensure the full value of training was delivered. Record documents including red-line drawings were gathered by the contractors and Operations and Maintenance (O&M) manuals were provided to Seattle School District. The Seattle School District mechanical coordinator reviewed the final O&M and systems manual assembled by the General Contractor (Skanska).

#### **7) Performance Trend Log Results / Seasonal Warm-up**

Graphical representation of the performance period trend log data is presented and analyzed in the trend log report. This data was provided to the Commissioning Authority by the controls contractor (JCI) and then converted to graphical format by Wood Harbinger. These graphs are then analyzed for proper system operation according to the submitted sequence of operation. The first trend log period was conducted in August 2018 for a



period of 3 days. An extended winter seasonal monitoring and trend period was then be conducted from October through March. The trend report data analysis and reports are provided in Appendix E.

During this past peak winter season, the HVAC system did not successfully warm-up the first-floor administration and library areas to their space temperature setpoints in time for occupancy within the two-hour warm-up period per the design sequence of operation. Cold complaints were reported by staff and the Cx trend analysis revealed that space temperature setpoints were not maintained.

The staff responded to the cold work spaces by utilizing electric space heaters. Continued use of electric heaters would result in a significant energy cost for the school district. Resolution of this issue is beyond the commissioning contract scope, but the commissioning team has discussed the possible solutions noted:

- Optimize morning warm-up sequence to achieve setpoint by occupancy, consider increasing the warmup time to three hours (4:00 AM start for 7:00 AM occupancy) by starting the HVAC system earlier.
- Install ceiling fans or other displacement fans to prevent stratification in the library.
- Align staff operating procedures regarding access doors. Ensure doors to corridors/common spaces, vestibules, and outside are kept closed.
- Install hydronic fin tube radiators in the admin area (high cost).

## **8) Value of Commissioning Process**

The commissioning process for Seattle School District *Loyal Heights Elementary School* project proved its value by providing oversight for the construction and integration of new building systems. Beginning with the design review and concluding with the successful operation of the equipment, the commissioning process structured the methodical performance quality control and acceptance of the project design and installation. The commissioning process helped to facilitate communication between the Owner and the design team, to establish and implement the controls sequence of operation, and to evaluate set points for equipment operation. The occupant comfort, energy consumption, and equipment operation are all improved through the efforts and effects of the commissioning process.

## **9) Outstanding Issue Resolution/Conclusions**

Commissioning is complete; all commissioning issues are resolved. The few remaining items on the issues log are identified as warranty issues and are on resolution paths.

A log of commissioning issues and resolutions is provided in Appendix A.

**Seattle School District #1  
Board Resolution**

**Resolution No. 2019/20-5**



**A RESOLUTION** of the Board of Directors of Seattle School District No. 1, King County, Seattle, Washington accepting the Building Commissioning Report by Wood Harbinger for the BEX IV / BTA III Program, Loyal Heights Elementary School Project Modernization and Addition project as part of the Office of Superintendent of Public Instruction (OSPI) Form -D11 Application to Release Retainage Bond.

**WHEREAS**, The Seattle School District Board of Directors has received the building commission report from Wood Harbinger regarding the Loyal Heights Elementary School Modernization and Addition project; and

**WHEREAS**, it has been determined that the commissioning report is complete and the building is operating as the commissioning report states; and

**NOW THEREFORE, BE IT**

**RESOLVED**, that the Seattle School Board of Directors, in accordance with the provisions in WAC 392-344-165, accepts the commissioning report by Wood Harbinger for the BEX IV Program, Loyal Heights Elementary School Modernization and Addition Project as part of OSPI D-11 Application to Release Retainage Bond; and therefore be it further

**RESOLVED**, that duly certified copies of this resolution shall be presented to the Office of Superintendent of Public Instruction.

ADOPTED this \_\_\_\_\_ day of \_\_\_\_\_, 2019

\_\_\_\_\_  
Leslie Harris, President

\_\_\_\_\_  
Rick Burke, Vice President

\_\_\_\_\_  
Zachary DeWolf, Member-at-Large

\_\_\_\_\_  
Jill Geary, Member

\_\_\_\_\_  
Eden Mack, Member

\_\_\_\_\_  
Scott Pinkham, Member

ATTEST: \_\_\_\_\_  
Denise Juneau, Superintendent  
Secretary, Board of Directors  
Seattle School District No. 1  
King County, WA