PACIFIC RIM SCHOOL DISTRICT
FINANCE, OPERATIONS & ASSETS COMMITTEE MEETING AGENDA

Tuesday, January 6, 2026, 3:30 p.m.
Administration Office Board Office, Port Alberni

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10. Next Meeting

The next Finance, Operations and Assets Meeting will be held on April 7, 2025 at3:30pm, in the Administration Office Board Room.

11. Adjournment

The meeting was adjourned at TIME.

PACIFIC RIM SCHOOL DISTRICT
FINANCE, OPERATIONS & ASSETS COMMITTEE MEETING
INFORMATION SHEET

Date: January 6, 2026
To: Finance, Operations & Assets Committee
From: Peter Klaver, Superintendent
Subject: 2025/26 Amended Annual Budget

Background:

A preliminary 2025/26 budget was presented by the Secretary-Treasurer and approved by the Board in June 2025. Since that time, the budget has been further reviewed and refined to better align with updated information and anticipated expenditures.

Over recent years, expenditures have increased in line with operational pressures and service demands and were managed through the use of accumulated surplus. As a result, the 2024/25 actual budget substantially utilized all available surplus funds, limiting the district's ability to continue this approach in future years.

In response, staff have developed a series of cost-saving measures designed to bring ongoing expenditures within the expected revenues as shown in the 2025/26 Amended Annual Budget. These measures include staff reductions, staff re-assignments, reductions in excluded travel, and reductions to departmental budgets. Further details will be presented at the Special Public Board meeting scheduled for January 7, 2026.

PACIFIC RIM SCHOOL DISTRICT
FINANCE AND OPERATIONS COMMITTEE
INFORMATION SHEET

Date: January 6, 2026
To: Finance and Operations Committee
From: James Messenger – Assistant Superintendent
Subject: Enrollment Projections Process

Purpose:

Enrollment projections are a critical component of budget development, staffing allocations, and long-range facilities planning. While projections are monitored throughout the year, this period (December–February) is particularly important as the district prepares its February enrolment estimate submission to the Ministry of Education and Child Care.

As per section 106.3(2) of the *School Act*, a Board of Education must submit to the Minister on or before February 15 of each year an estimate of the number of students who may be enrolled in educational programs provided by the board in the next school year. These enrolment estimates are used by the Ministry to facilitate the development of preliminary operating grant estimates, which for the 2026–27 school year will be announced on or before March 15, 2026.

Annual Timeline and Key Activities:

December – January: Internal Review and School-Level Input

- Enrollment projections are reviewed continuously; however, formal planning for the upcoming school year begins in early January.

- At the January 8th Principals Meeting, school administrators will be asked to review projected numbers and provide insight into expected school-level enrollment changes (e.g., student movement, local knowledge of family inflow/outflow, impact of independent school /immersion enrolment).

Initial Projection Method

- Projections for returning students are built by advancing current enrollment one grade forward.

- Kindergarten projections are developed using Baragar Systems, supplemented by historic kindergarten intake patterns and local registrations.

Feeder School Data

For the transition into ADSS, the District gathers Grade 7 enrollment projections from: John Paul II Catholic School, Haa-Huu-Payak School, École des Grands-Cèdres

Adjustments

Small adjustments may be made based on:
- Local knowledge of family mobility

- Unique circumstances affecting specific schools or communities
- Identified trends flagged by school administrators

Unique Needs Funding

The Inclusive Education Department separately analyzes, and forecasts changes related to unique student needs funding.

Baragar Systems – How Projections are Generated:

Pacific Rim School District uses Baragar Systems, a demographic forecasting tool used widely across BC. Baragar's model incorporates:

- Cohort-survival analysis
- Local birth data
- Historic enrolment patterns
- Census and demographic trends
- Municipal housing development forecasts
- Student migration and mobility patterns
- Real-time recalibration using actual September 1701 data and local economic indicators

Harder to Forecast Student Categories

Some program areas show greater fluctuation:
- Alternate Education
- Online Learning
- Continuing Education

How Enrollment Projections Affect Pacific Rim School District's Operating Grant

A. Preliminary Grant (March)
- Based on February projected FTE
- Used for budget development and staffing preparation
- Not final

B. Final Grant (September)
Actual funding is determined by:
- September 1701 headcount
- February and May counts for eligible categories

If actual enrolment is higher than projected → additional funding.
If enrolment is lower than projected → Ministry recovers funding.

Key Takeaway

Enrollment projections are a continuous, multi-source process that significantly influence district funding, staffing, and long-range planning.

PACIFIC RIM SCHOOL DISTRICT
FINANCE AND OPERATIONS COMMITTEE MEETING
INFORMATION SHEET

Date: 6-Jan-2026
To: Finance And Operations Committee
From: Alex Taylor, Director of Operations
Subject: ADSS Bridge Update
Attachments: N/A

Background-The Pacific Rim School District is closing public access to a pedestrian bridge located on Alberni District Secondary School's (ADSS) grounds after an engineering assessment identified significant structural deterioration in one of its main support beams.

Penny Lane bridge, located in the forested area at the corner of 10th Avenue and Roger Street, was acquired several years ago from the City of Port Alberni as part of a land exchange. It is now in the latter half of its service life, with early indications suggesting that a targeted repair or partial replacement may not be cost-effective or practical given the bridge's age, location and current condition.

The school district has consulted with the City of Port Alberni to ensure that the closure or removal does not adversely affect the City's neighboring property and has confirmed that the City does not have an ongoing need for the bridge. While long-term options are being reviewed, signage and barriers have been installed at both approaches to restrict access, and the area will remain closed until further notice.

The District appreciates the public's cooperation and understanding as it takes these precautionary measures to ensure community safety.

Information-Assistant Director Jeff Goode and I have started two project proposals and business cases for this bridge.

1. Safe removal and replacement with a like structure
2. Safe removal and replacement with a wooded path and simple culverts

The start of this project was to get recent survey results for any Civil work required. This survey result is attached on the last page of this info sheet and shows that at least half of the wooden bridge is on City of Port Alberni Property.

In an email to the City on Dec 8th, 2025, we communicated our recent survey findings and requested the city come to the table to work collaboratively on this project. In response back, Wayne Mihalics, Manager of Parks, believes a simple path would be the best option as a bridge will be costly and attract encampments of the vulnerable population in the area, which has been a reoccurring issue.

Jeff has reached out to a local contractor for price estimates; as shown below. Please note that this estimate does not include all costs such as structural engineering, internal trades etc. You can likely expect a 10-20% additional cost for these project aspects.

COASTAL BRIDGE & CONSTRUCTION LTD.
1080 B Franklin River Rd, PORT ALBERNI, BC V9Y 7M7
250.723.0233 WWW.COASTALBRIDGE.NET

Budgetary Estimate

December 10, 2025

School District 70 – Pacific Rim
Operations & Maintenance
4690 Roger Street, Port Alberni, BC V9Y 3Z4

Attn: Jeff Goode A/Assistant Director of Operations
Jgoode1@sd70.bc.ca

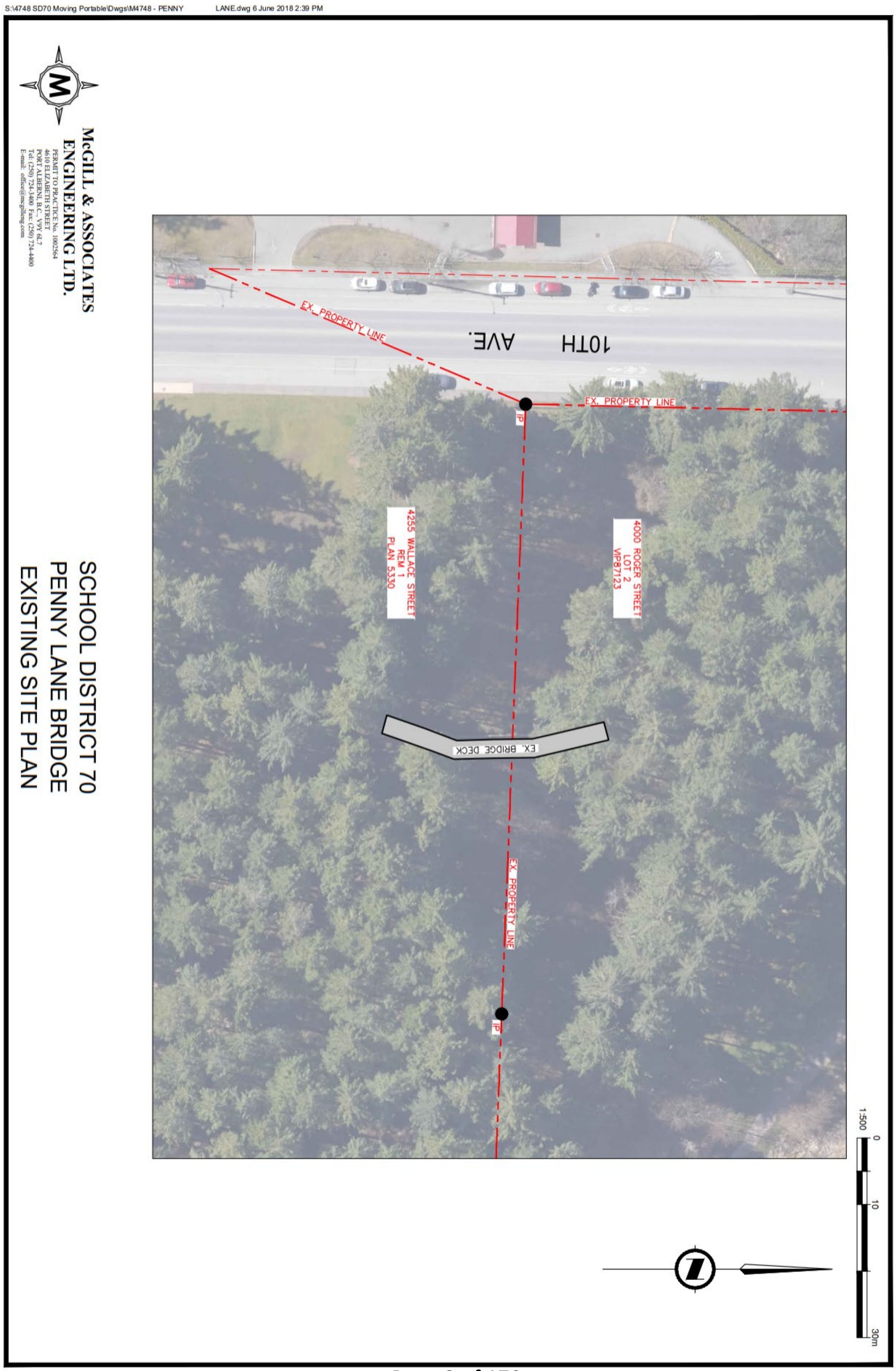
Rebuild in Wood Using Existing Gabion Basket Supports	**$ 210,925**
Aggregate Approaches with 40' Span Bridge - Wood	**$ 125,885**
Aggregate Approaches with 40' Span Bridge - Aluminum	**$ 108,630**
Aggregate Base with Culverts	**$ 95,760**

- **GST to be added**
- **All pricing subject to market price fluctuations**

COASTAL GROUP OF COMPANIES
CROSS OVER WITH COASTAL

Coastal Bridge & Construction Ltd (Coastal) is pleased to provide School District 70 – Pacific Rim (SD70) budgetary estimates for the removal of the existing wooden bridge structure on the Penny Lane Trail adjacent to Alberni District Secondary School with various replacement options.

Please review the following criteria for assumptions we have made to complete the proposed budgetary pricing estimates.



S:\4748 SD70 Moving Portable\Dwgs\M4748 - PENNY LANE.dwg 6 June 2018 2:39 PM
McGILL & ASSOCIATES ENGINEERING LTD.
PERMIT TO PRACTICE No. 1002564
4610 ELIZABETH STREET
PORT ALBERNI, B.C. V9Y 6L7
SCHOOL DISTRICT 70
PENNY LANE BRIDGE
EXISTING SITE PLAN
10TH AVE.
EX. PROPERTY LINE
EX. PROPERTY LINE
IP
4255 WALLACE STREET
REM 1
PLAN 5330
4000 ROGER STREET
LOT 2
VIP87123
EX. BRIDGE DECK
EX. PROPERTY LINE
IP
1:500
0
10
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PACIFIC RIM SCHOOL DISTRICT
FINANCE AND OPERATIONS COMMITTEE MEETING
INFORMATION SHEET

Date: 6-Jan-2026
To: Finance And Operations Committee
From: Alex Taylor, Director of Operations
Subject: Wood Elementary School Child Care Centre New Build
Attachments: N/A

Background

ChildCare BC New Spaces Fund Project 12825, located at 1-4111 Wood Avenue, Port Alberni, BC, was set for substantial completion Sept 2025.

Information

Through four separate deficiency walkthroughs, many Prime Contractor and sub-trade deficiencies were found. These deficiencies, which are being actioned and addressed in accordance to the Canadian Stipulated Price Contract (CCDC2), are still being actioned and completed. Request to the City of Port Alberni for Occupancy status was made on 2-Dec-2025. A walkthrough performed on Dec 9th yielded no concerns and Occupancy Status was granted on Dec 15th.

The project did encounter some change orders for unforeseeable conditions in the build and project scope. The final contract price to the prime contractor was increased to address these change orders. Director Charbonneau and I are working on finalizing the project's remaining tasks prior to Child Care Contractor Occupancy.

PACIFIC RIM SCHOOL DISTRICT
FINANCE AND OPERATIONS COMMITTEE MEETING
INFORMATION SHEET

Date: 6-Jan-2026
To: Finance and Operations Committee
From: Alex Taylor, Acting Director of Operations
Subject: Prism- Energy Audits
Attachments: 5-Energy Audits

Background-BC Hydro's Continuous Optimization (C-Op) program helps large commercial buildings (40,000 ft² and ≥2 GWh annual energy use) reduce operating costs and carbon emissions by funding low-cost tuning and calibration of existing HVAC and other energy-intensive systems through retro- or re-commissioning. Building owners engage approved service providers to investigate system inefficiencies (with 75 % of funding provided upfront) and implement prioritized improvements (final 25 % upon completion), resulting in optimized energy performance, enhanced occupant comfort, and extended equipment lifespan.

Early in 2024 PRISM Engineering consulted with the Pacific Rim School District (PRSD) to apply to BC Hydro's C-OP program and conduct these engineer reviews. December 2024 PRSD signed on with PRISM to conduct the energy audits at 5 of our largest schools that would qualify for this BC Hydro C-OP project.

Over the course of 2025, PRISM studied our energy and fuel usage at these 5 schools. Evaluating our Direct Digital Controls (DDC) through our hot seasons and cold seasons.

Information-On Dec 9th, 2025, PRISM finalized the reports as seen in the following attached documents. The below table summarizes the potential year over year savings we could realize if/when we implement their recommendations.

School	Potential Savings ($/year)	Estimated GHG Reduction (tCO2e/yr)
Alberni District Secondary School	$22,755	10.7
Alberni Elementary School	$2,396	2.4
Eric J Dunn Elementary	$4,978	12.7
Tsuma-as Elementary	$4,877	8.6
Ucluelet Secondary	$15,369	16.1

The next step for the PRSD is to implement the recommended changes. This will need to be done strategically, leaning on our internal resources where possible, but will also require contracted DDC programmers. The cost for this programming and implementing these changes was requested to the Ministry of Education and Childcare on the Sept 30th Minor Capital Submission under the Carbon Neutral Capital Program for $100,000.00.

Continuous Optimization Investigation Report

School District 70 | Alberni District Secondary School
4000 Roger St, Port Alberni, BC V9Y 7S6

BCH Project #: BCH-11740
Prism Project #: 2025021

Prism ENGINEERING
Changing systems for a better world
320 – 3605 Gilmore Way
Burnaby, BC V5G 4X5
tel: 604 298 4858 | 1.888.724.1715
prismengineering.com

Version	Updated on	Phase
v0.1	December 9, 2025	Investigation Draft

Limits of Liability

This report was prepared by Prism Engineering Limited for School District 70. The material in it reflects our professional judgement considering the information available to us at the time of preparation. The savings calculations are estimates of savings potential and are not guaranteed. The impact of building changes, building use changes, new equipment, additional computers, and weather needs to be considered when evaluating savings. Without express written permission, any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Prism Engineering Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Document Authentication

<table>
<tr><td colspan="2">Prepared By:</td><td colspan="2">Checked / Reviewed By:</td></tr>
<tr><td>Name:</td><td>Ross Hilliard, P.Eng</td><td>Name:</td><td>Tim Aske, P.Eng.</td></tr>
<tr><td>Title:</td><td>Energy Management Engineer</td><td>Title:</td><td>Associate, Senior Energy Engineer</td></tr>
<tr><td>Date:</td><td>December 5, 2025</td><td>Date:</td><td>December 8, 2025</td></tr>
<tr><td colspan="4">Professional of Record</td></tr>
<tr><td>Name:</td><td>Ross Hilliard, P.Eng</td><td colspan="2" rowspan="3">Prism Engineering Ltd Permit to Practice # BC: 1000889</td></tr>
<tr><td>Title:</td><td>Energy Management Engineer</td></tr>
<tr><td>Discipline / Responsibility</td><td>Mechanical</td></tr>
</table>

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1.0 Introduction

Prism Engineering is pleased to present the results of the Investigation Phase that was conducted as part of BC Hydro's Continuous Optimization for Commercial Buildings Program for Alberni Elementary School. The objective of an Investigation is to identify deficiencies and improvements in the operation of a facility's mechanical equipment, lighting, and related controls, and determine opportunities for corrective action that reduce energy consumption and preserve the indoor environmental quality.

This document is a complete record of the work performed at this facility, including the in-depth investigation of the building systems and the implementation of selected measures to optimize building performance.

The Recommissioning Investigation Report provides an overview of the recommendations for the implementation of measures. This information is not considered a specification or detailed sequence of operations. The intent is to provide an overview of the recommendation that can be built upon during the implementation phase as part of any detailed design that may be required. Certain measures may require further investigation and specification for the correct implementation by the owner or the DDC contractor.

Nine recommended retrofits were identified as a part of this investigation. The proposed measures will be reviewed in a meeting with School District 70 and Prism Engineering representatives to determine which measures will be implemented.

Recommended retrofits for implementation include:

- Measure 1: Update the Holiday Calendar
- Measure 2: Rectify 24/7 AHU and Cooling Plant Operation During Summer Months
- Measure 3: Reduce AHU-1, AHU-2, and AHU-6 Static Air Pressure Setpoint During
- Measure 4: Close AHU OADs During Heating Optimum Start Mode
- Measure 5: Disable DHW Pre-Heat Pumps During the Cooling Season
- Measure 6: Disable P3/P4 During the Cooling Season when AHUs are in Free Cooling Mode
- Measure 7: Increase the Hot Water Temperature Setpoint During Unoccupied Heating Mode
- Measure 8: Maintain a Minimum Hot Water Supply Temperature During Occupied Hours in the Heating Season
- Measure 9: WSHP Demand Response

These measures are presented in the Investigation Summary Table (see Appendix A).

Other measures that were identified but not selected as part of this C. Op. project are outlined in section 6.0.

2.0 Project Overview

Project Information

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RCx Project File #	**BCH-11740**		
Date of Workbook Update	05-Dec-2025		
Organization	School District 70		
Building Name	Alberni District Secondary School		
Building Type	Large School		
Location (City)	Port Alberni, B.C.		
Owner Contact	Alex Taylor		
Investigation Phase start date	09-Sep-2025		
Participated in previous BCH RCx program?	No		
Previous RCx File #			
Previous RCx completion date			

Building Information

Facility Area (ft2)	133,698		
Annual elec consumption (kWh)	1,349,935	10.1	kWh/ft^2
Annual elec costs ($)	$ 148,723	$ 0.11	Avg. $/kWh
Fuel type	Natural Gas		
Annual fuel consumption (GJ)	647	1.3	$ekWh/ft^2$
Annual fuel cost ($)	$ 8,273	$ 12.8	Avg. $/GJ
Total GHG emissions (tCO2e/yr)	46		
Total Energy Cost	$ 156,996	$ 1.17	$\$/ft^2$
Energy Use Intensity (ekWh/ft2)	11.4		
Year for energy data above	2024		

3.0 Savings Summary

Savings Summary	Previous, still working	New + Previous, rectify + Previous, documented					
		Identified		Selected		Implemented	
# of measures	0	9		9		0	
	Re-claim Savings	Total Savings	% Savings	Total Savings	% Savings	Total Savings	% Savings
Electrical savings (kWh/yr)	-	102,716	7.6%	102,716	7.6%	-	0.0%
Fuel savings (GJ/yr)	-	191	29.6%	191	29.6%	-	0.0%
Cost savings ($)	$ -	$ 22,755	14.5%	$ 22,755	14.5%	$ -	0.0%
Estimated GHG reduction (tCO2e/yr)	-	10.7	23.2%	10.7	23.2%	-	0.0%
# of Abandoned measures	**0**						

4.0 Brief Description of Existing System

This section contains a brief description of the existing HVAC and Controls system. The information is intended to provide a general overview only.

4.1 Facility Description

Alberni District Secondary School was originally constructed in 2012. The building is two stories above grade and has a floor area of 133,698 ft².

4.2 Mechanical Systems Description

4.2.1 Heating & Cooling Systems

Heating and cooling are provided by ground source water-to-water heat pumps (WSHP) and condensing boilers.

In heating mode, the system serves terminal units including air handling unit switchover coils, re-heat coils, radiant floor heating, hydronic unit heaters, domestic hot water (DHW) pre-heat, and water-to-air heat pumps.

In cooling mode, chilled water is provided to air handling unit switchover coils, and heat is recovered from the geothermal loop for DHW pre-heat.

A review of 2024 utility bill data indicates that 92% of space heating is done by the ground-source heat pumps, with the remaining 8% provided by the boilers.

Table 1: Summary of Hydronic Boilers

Tag	Quantity	Make/Model	Heating Output (MBH)	Notes
B-1 – 3	3	Viessman Vitodens 200 WB2 15-60	214 (each)	Gas fired condensing boilers.

Table 2: Sumary of Water Source Heat Pumps

Tag	Quantity	Make/Model	Cooling Output (MBH)	Heating Output (MBH)	Notes
WSHP-1	1	WFI EW360FULL	420	374	2 scroll compressors. Recovers heat from AHU-5 and AHU-6 exhaust air.
WSHP-2 -6	5	WFI EW540FULL	541.5	564.5	2 scroll compressors.

Table 3: Summary of Hydronic Heating/Cooling Distribution Pumps

Tag	Quantity	Description	Power (hp)	Flow (L/s)	Notes
P-1 & P-2	2	Geo-Thermal Loop	20	27.8	Variable speed. Duty/standby.
P-3 & P-4	2	Main Heating & Cooling Water Supply	20	48.3	Variable speed. Duty/standby.

Tag	Quantity	Description	Power (hp)	Flow (L/s)	Notes
P-7A & P-7B	2	Water-to-Air Heat Pump Circulation (Geo-Thermal Side)	1.5	4.55	Constant speed. Duty/Standby.
P-8A & P-8B	2	Boiler Loop Primary Circulation	0.75	2.5	Variable speed. Duty/Standby.
P-9	1	WSHP-1 Circ. Pump (Building Side)	1.5	5.7	Constand speed.
P-10 – 14 (5 units)	5	WSHP-2 – 6 Circ. Pumps (Building Side)	1.5	8.5	Constand speed.
P-15 – 19 (5 units)	5	WSHP-2 – 6 Circ. Pumps (Geo-Thermal Side)	1.5	8.5	Constand speed.
CP-1 & CP-2	2	AHU-5 & AHU-6 Heat Recovery Coil Circulation	3	90	Constand speed.

4.2.2 Ventilation

Ventilation is provided to the building by nine air handling units.

There are 36 fractional horsepower exhaust fans serving washrooms, workshop classrooms, custodian rooms, and other spaces throughout the building, most of which are controlled by the DDC control system.

Table 4: Summary of Air Handling Units

Tag	Service Area	Power (HP)	Flow (L/s)	Notes
AHU-1	Gymnasiums	20 (supply) 10 (return)	9,000 (supply) 9,000 (return)	CO_2 sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Constant flow system with re-heat.
AHU-2	Theatre	20 (supply) 10 (return)	8,000 (supply) 8,000 (return)	CO_2 sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Constant flow system.

Tag	Service Area	Power (HP)	Flow (L/s)	Notes
AHU-3	Lower Floor C – Multi-Purpose Student Commons Main Floor C – Library, Main Entrance	20 (supply) 10 (return)	7,500 (supply) 7,385 (return)	Serving downstream variable air volume boxes. CO_2 sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Downstream hydronic re-heats in VAV boxes.
AHU-4	Main Floor Admin	5 (supply) 2 (return)	2,000 (supply) 2,000 (return)	Serving downstream variable air volume boxes. CO_2 and occupancy sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Downstream hydronic re-heats in VAV boxes.
AHU-5	Lower Floor A & B – Classrooms on North Side of Corridor Main Floor A & B - Classrooms on North Side of Corridor	40 (supply) 15 (return)	15,455 (supply) 13,120 (return)	CO_2 and occupancy sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Exhaust heat recovery coil. Constant flow system with re-heat.
AHU-6	Lower Floor A & B – Classrooms on South Side of Corridor Main Floor A & B - Classrooms on South Side of Corridor	30 (supply) 15 (return)	12,967 (supply) 11,740 (return)	CO_2 and occupancy sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Exhaust heat recovery coil. Constant flow system with re-heat.
AHU-7	Lower Floor A - Workshops	15 (supply) 5 (return)	7,000 (supply) 4,120 (return)	Serving downstream variable air volume boxes. CO_2 and occupancy sensor control. Variable speed fans.

Tag	Service Area	Power (HP)	Flow (L/s)	Notes
				Mixed-air unit. Hydronic heating/cooling switch-over coil. Downstream hydronic re-heats in VAV boxes.
AHU-8	Lower Floor D – Dressing Rooms, Offices, Weights Room Main Floor D – First Nations Classrooms	15 (supply) 5 (return)	5,000 (supply) 3,770 (return)	Serving downstream variable air volume boxes. CO_2 and occupancy sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Downstream hydronic re-heats in VAV boxes.
AHU-9	Lower Floor D – Drama Instruction Room & Meeting Room	15 (supply) 5 (return)	4,000 (supply) 3,400 (return)	Serving downstream variable air volume boxes. CO_2 and occupancy sensor control. Variable speed fans. Mixed-air unit. Hydronic heating/cooling switch-over coil. Downstream hydronic re-heats in VAV boxes.

4.2.3 Domestic Hot Water System

Domestic hot water (DHW) is generated by two banks of instantaneous hot water heaters and re-circulated by pumps RCP-1 and RCP-2.

Each DHW system is connected to the geo-thermal loop by a double wall plate heat exchanger for DHW pre-heat when the mechanical plant is in cooling mode.

Table 5: Summary of DHW Heaters

Tag	Quantity	Make/Model	Heating Input (BTU)	Notes
DHW 1 – 9 (System B)	9	Navien NR-240	17,000 – 199,000 (each)	Instantaneous hot water heaters. Includes a DHW pre-heat heat exchanger that recovers heat from the ground loop during cooling mode. Located in Mechanical Room B236.
DHW 10 – 14 (System D)	5	Navien NR-240	17,000 – 199,000 (each)	Instantaneous hot water heaters.

Tag	Quantity	Make/Model	Heating Input (BTU)	Notes
				Includes a DHW pre-heat heat exchanger that recovers heat from the ground loop during warm weather periods. Located in Custodial Room D214.

Table 6: Summary of DHW System Pumps

Tag	Quantity	Description	Power (hp)	Flow (L/s)	Notes
RCP-1 – 2	2	DHW Recirculation Pumps	Frac.	0.44	Constant speed.
P-5A & P-5B	2	DHW Pre-Heat Loop Pump (Geo-Thermal Side)	5	21.45	Variable speed. Duty/Standby. Transfer heat from the ground-loop to DHW system when central plant is in cooling mode.
P-6A & P-6B	2	DHW Pre-Heat Loop Pump (Building Side)	10	21.45	Variable speed. Duty/Standby. Transfer heat from the ground-loop to DHW system when central plant is in cooling mode.

4.2.4 Others

Heating and cooling is provided to several spaces throughout the building by water-to-air heat pumps, as summarized in Table 7.

Table 7: Summary of Water-to-Air Heat Pumps

Tag	Service Area	Make/Model	Cooling Output (MBH)	Notes
HP-1	Main Elec. Room B112	McQuay CCH060	55.3	Scroll compressor.
HP-2	Data Room C107	McQuay CCH036	36.1	Scroll compressor.
HP-3	Data Room A213	McQuay CCH019	18.1	Reciprocating compressor.
HP-4	Dimmer Room D213	McQuay CCH019	18.1	Reciprocating compressor
HP-5	Mech. Room B111	McQuay CCH024	23.9	Reciprocating compressor
HP-6	Elec. Closet A210	McQuay CCH036	36.1	Scroll compressor.

Tag	Service Area	Make/Model	Cooling Output (MBH)	Notes
HP-7	Mech. Room B236	McQuay CCH036	36.1	Scroll compressor.
HP-8	Elec. Room D211	McQuay CCH048	46	Scroll compressor.

4.2.5 Controls System (includes Lighting Controls if Applicable)

The mechanical systems in this building are controlled by a Direct Digital Control (DDC) Building Automation System (BAS) that is original to the building (2012). The system is manufactured by Reliable Controls.

5.0 Measures Selected for Implementation

This section provides an overview of new measures identified in this Round of Investigation, including recommendations for implementation, and updates post implementation.

For each measure, costs, savings and payback calculations can be referenced in the *Investigation Summary Table* (see Appendix A).

5.1 Measure 1: Update the Holiday Calendar

5.1.1 Description of Finding

Each air handling unit (AHU) is controlled by a schedule setup on the building automation system (BAS). Most AHU schedules are currently set to 8:00 AM – 4:00 PM, Monday to Friday.

There is an existing holiday HVAC calendar setup on the BAS; however, no statutory holidays or school break periods are set, other than the summer break in July and August. Figure 1 shows a screenshot of the existing holiday HVAC calendar for 2025.

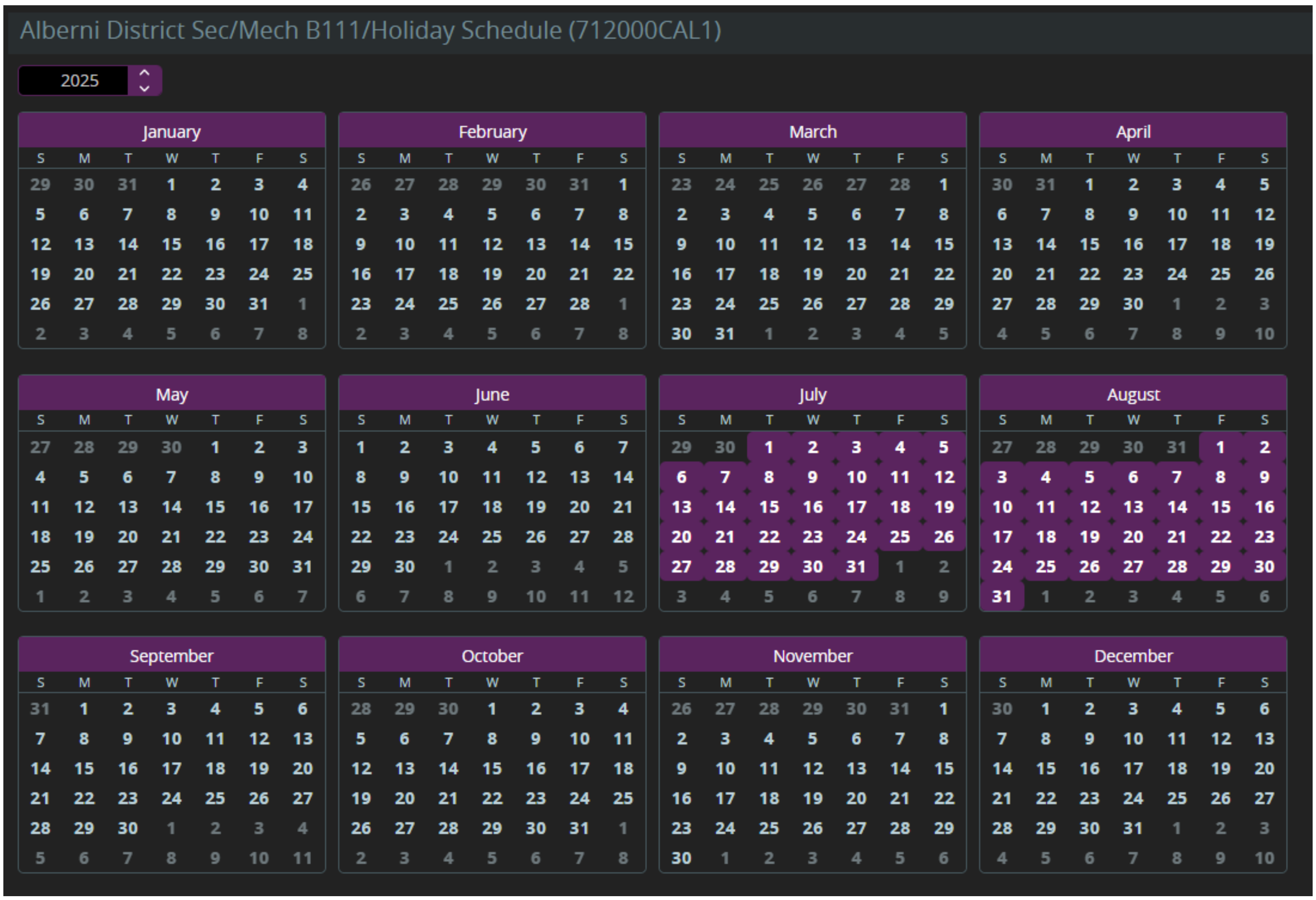

Figure 1: Screenshot of Holiday HVAC Schedule Set on the BAS

5.1.2 Measure Description

Update the holiday HVAC calendar such that HVAC systems do not run in occupied mode on statutory holidays and during school break periods.

Savings assume all AHUs and the central plant can run in unoccupied mode on statutory holidays, during the March break period, and the winter break period.

5.2 Measure 2: Rectify 24/7 AHU and Cooling Plant Operation During Summer Months

5.2.1 Description of Finding

AHU-2, AHU-3, and the cooling plant were enabled 24/7 from July 9, 2025, to July 25, 2025. It is assumed that this operation was caused by manual overrides on the DDC system.

A trend log of the AHU-2 supply fan enable and variable frequency drive (VFD) speed over this period is shown in Figure 2. A trend log of the P-3/4 distribution pump VFD speeds is shown in Figure 3. Both trend logs show 24/7 operation during this period.

Figure 4 shows a plot of 5-minute electricity interval data for ADSS from July 1 – July 25, 2025. On average, there was a 90-kW increase in electricity baseload during this period compared to the rest of the summer.

It is understood that janitorial staff are typically in the school during the summer break period from approximately 7:00 AM to 3:00 PM. Outside of hours when janitorial staff are in the building, HVAC systems can be scheduled off.

Figure 2: DDC Trend Log of AHU-2 Enable and Supply Fan VFD Speed in July 2025

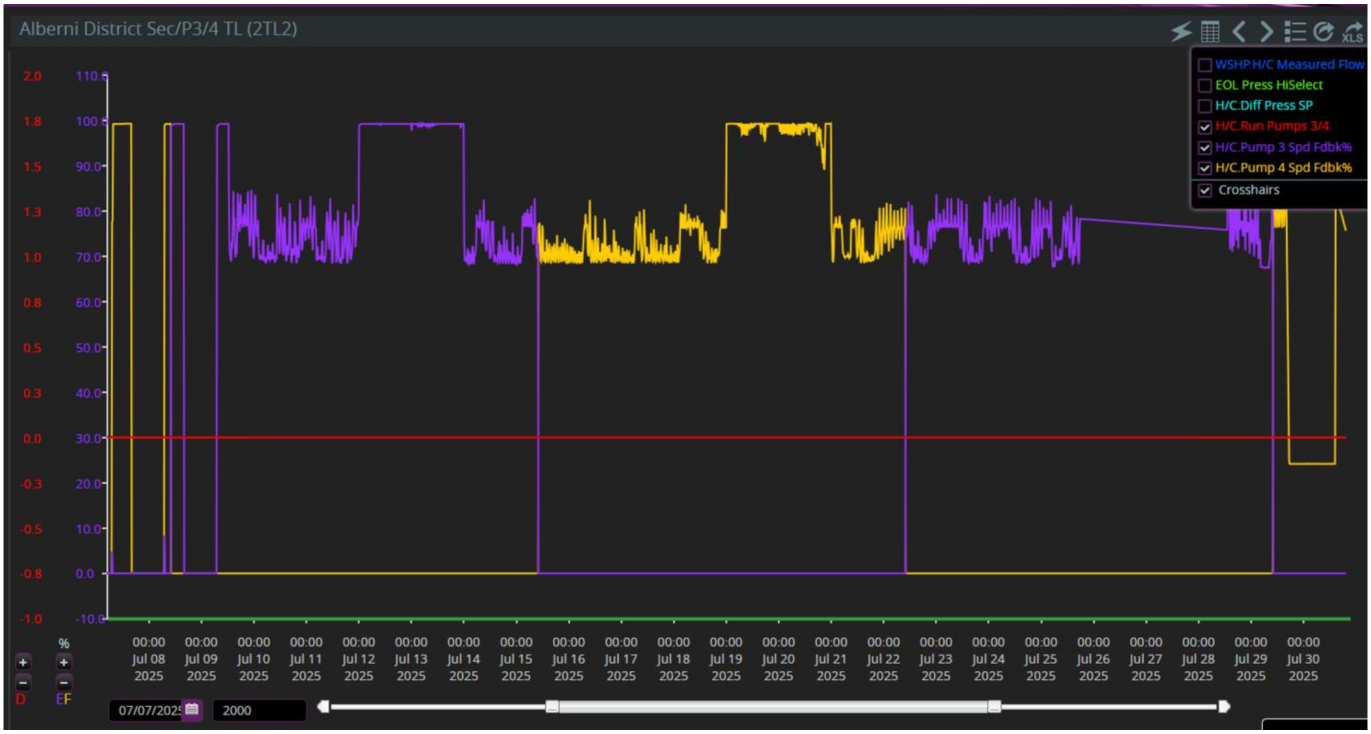

Figure 3: DDC Trend Log of P-3 and P-4 Distribution Pumps in July 2025

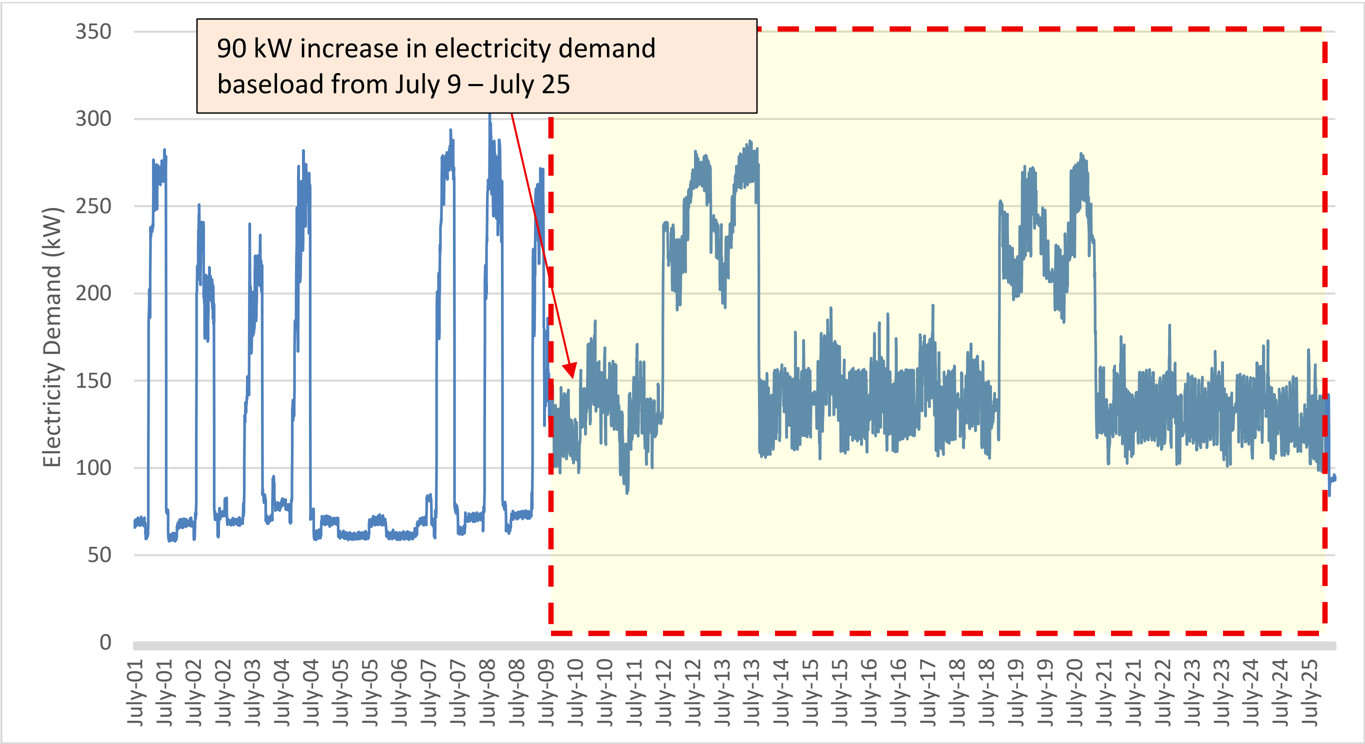

Figure 4: Plot of 5-minute Electricity Interval Data for ADSS from July 1 – July 25, 2025, Highlighting High Baseload Period from July 9 - July 25

5.2.2 Measure Description

Rectify 24/7 operation of HVAC systems during the summer break period.

5.3 Measure 3: Reduce AHU-1, AHU-2, and AHU-6 Static Air Pressure Setpoint During Low Heating and Cooling Demand Periods

5.3.1 Description of Finding

AHU-1, AHU-2, and AHU-6 supply fan VFD speeds control to maintain a constant static pressure setpoint. There are no variable air volume boxes (VAVs) downstream of these units and the static pressure in each system is mostly constant. The AHU-1 system volume changes when there is no occupancy sensed in downstream zones, allowing re-heat dampers to close until the space becomes occupied again. A review of DDC trend log data shows that these three AHUs always operate at VFD speeds of 85% or higher, with minimal modulation, indicating that the system volume is mostly constant.

Design supply flow for these units is based on design heating and cooling requirements, which are rarely needed. While constant volume systems lack zone controls to tailor air supply to specific zones, total supply air flow can be partially reduced most of the time without impacting air distribution.

Minimum ventilation requirements can be maintained by increasing the minimum AHU OAD positions proportionally to the decrease in fan speed.

The relationship between fan power and % flow is shown graphically in Figure 5. A 10% reduction in flow from 90% to 80% will result in a 21% reduction in fan power.

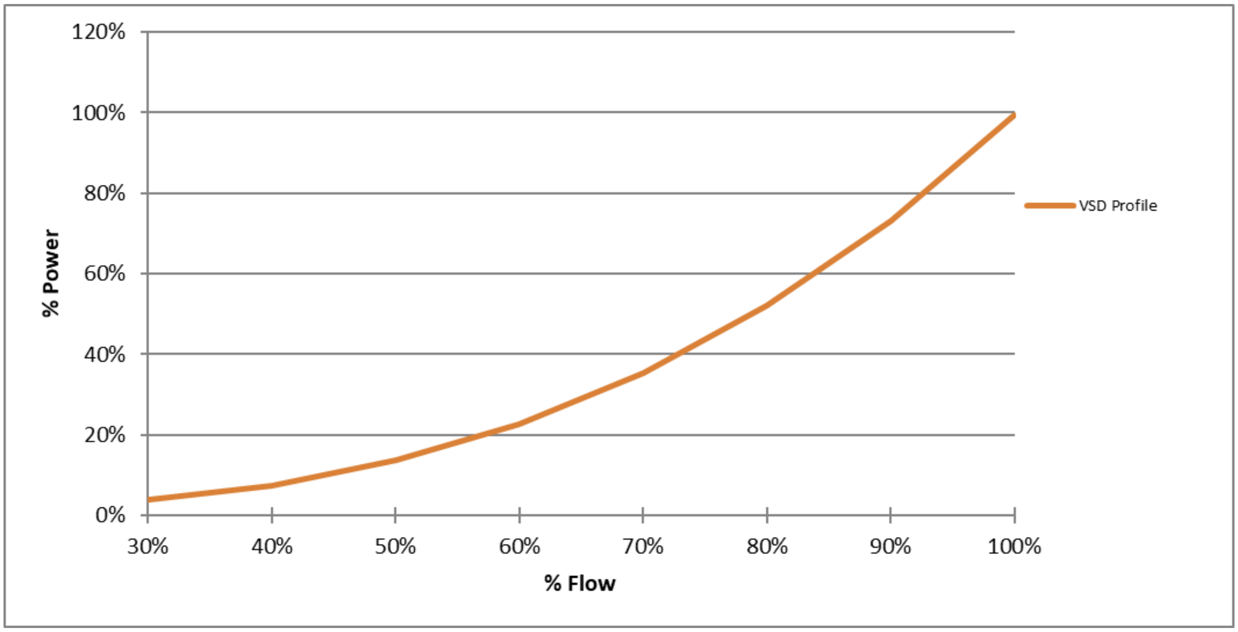

Figure 5: Fan Power vs. Flow VFD Profile

5.3.2 Measure Description

Reduce the AHU-1, AHU-2, and AHU-6 static air pressure setpoints during low demand periods. VFD speeds should not drop below 70%.

Program the OAD position for each AHU to increase proportionally to the reduction in fan speed such that minimum ventilation rates are maintained.

5.4 Measure 4: Close AHU OADs During Heating Optimum Start Mode

5.4.1 Description of Finding

All AHUs were found to be operating in heating optimum start (OS) mode with their outdoor air dampers (OAD) open to their minimum positions.

Figure 6 shows a DDC trend log of the AHU-5 OAD over a seven-day period in January 2025, highlighting instances where AHU-5 was running in heating OS mode. The OAD was open to its minimum position of 10% during all heating OS operation over this review period.

During unoccupied hours, outdoor air ventilation is not required, and OADs can be closed, reducing the ventilation heating load.

Figure 6: Trend Log Data of the AHU-5 Outdoor Air Damper from January 5 - 11, 2025, Highlighting Heating Optimum Start Operation

5.4.2 Measure Description

Program AHU outdoor air dampers closed during heating OS mode.

5.5 Measure 5: Disable DHW Pre-Heat Pumps During the Cooling Season

5.5.1 Description of Finding

When the heating/cooling plant is operating in cooling mode, pumps P-5A/B and P-6A/B are enabled, and extract heat from the ground loop for DHW pre-heat. The DHW pre-heat heat exchangers (HEX) are each equipped with a control valve that can enable/disable DHW pre-heat. The control valves remain closed if the pre-heat water temperature is below a minimum setpoint. According to the as-built control drawings, the minimum supply water temperature for DHW pre-heat to be enabled during the cooling season is 32°C.

Trend log data shows that the DHW system pre-heat control valves were closed for the entire cooling season in 2025, as shown in Figure 7, indicating that the DHW pre-heat water temperature never exceeded 32°C.

Meanwhile, P-5A/B and P-6A/B were enabled anytime the WSHPs were active in cooling mode, as shown in Figure 8.

Since the DHW pre-heat temperature never exceeds 32°C when the central plant is operating in cooling mode, and the DHW supply temperature is 60°C, the DHW system cannot recover much heat from the ground loop. It is recommended that the DHW pre-heat pumps P-5A/B and P-6A/B be disabled year-round to reduce electricity use and peak electricity demand in the cooling season.

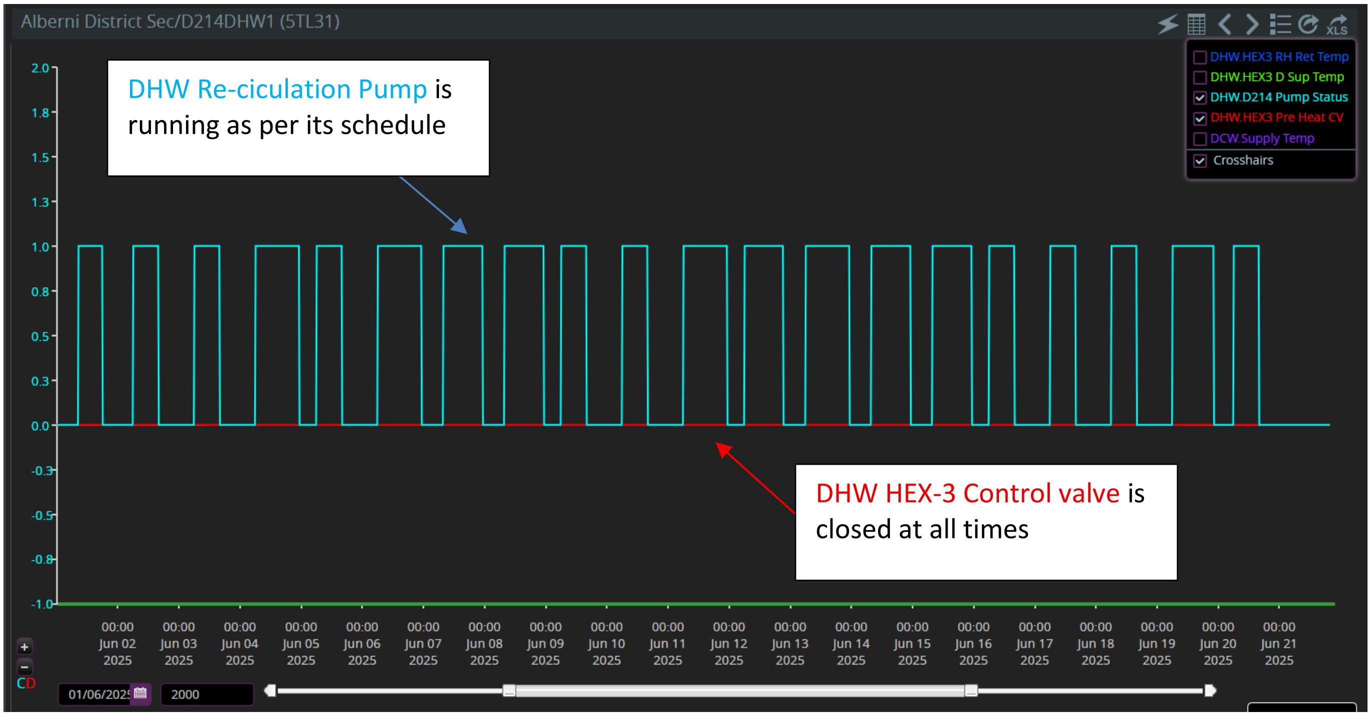

Figure 7: Trend Log of DHW-D Re-circulation Pump Status and HEX Pre-Heat Control Valve in June 2025

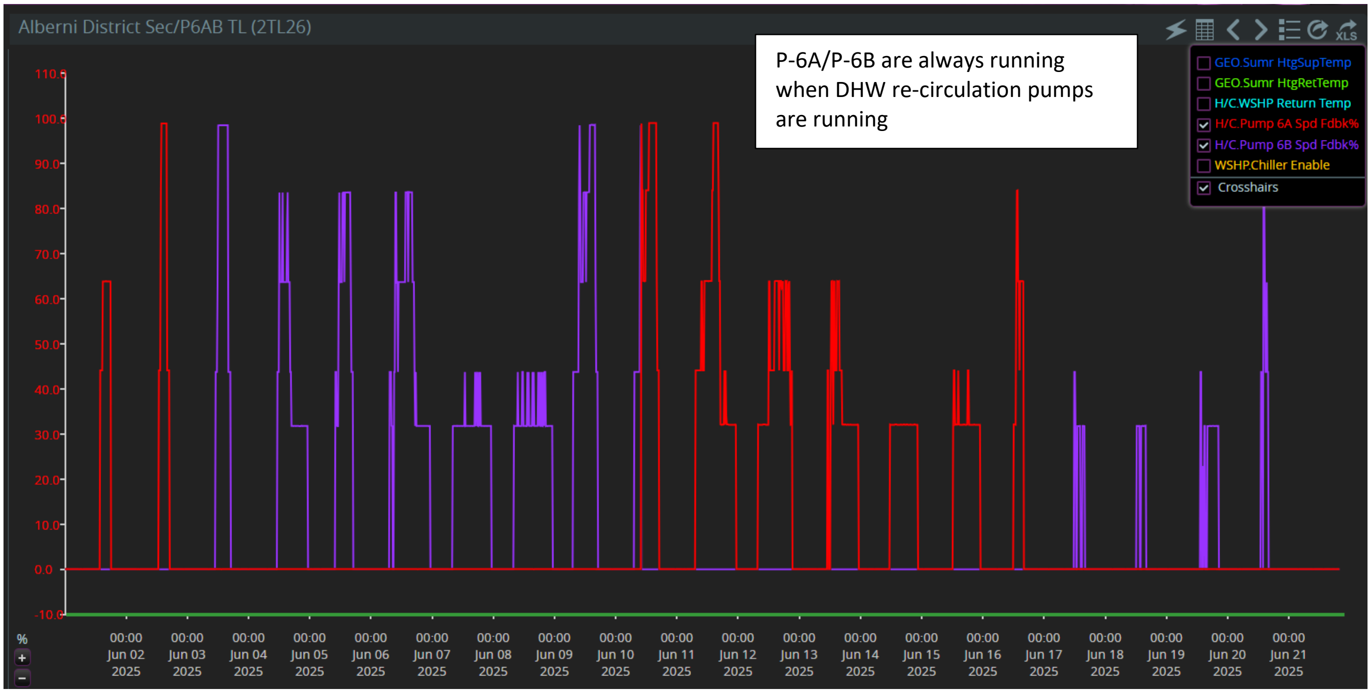

Figure 8: Trend Log of DHW Pre-Heat Pumps 6A/B VFD Speeds in June 2025

5.5.2 Measure Description

Disable the DHW pre-heat pumps P-5A/B and P-6A/B during the cooling season.

5.6 Measure 6: Disable P3/P4 During the Cooling Season when AHUs are in Free Cooling Mode

5.6.1 Description of Finding

The WSHPs are enabled in cooling mode during the cooling season, as set by the cooling season calendar on the BAS, when outdoor air temperature (OAT) is greater than 18°C. When OAT is less than 18°C during the cooling season, the WSHPs are disabled, and all AHUs operate in free cooling mode.

Figure 9 shows a trend log of the WSHP supply water temperature (SWT) and return water temperature (RWT) on a day in September 2025. The trend log data shows a sharp drop in the WSHP SWT when OAT increases above 18°C, indicating that the WSHPs are enabled to provide cooling. Prior to this drop in SWT, the WSHPs are disabled, and any active AHUs are operating in free cooling mode.

Figure 10 shows a trend log of the P-3 and P-4 distribution pump VFD speeds during the same period in September 2025. In the cooling season, one of P-3 and P-4 is always running during occupied hours and if there are units operating in unoccupied or optimum start modes. P-3 and P-4 provide chilled water distribution to air handling unit switchover coils.

During the cooling season, when the AHUs are operating in free cooling mode, and the WSHPs are disabled, P-3 and P-4 can be disabled.

Figure 9: Trend Log of the WSHP Supply Water Temperature (BLUE), Return Water Temperature (GREEN), Supply Water Temperature Setpoint (PURPLE), and Outdoor Air Temperature (YELLOW) on September 23, 2025

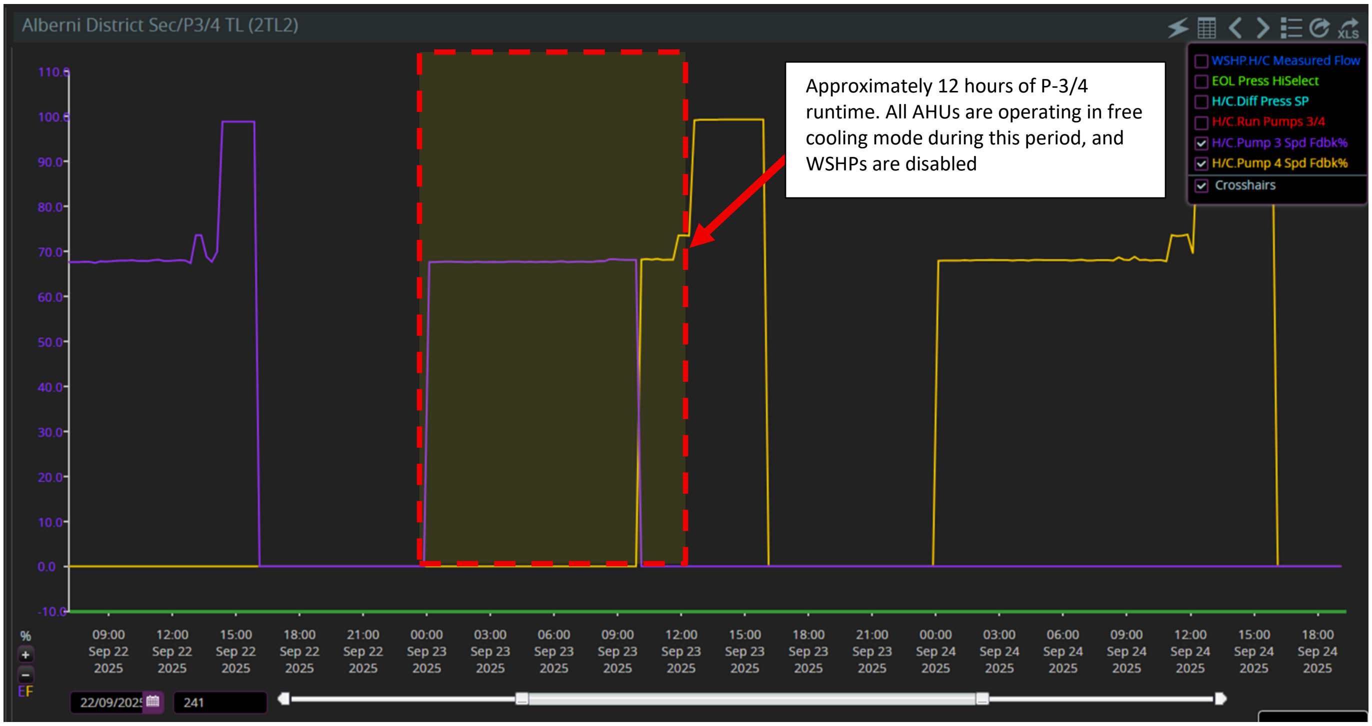

Figure 10: Trend Log of P-3 and P-4 Distribution Pump VFD Speeds on September 23, 2025

5.6.2 Measure Description

Disable P-3 and P-4 during the cooling season when the WSHPs are disabled

5.7 Measure 7: Increase the Hot Water Temperature Setpoint During Unoccupied Heating Mode

5.7.1 Description of Finding

The hot water supply temperature (HWST) setpoint is calculated based on the building's heating demand. During periods of low heating demand, including unoccupied hours, the HWST was observed to be as low as 18°C.

Figure 11 shows a trend log of the HWST in October and November 2025. The HWST typically increases in the morning when all AHUs are enabled in occupied mode. After a short period, the HWST decreases, and remains below 25°C until the following morning.

P-3 and P-4 are enabled during the heating season when terminal units (AHUs and unit heaters) are operating in occupied mode, unoccupied heating mode, and heating optimum start mode. P-3 and P-4 were found to be running close to 24/7 during the heating season, as shown in Figure 12, indicating that there are terminal units that are unable to meet their unoccupied zone temperature setpoint.

Maintaining a higher HWST setpoint during unoccupied heating mode will allow zones to heat up quickly, allowing terminal units and distribution pumps to cycle off when all zones have met their unoccupied heating setpoint. This will result in a reduction in AHU and distribution run-time during unoccupied hours.

Figure 11: Trend Log of Hot Water Supply and Return Temperatures During a Period in October and November 2025

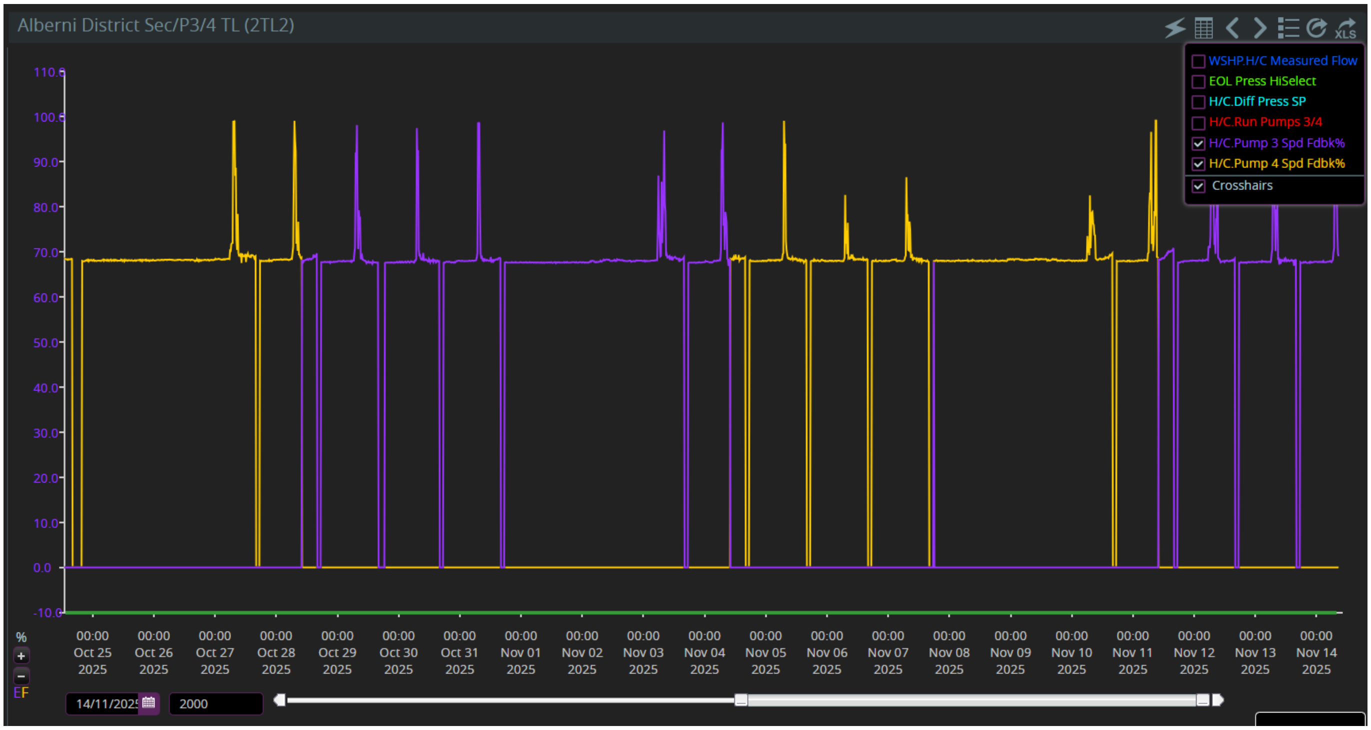

Figure 12: Trend Log of P-3 and P-4 VFD Speeds in October and November 2025

5.7.2 Measure Description

Increase the WSHP hot water supply temperature setpoint during night setback operation.

5.8 Measure 8: Maintain a Minimum Hot Water Supply Temperature During Occupied Hours in the Heating Season

5.8.1 Description of Finding

The central plant HWST setpoint is controlled based on heating demand.

In the winter, the HWST setpoint was typically found to decrease significantly in the middle of occupied hours after the building has sufficiently warmed up, causing the WSHPs to disable. After a few hours, the hot water loop cools significantly and can no longer meet the building's heating demand, resulting in a sudden increase to the HWST setpoint. The sudden jump in HWST setpoint causes all WSHPs and the boiler system to enable at the same time to increase the hot water loop temperature, resulting in a spike in electricity demand and natural gas use.

An example of the observed heating plant operation is shown in Figure 13.

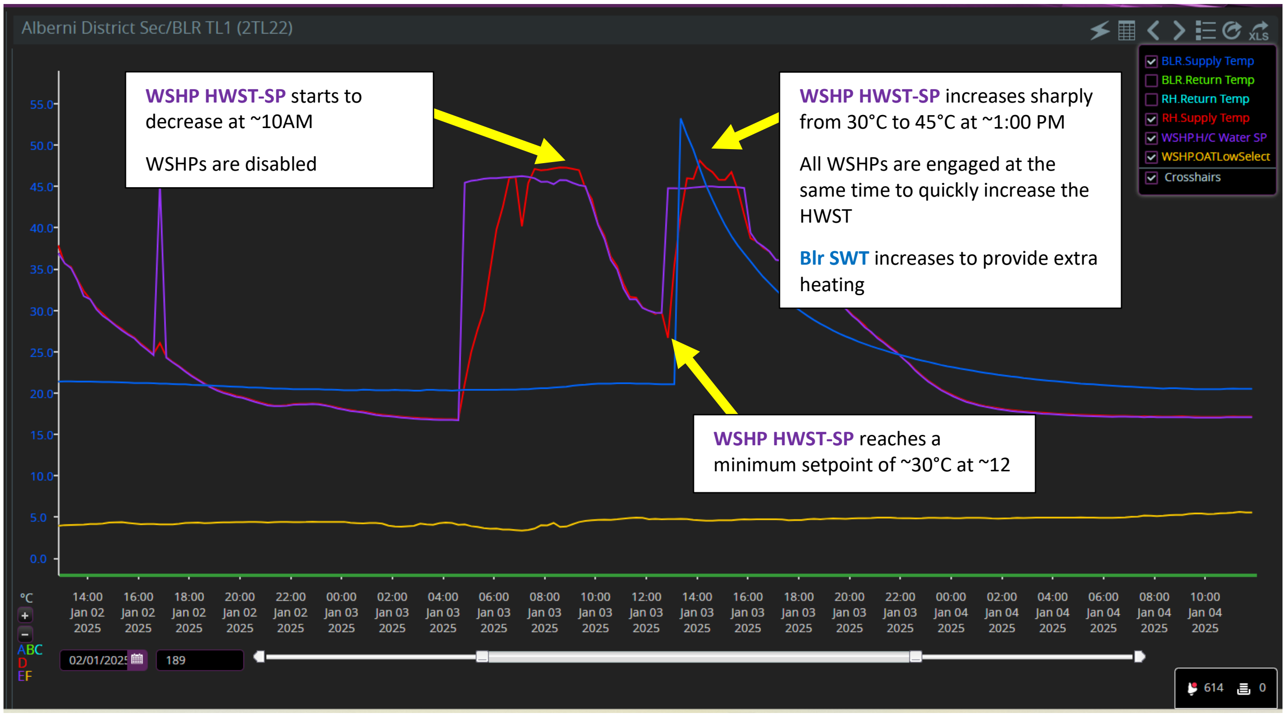

Figure 13: Trend Log of Boiler Supply Water Temperature and Re-heat Supply Water Temperature on January 3, 2025

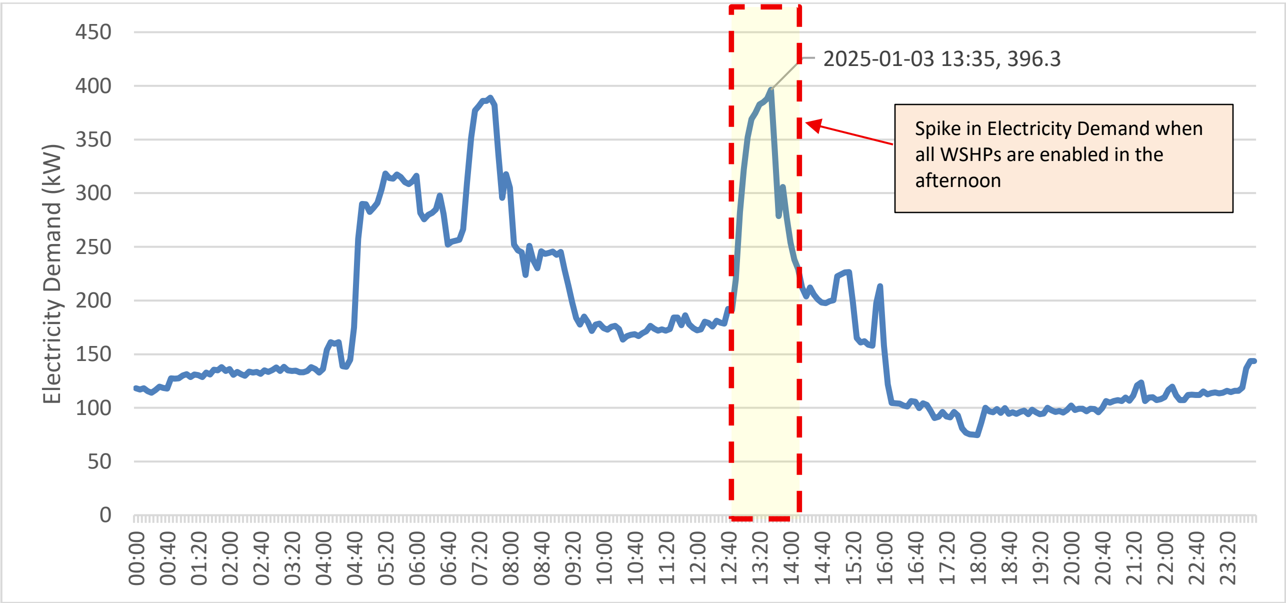

Figure 14: Electricity Interval Data on January 3, 2025, Highlighting a Spike in Electricity Demand at 1:35 PM when WSHPs are Enabled

5.8.2 Measure Description

Maintain a minimum hot water supply temperature setpoint during occupied hours in the heating season to limit boiler use and afternoon spikes in electricity demand.

Implementation of this measure is not expected to result in a reduction in peak electricity demand, although implementation is required to achieve the full demand savings highlighted in section 5.9.

5.9 Measure 9: WSHP Demand Response

5.9.1 Description of Findings

A review of 5-minute electricity interval data found that there are consistent large peaks in electricity demand between 8:00 AM and 9:00 AM during the heating season. This coincides with an increase in the building's heating load at the start of building occupancy.

Figure 15 shows 5-minute electricity interval data from November 1 – 12, 2025, highlighting three large spikes in electricity demand, all occurring between 8:30 AM and 9:00 AM. Figure 16 shows a BAS trend log of the WSHP supply water temperature (SWT) and SWT setpoint. The WSHP SWT peaks at 8:35 AM, coinciding with the time that peak demand is set on this day.

Figure 17 shows November 2025 electricity interval data, sorted from largest to smaller, and ranked based on percentile within the dataset. The peak electricity demand recorded over this period was 489 kW, while the 98th percentile was 359 kW.

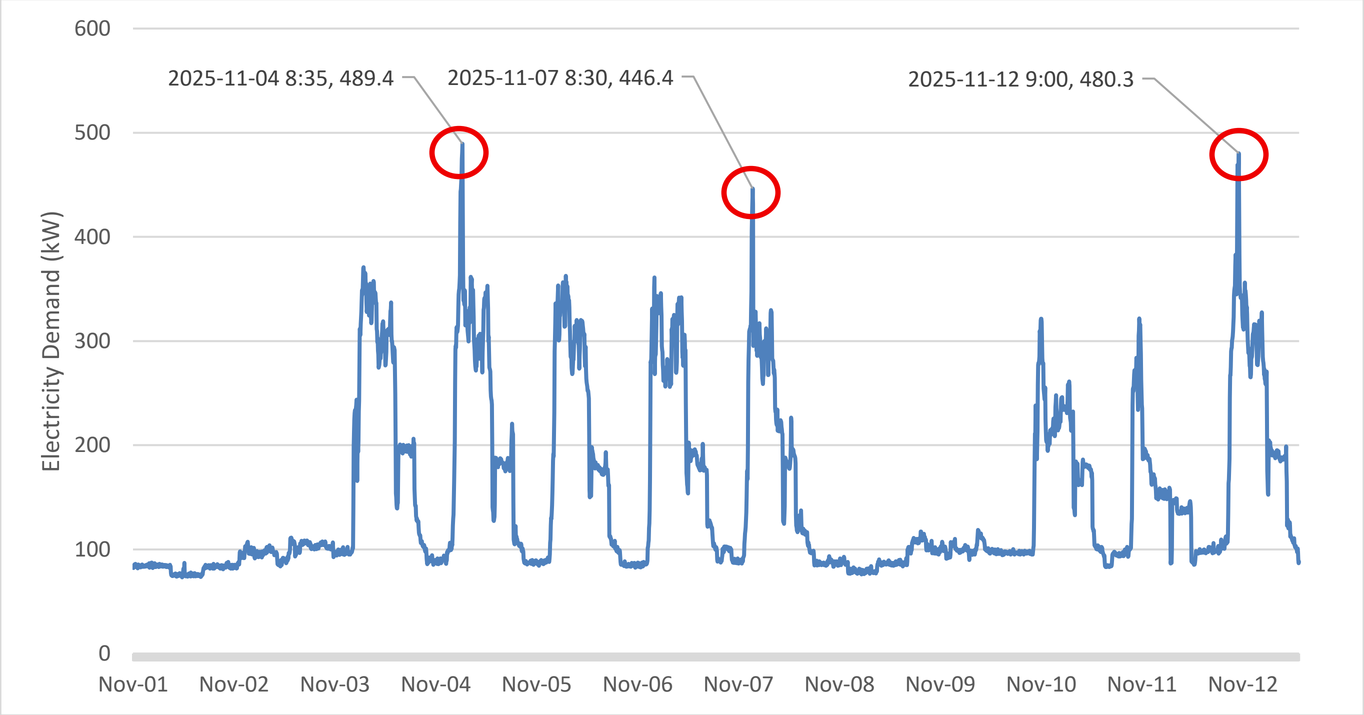

Figure 15: 5-minute Electricity Interval Data from November 1 - 12, 2025, Highlighting Notable Demand Spikes

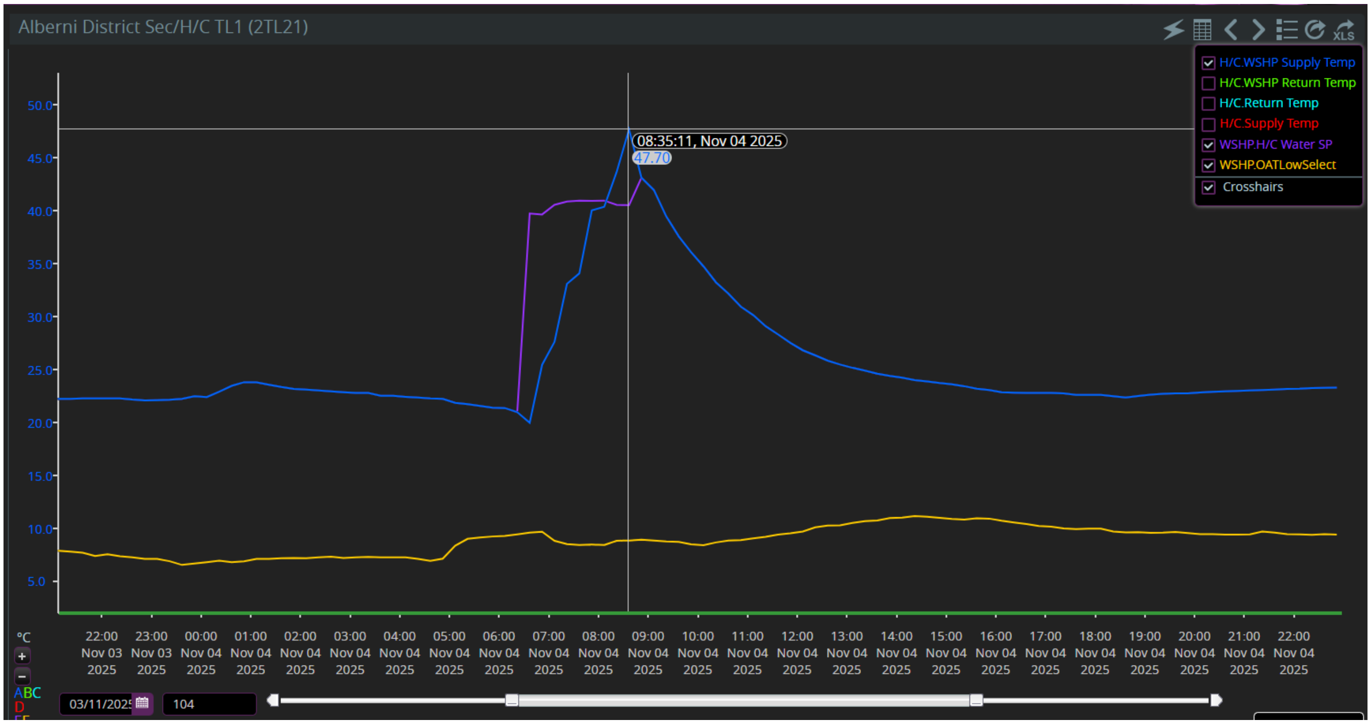

Figure 16: BAS Trend Log of WSHP Supply Water Temperature and Setpoint on November 4, 2025.

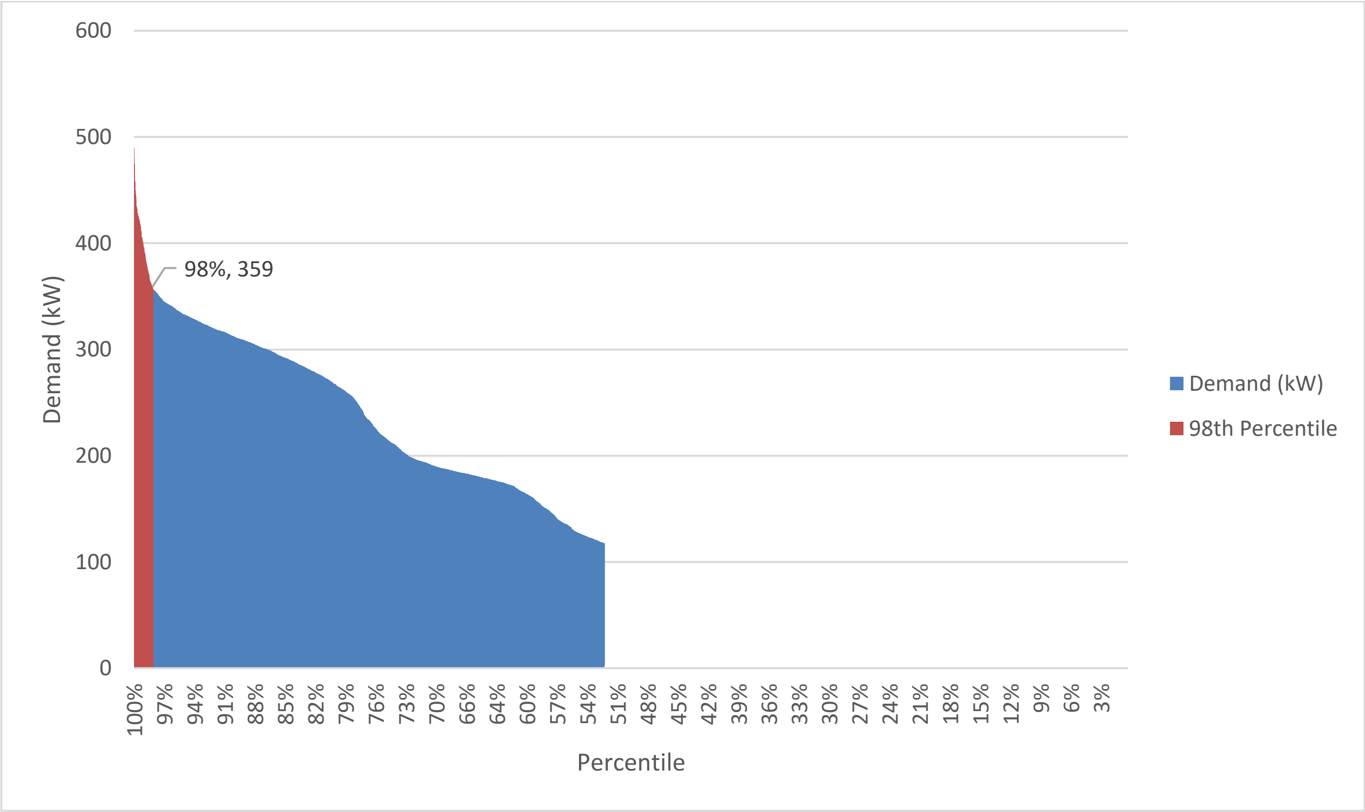

Figure 17: Electricity Interval Distribution from November 2025, Sorted Based on Percentile

5.9.2 Measure Description

Peak electrical demand during the heating season can be significantly reduced by disabling WSHP compressor stages when the building is at risk of setting a new monthly peak. Install an electricity submeter to capture the building's real-time electricity demand and integrate the submeter with the DDC system. Program the WSHPs to disable compressor stages when demand exceeds monthly peak demand setpoints.

6.0 Measures to be considered for Future Implementation

This section provides an overview of each measure that was identified but **was not selected** as part of this C. Op. project. These measures either require further investigation or were determined to have lengthy payback periods. Energy savings and estimated retrofit costs were not quantified for the measures presented in this section.

6.1 Measure 1: Rectify the WSHP-1 Heat Recovery System

6.1.1 Description of Finding

WSHP-1 recovers heat from heat recovery coils installed in the AHU-5 and AHU-6 exhaust streams. As-built control drawings indicate that WSHP-1 will run if there is more than 40 Pa of pressure across either heat recovery coil. Relief dampers in each exhaust stream modulate to maintain the relief hood static pressure setpoint.

The relief dampers in both exhaust streams were found to be opening when static pressure is well below the 40 Pa setpoint. Figure 18 shows an instance where the AHU-5 and AHU-6 relief hood static pressures were measured at 9.3 Pa and 2.5 Pa, respectively, and both dampers are 100% open. Trend log data shows that the relief dampers are controlling to static pressure setpoints well below 40 Pa.

A review of trend log data also shows evidence that the relief dampers are not controlling to their commanded positions. Figure 19 shows a trend log of the AHU-5 relief damper command and feedback, showing a ~18% offset between command and feedback. Figure 20 shows a trend log of the AHU-6 relief damper position and the measured relief hood static pressure. Over 15 hours of AHU-5 operation, the static pressure does not exceed 3 Pa, even with the relief damper commanded closed. The lack of pressure in the relief hood could indicate that the damper is not controlling to its commanded position, or that the pressure sensor is not calibrated.

Since the pressure across each heat recovery coil never exceeds the 40 Pa setpoint, WSHP-1 does not operate.

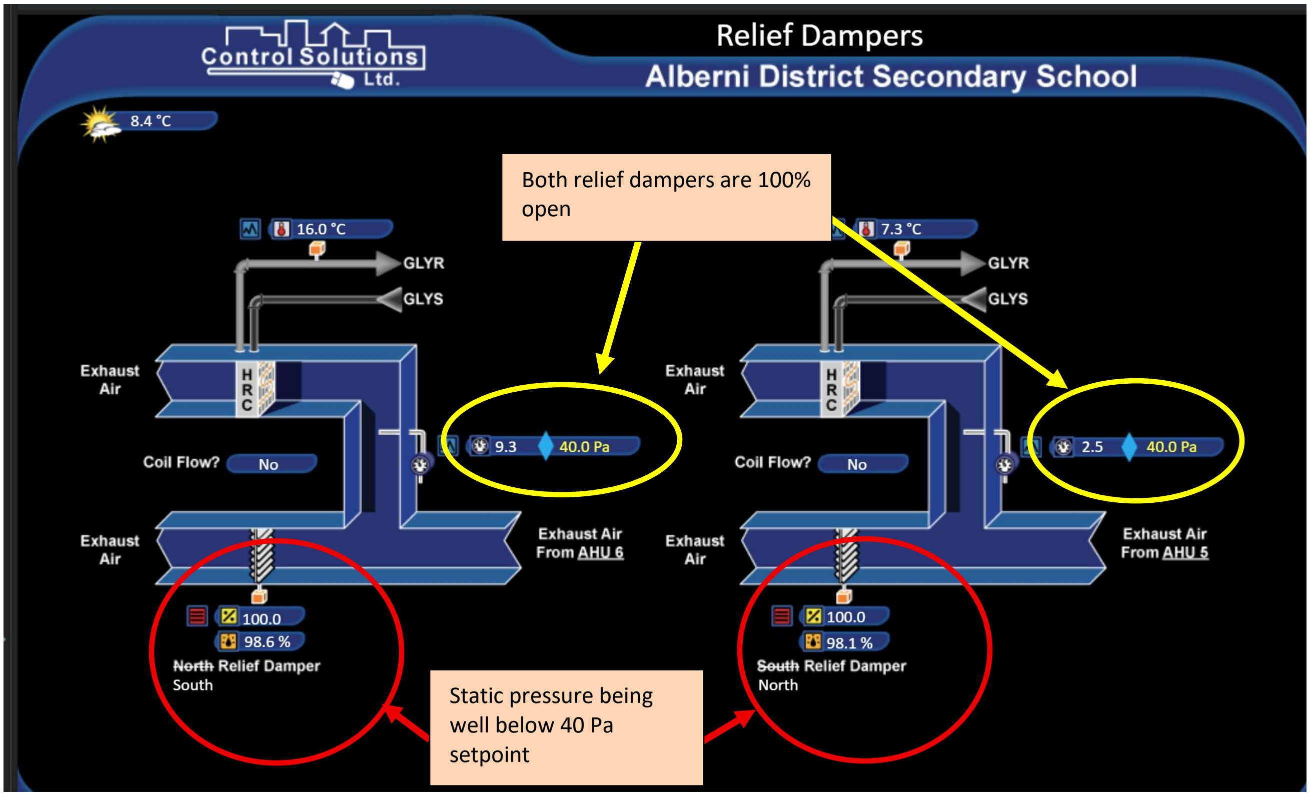

Figure 18: Screenshot of BAS Graphics for the AHU-5 and AHU-6 Heat Recovery Coils and Relief Dampers

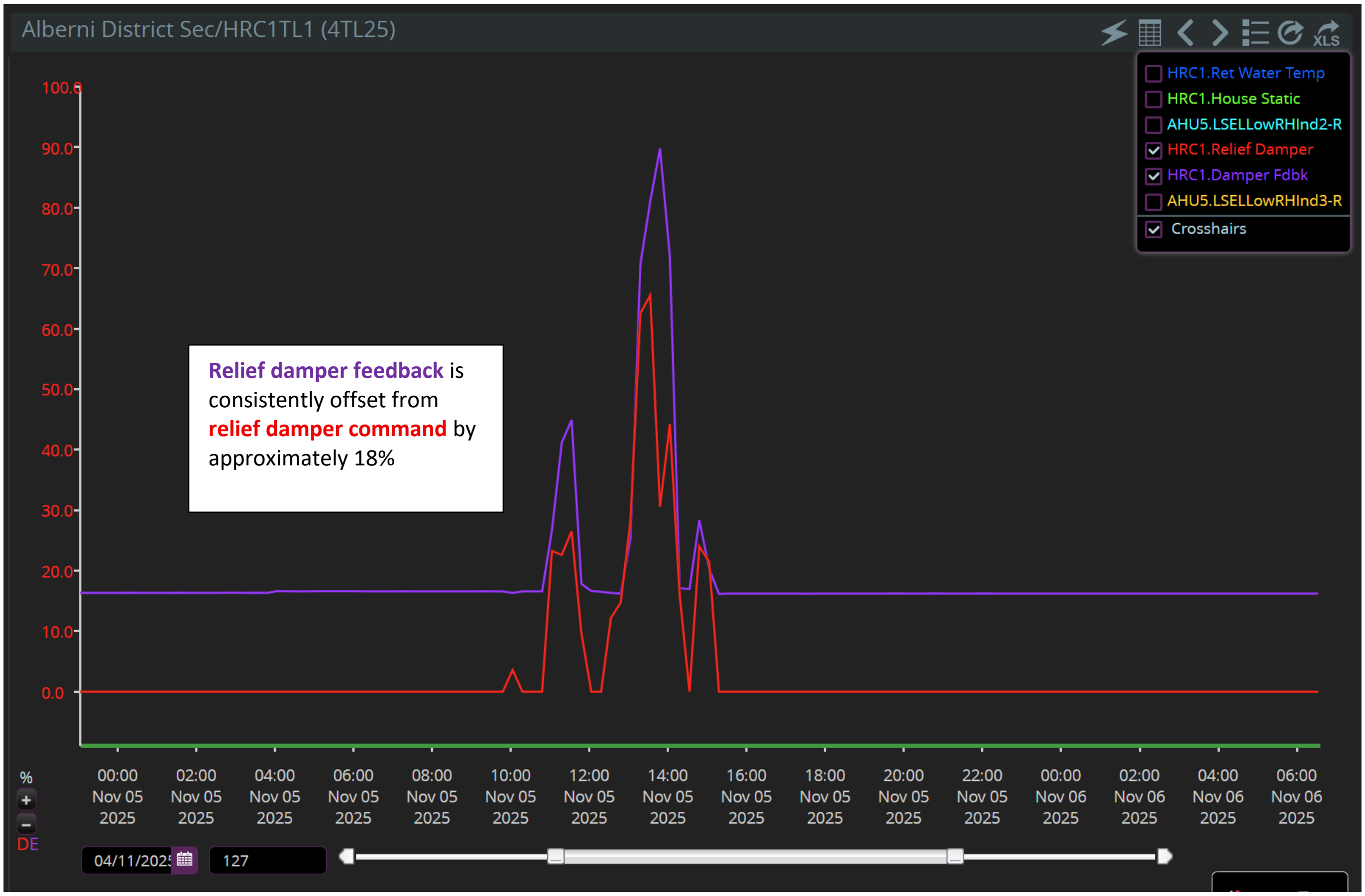

Figure 19: DDC Trend Log of AHU-5 Exhaust Relieft Damper Command and Feedback on November 5, 2025

Figure 20: DDC Trend Log of the AHU-6 Relief Damper Position and the Measured Relief Hood Static Pressure

6.1.2 Measure Description

Update the AHU-5 and AHU-6 relief damper programming such that the relief dampers control to maintain the 40 Pa relief hood static pressure setpoint.

Diagnose the AHU-5 and AHU-6 relief dampers by commanding them to different positions and observing the physical damper position in the field. Repair the damper as indicated by testing.

Re-calibrate the relief hood static pressure sensors, if required.

The five WSHPs connected to the ground loop have enough heating capacity to meet the building's peak heating demand. As a result, implementation of this measure is not expected to result in energy or utility cost savings.

7.0 Next Steps – Implementation Phase and Completion Phase

7.1 Implementation Phase

To continue in the program, the owner is responsible for implementing the selected bundle of measures that pay back in two years or less. Using the *Recommissioning Report* for implementation allows flexibility in how the selected measures are implemented. Options include: utilize in-house building staff, hire the C.Op Provider to implement or provide technical assistance, contract with outside service contractors, or any combination of the above.

7.2 Completion Phase

C.Op Service provider will follow up after implementation of the selected measures and **update** this *Recommissioning report and Recommissioning Workbook*.

The updated report for the implemented measures includes but not limited to: date of completion of each measure, new or improved sequences of operation, the energy savings impact of the measures, the requirements for ongoing maintenance and monitoring of the measures, and contact information for the service provider, in house staff, and contractors responsible for the implementation. When feasible, verification data should include trends or functional test results, though other methods, such as copies of invoices, site visit reports, and before/after photos, may be acceptable.

The C.Op Service Provider will conduct an in-house (teleconference) session for the Applicant and the appropriate building operations personnel covering the new documentation, measures that were implemented, and requirements for ongoing maintenance and monitoring. Document the attendance of the building operations staff.

The *updated Recommissioning Workbook* and *updated Recommissioning Report* will be submitted to the owner and the program for review. See Appendix B: Completion Phase Summary Table for more details on implemented measures.

8.0 Appendix A: Investigation Phase Summary Table

Investigation Phase Summary				Investigation Phase							
				Energy Savings			Cost Savings	Financial		Est. GHG Reduction	
ECM #	Measure Title	Measure History	Include cost	Demand (kW)	Electrical (kWh/yr)	Fuel (GJ)	Total ($/yr)	Estimated Measure Cost ($)	Simple Payback (yrs)	tonnes CO2e/yr	Enter "x" if DESELECT for implementation
ECM-1	Update the Holiday Calendar	New	1	-	29,304	1	$ 1,903	$ -	-	0.4	
ECM-2	Rectify 24/7 AHU and Cooling Plant Operation During Summer Months	New	1	-	31,616	-	$ 2,039	$ -	-	0.4	
ECM-3	Reduce AHU-1, AHU-2, and AHU-6 Static Air Pressure Setpoint During Low Heating and Cooling Demand Periods	New	1	-	9,054	-	$ 584	$ 9,300	15.9	0.1	
ECM-4	Close AHU OADs During Heating Optimum Start Mode	New	1	-	2,163	-	$ 140	$ 1,900	13.6	0.0	
ECM-5	Disable DHW Pre-Heat Pumps During the Cooling Season	New	1	4	1,305	-	$ 696	$ 1,000	1.4	0.0	
ECM-6	Disable P3/P4 During the Cooling Season when AHUs are in Free Cooling Mode	New	1	-	4,154	-	$ 268	$ 3,700	13.8	0.0	
ECM-7	Increase the Hot Water Supply Tempeature Setpoint During Unoccupied Heating Mode	New	1	-	41,108	-	$ 2,651	$ 5,600	2.1	0.5	
ECM-8	Maintain a Minimum Hot Water Supply Temperature During Occupied Hours in Heating Mode	New	1	-	- 15,988	190	$ 639	$ 1,900	3.0	9.3	
ECM-9	WSHP Demand Response	New	1	88	-	-	$ 13,835	$ 16,600	1.2	-	
			TOTAL (Previous, still working):	-	-	-	$ -	n/a	n/a	-	
			TOTAL (All potential measures for Implementation):	92	102,716	191	$ 22,755	$ 40,000	1.8	10.7	
			TOTAL (Selected measures only):	**92**	**102,716**	**191**	**$ 22,755**	**$ 40,000**	**1.8**	**10.7**	
							Implementation cap @$0.25/ft2	$ 33,425			

9.0 Appendix B: Completion Phase Summary Table

To be completed during the completion phase.

10.0 Appendix C: Sample Training Outline

The Commissioning Provider (C.Op Provider) may customize the outline for the training and developing the training materials. Before preparing the training outline and materials, the C.Op Provider should assess the related level of knowledge of the building operators, to set up the training accordingly. For reference, the Program provides the following sample outline for the training:

- Background on the energy use of this particular building
  - Present Energy Utilization Index
  - Describe Operating Schedules and Owner's operating requirements
- RCx investigation process used in this building
  - Describe the methods used to identify problems and deficiencies
  - Review the RCx Workbook
- Implementation process in this building
  - Describe the measures that were implemented and by whom
  - Walk around the building to look at any physical changes or step through the new control sequences at the operator workstation
  - Provide as many details about implementation as necessary to describe what was done
  - Describe improved performance that these measures will create (show trends if available)
- O&M requirements
  - Describe the O&M requirements needed to keep these improvements working
  - Describe how the staff can be aware of energy efficiency opportunities and begin looking for additional savings potential

The C.Op Provider should follow the outline to prepare materials, as necessary, to hand out at the training session.

11.0 Appendix D: Training Completion Form

Project ID

Facility Information

Company Name	Building Name(s)	
Facility Address	City	Province

Training Details

Location	Date
Commissioning Provider/Trainer	

Materials Attached

☐ Agenda
☐ Materials used for training
☐ List of individuals who attended

COMMISSIONING PROVIDER SIGNATURE

By signing this Training Completion Form, I verify that this training took place with the listed attendees.	
Commissioning Provider (print name):	
Signature:	Date:

FACSIMILE/SCANNED SIGNATURES: Facsimile transmission of any signed original document, and the retransmission of any signed facsimile transmission, shall be the same as delivery of the original signed document. Scanned original documents transmitted to BC Hydro as an attachment via electronic mail shall be the same as delivery of the original signed document. At the request of BC Hydro, C.Op Provider shall confirm documents with a facsimile transmitted signature or a scanned signature by providing an original document.

Targeted Documentation

O & M Manual

O & M Manual updated	☐	Describe updates below and attach copies of new or amended portions
O & M Manual not updated	☐	Province reasons below
Building has no O & M Manual	☐	

Building Plans ("as-builts")

Building Plans updated	☐	Describe below
Wiring diagrams updated	☐	Describe below
No plans or diagrams updated	☐	Describe below

EMS Programming

New sequences of operation on file	☐	Specify location of file and attach copy
Printed screenshots on file	☐	Specify location of file and attach copy

Equipment Manuals

Manuals for new equipment are on file	☐	Describe below (attach copy if applicable)

Checklist of subjects discussed at training

Explain investigation process and how measures were identified	☐
Describe implemented measures, and how they are reducing energy usage	☐
Building walkthrough to show implemented measures	☐
Describe methods for monitoring and maintaining optimum system performance related to implemented measures	☐
Describe scenarios where system setting changes would be required, and how to maintain optimum energy efficiency, e.g., seasonal-based manual adjustments to setpoints.	☐

List of Individuals Who Attended

Name	**Title**	**Building (address or name)**	**Contact information (e-mail and/or phone number)**

Continuous Optimization Investigation Report

School District 70 | Alberni Elementary School
4645 Helen Street, Port Alberni, BC V9Y 6P6
BCH Project #: BCH-11741
Prism Project #: 2025021

Prism Engineering
Changing systems for a better world

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prismengineering.com

Version	Updated on	Phase
v0.1	December 9, 2025	Investigation Draft

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This report was prepared by Prism Engineering Limited for School District 70. The material in it reflects our professional judgement considering the information available to us at the time of preparation. The savings calculations are estimates of savings potential and are not guaranteed. The impact of building changes, building use changes, new equipment, additional computers, and weather needs to be considered when evaluating savings. Without express written permission, any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Prism Engineering Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Document Authentication

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<tr><td>Date:</td><td>November 18, 2025</td><td>Date:</td><td>November 28, 2025</td></tr>
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<tr><td>Discipline / Responsibility</td><td>Mechanical</td></tr>
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TABLE OF CONTENTS

1.0 Introduction

Prism Engineering is pleased to present the results of the Investigation Phase that was conducted as part of BC Hydro's Continuous Optimization for Commercial Buildings Program for Alberni Elementary School. The objective of an Investigation is to identify deficiencies and improvements in the operation of a facility's mechanical equipment, lighting, and related controls, and determine opportunities for corrective action that reduce energy consumption and preserve the indoor environmental quality.

This document is a complete record of the work performed at this facility, including the in-depth investigation of the building systems and the implementation of selected measures to optimize building performance.

The Recommissioning Investigation Report provides an overview of the recommendations for the implementation of measures. This information is not considered a specification or detailed sequence of operations. The intent is to provide an overview of the recommendation that can be built upon during the implementation phase as part of any detailed design that may be required. Certain measures may require further investigation and specification for the correct implementation by the owner or the DDC contractor.

Eight recommended retrofits were identified as a part of this investigation. The proposed measures will be reviewed in a meeting with School District 70 and Prism Engineering representatives to determine which measures will be implemented.

Recommended retrofits for implementation include:

- Measure 1: Update the Holiday Measure 1: Update the Holiday
- Measure 2: Reduce the Purge Mode Calendar and Update Cooling OS
- Measure 3: Rectify 24/7 Operation of AHU-1, AHU-2, and AHU-3 During the Summer Break Period
- Measure 4: Reduce AHU-1 and AHU-2 Weekly Schedules
- Measure 5: Increase AHU-1 and AHU-2 Unoccupied Cooling Setpoints
- Measure 6: Close Outdoor Air Dampers in Unoccupied Heating and Heating Optimum Start Modes
- Measure 7: Adjust Unit Ventilator Heating Coil Valve Control in Heating OS Mode
- Measure 8: Reduce Unit Ventilator Weekly Schedules

These measures are presented in the Investigation Summary Table (see Appendix A).

Other measures that were identified but not selected as part of this C. Op. project are outlined in section 6.0.

2.0 Project Overview

Project Information

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RCx Project File #	**BCH-11741**		
Date of Workbook Update	07-Nov-2025		
Organization	School District 70		
Building Name	Alberni Elementary School		
Building Type	Large School		
Location (City)	Port Alberni, B.C.		
Owner Contact	Alex Taylor		
Investigation Phase start date	09-Sep-2025		
Participated in previous BCH RCx program?	No		
Previous RCx File #			
Previous RCx completion date			

Building Information

Facility Area (ft2)	50,483		
Annual elec consumption (kWh)	232,525	4.6	kWh/ft^2
Annual elec costs ($)	$ 27,954	$ 0.12	Avg. $/kWh
Fuel type	Other		
Annual fuel consumption (GJ)	935	5.1	$ekWh/ft^2$
Annual fuel cost ($)	$ 11,630	$ 12.4	Avg. $/GJ
Total GHG emissions (tCO2e/yr)	47		
Total Energy Cost	$ 39,584	$ 0.78	$\$/ft^2$
Energy Use Intensity (ekWh/ft2)	9.7		
Year for energy data above	2024		

3.0 Savings Summary

Savings Summary	Previous, still working	New + Previous, rectify + Previous, documented					
		Identified		Selected		Implemented	
# of measures	0	8		8		0	
	Re-claim Savings	Total Savings	% Savings	Total Savings	% Savings	Total Savings	% Savings
Electrical savings (kWh/yr)	-	18,478	7.9%	18,478	7.9%	-	0.0%
Fuel savings (GJ/yr)	-	44	4.7%	44	4.7%	-	0.0%
Cost savings ($)	$ -	$ 2,396	6.1%	$ 2,396	6.1%	$ -	0.0%
Estimated GHG reduction (tCO2e/yr)	-	2.4	5.1%	2.4	5.1%	-	0.0%
# of Abandoned measures	**0**						

4.0 Brief Description of Existing System

This section contains a brief description of the existing HVAC and Controls system. The information is intended to provide a general overview only.

4.1 Facility Description

Alberni Elementary School is two stories above grade and has a floor area of 50,483 ft². A major HVAC upgrade was completed in 2002, including the installation of new unit ventilators.

4.2 Mechanical Systems Description

4.2.1 Heating System

Heating water is provided by a hydronic boiler system serving terminal units including air handling unit heating coils, unit ventilator heating coils, re-heat coils, and hydronic convectors. The existing boilers were installed in 2014.

The piping configuration consists of a primary boiler loop and two secondary loops. The secondary loops are hydraulically separated from the primary loop by a low-loss header.

Each secondary loop serves a distinct set of terminal units. The heating coils in the air handling units (AHUs) are controlled by 3-way valves, while most reheat coils, unit ventilators, and convector heaters use 2-way valves.

Table 1: Summary of Boilers

Tag	Make/Model	Heating Output (MBH)	Type
B-1	Viessman Vitocrossal-200	643	Condensing
B-2	Viessman Vitocrossal-200	643	Condensing

Table 2: Summary of Hot Water Distribution Pumps

Tag	Description	Power	Flow (GPM)	Head (ft)	Notes
P-1	B-1 Primary Circulator	203 W	43	12	Constant Volume
P-2	B-2 Primary Circulator	203 W	43	12	Constant Volume
P-3	Zone 1 (North) Hot Water Distribution	1.5 hp	60	52	Variable Flow.
P-4	Zone 2 (South) Hot Water Distribution	1.5 hp	60	52	Variable Flow.
P-5	AHU-1 HC Circ Pump	1/2 hp	24	12	Constant Volume
P-6	AHU-2 HC Circ Pump	1/3 hp	12	12	Constant Volume

4.2.2 Ventilation

Ventilation is provided to the fieldhouse, gymnasium, and admin office by three air handling units. Unit ventilators provide ventilation to the library, individual classrooms, and the staff room.

Various fractional exhaust fans serve the building.

Table 3: Summary of Air Handling Units

Tag	Service Area	Power (HP)	Flow (CFM)	Notes
AHU-1	Fieldhouse	7.5	11,000	CO_2 and occupancy sensor control. Constant speed fan. Mixed-air unit. Hydronic heating coil. No cooling.
AHU-2	Gym	3	5,250	CO_2 and occupancy sensor control. Constant speed fan. Mixed-air unit. Hydronic heating coil. No cooling.
AHU-3	Admin Office	3	2,000	Constant speed fan. Mixed-air unit. DX cooling coil. Heating provided by downstream re-heat coils.

Table 4: Summary of Typical Unit Ventilators

Tag	Make/Model	Power (HP)	Flow (CFM)	Notes
UV (Typical)	Temspec HUV 1200; Temspec HUV 1600	1/3 - 3/4	650 – 1,600	CO_2 and occupancy sensor control. Constant speed fans. Mixed-air units. Hydronic heating coil. UV-13, serving the computer lab, is equipped with a DX cooling coil.

4.2.3 Domestic Hot Water System

Domestic hot water (DHW) for the south end of the school is generated by an electric water heater and re-circulated by pump P-8.

There is an additional electric DHW water heater below the gymnasium with no recirculation.

Table 5: Summary of DHW Tanks

Tag	Make/Model	Heating Capacity (kW)	Notes
DHW	John Wood JW880TDE-45 200	4.5 kW	Serving south side of the school
DHW	GSW G9-50SDE-30	11 kW	Serving gymnasium and fieldhouse change-rooms /washrooms. No recirculation.

Table 6: Summary of DHW Re-circulation Pump

Tag	Description	Power (HP)	Flow (L/s)
P-8	DHW Recirculation Pump	1/8	Unknown

4.2.4 Controls System

The mechanical systems in this building are controlled by a Direct Digital Control (DDC) Building Automation System (BAS). The system is manufactured by Reliable Controls.

5.0 Measures Selected for Implementation

This section provides an overview of new measures identified in this Round of Investigation, including recommendations for implementation, and updates post implementation.

For each measure, costs, savings and payback calculations can be referenced in the *Investigation Summary Table* (see Appendix A).

5.1 Measure 1: Update the Holiday Calendar

5.1.1 Description of Finding

Air handling units and unit ventilator weekly schedules are disabled on statutory holidays and school break periods by a holiday calendar setup on the building automation system (BAS). The holiday calendar currently captures three statutory holidays, the summer break period in July and August, and four days during the winter break period (December 24, 25, 26, and 27), as shown in Figure 1.

As per the 2025-2026 school calendar, the school is closed from December 22, 2025, to January 3, 2026, and from March 9, 2026, to March 22, 2026.

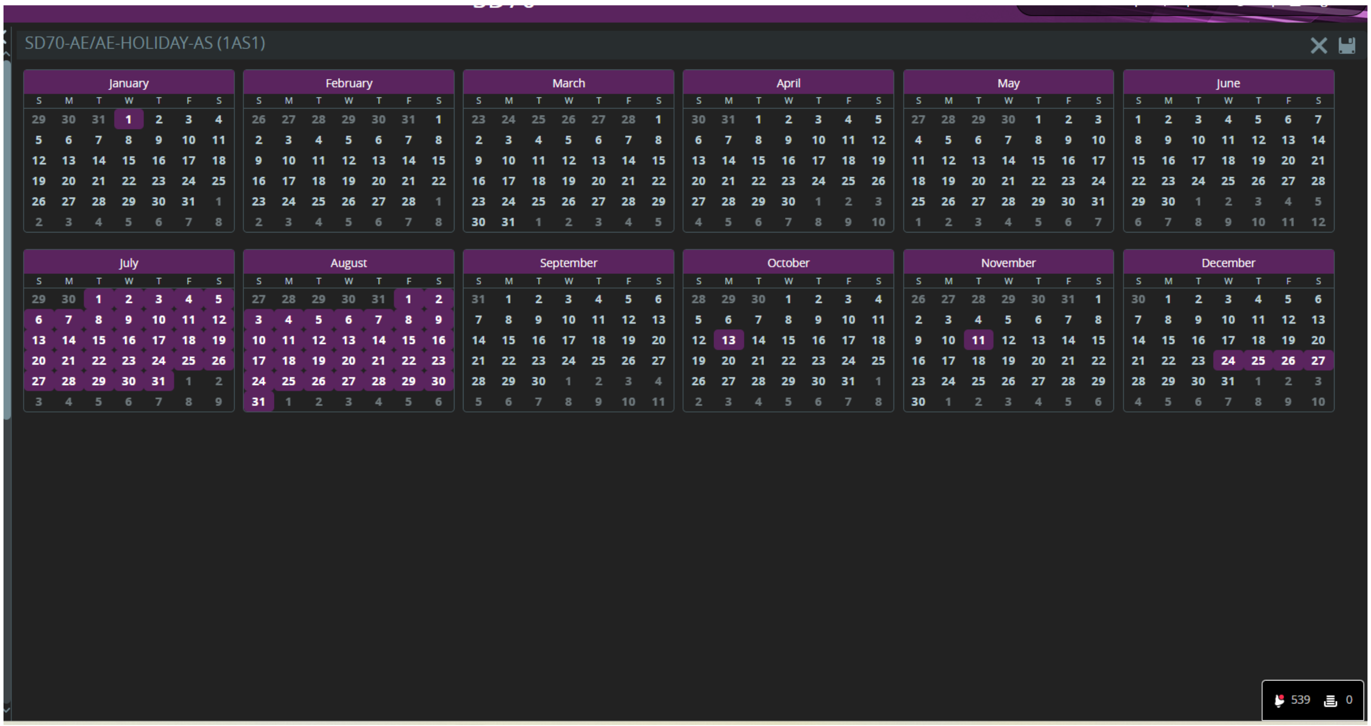


Figure 1: Screenshot of the DDC Holiday HVAC Calendar

5.1.2 Measure Description

Update the holiday calendar to include the winter and spring break periods, and any statutory holidays that are not already scheduled.

Savings assume that the school is unoccupied during the winter and spring break periods, and that all AHUs and unit ventilators can be scheduled off during these periods.

5.2 Measure 2: Reduce the Purge Mode Calendar and Update Cooling OS Programming

5.2.1 Description of Finding

Purge mode is currently enabled from May 1 – September 30. When purge mode is active, all unit ventilators are enabled from approximately 2:00 AM to 7:00 AM with their respective outdoor air dampers open to 100%. As an example, Figure 2 shows a DDC data log of the UV-7 supply fan status from June 4, 2025 – June 25, 2025, showing that the supply fan started at approximately 2:00 AM every day during this period.

All unit ventilators are programmed with cooling optimum start (OS) logic, which allows these units to start up to 1.5 hours before their schedule, if needed, to ensure their respective spaces are at their occupied room temperature setpoints when they become occupied.

Figure 3 shows Port Alberni weather data for May – September, averaged over a 4-year period from 2021-2025. Weather conditions are typically significantly cooler in May, early June, and late September, compared to peak summer conditions, and it is expected that purge mode is providing more cooling than necessary during these periods.

AE-UV7-SF-SS-RT (4RT1)

UV-7 starts at ~2:00 AM every morning

	ON	OFF	On Duration	Off Duration
55	Wed, June 25, 2025, 02:03:58 AM		13:56:02	10:04:03
56	Tue, June 24, 2025, 02:04:04 AM		13:55:56	10:03:58
57	Mon, June 23, 2025, 02:04:09 AM	Mon, June 23, 2025, 04:00:00 PM	13:55:51	10:04:04
58	Fri, June 20, 2025, 02:04:05 AM	Fri, June 20, 2025, 03:59:59 PM	13:55:54	58:04:10
59	Thu, June 19, 2025, 02:04:09 AM	Thu, June 19, 2025, 03:59:59 PM	13:55:50	10:04:06
60	Wed, June 18, 2025, 02:04:07 AM	Wed, June 18, 2025, 04:00:00 PM	13:55:53	10:04:09
61	Tue, June 17, 2025, 02:04:00 AM	Tue, June 17, 2025, 03:59:59 PM	13:55:59	10:04:08
62	Mon, June 16, 2025, 02:04:08 AM	Mon, June 16, 2025, 03:59:59 PM	13:55:51	10:04:01
63	Fri, June 13, 2025, 02:04:07 AM	Fri, June 13, 2025, 04:00:00 PM	13:55:53	58:04:08
64	Thu, June 12, 2025, 02:04:09 AM	Thu, June 12, 2025, 03:59:59 PM	13:55:50	10:04:08
65	Wed, June 11, 2025, 02:04:03 AM	Wed, June 11, 2025, 05:00:00 PM	14:55:57	09:04:09
66	Tue, June 10, 2025, 02:04:02 AM	Tue, June 10, 2025, 04:59:59 PM	14:55:57	09:04:04
67	Mon, June 9, 2025, 03:11:34 AM	Mon, June 9, 2025, 05:00:00 PM	13:48:26	09:04:02
68	Sun, June 8, 2025, 07:30:00 AM	Sun, June 8, 2025, 07:59:59 AM	00:29:59	19:11:35
69	Sat, June 7, 2025, 07:30:00 AM	Sat, June 7, 2025, 07:59:59 AM	00:29:59	23:30:01
70	Fri, June 6, 2025, 02:04:07 AM	Fri, June 6, 2025, 04:59:59 PM	14:55:52	14:30:01
71	Thu, June 5, 2025, 02:04:10 AM	Thu, June 5, 2025, 04:59:59 PM	14:55:49	09:04:08
72	Wed, June 4, 2025, 02:04:07 AM	Wed, June 4, 2025, 04:59:59 PM	14:55:52	09:04:11

Figure 2: Data Log of UV-7 Supply Fan Status from June 4, 2025, to June 25, 2025

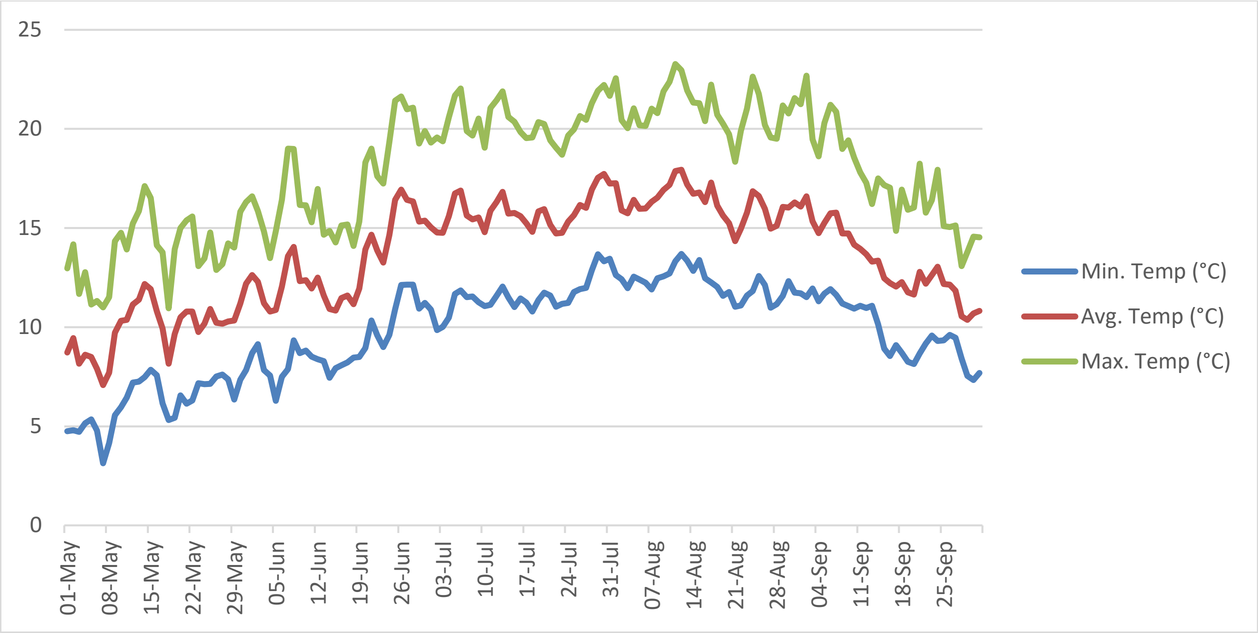


Figure 3: May – September Daily Minimum, Maximum, and Average Outdoor Air Temperature from Port Alberni Weather Station, Averaged Over a 4-year Period from 2021-2025

5.2.2 Measure Description

Reduce the purge mode calendar.

Update the cooling OS maximum start-time, allowing AHUs and unit ventilators to start earlier than allowed by existing programming, as needed. Update the cooling OS target room temperature setpoint such that spaces are cooled beyond the occupied zone temperature setpoint.

Savings assume that purge mode can be limited to mid-June – mid-September.

5.3 Measure 3: Rectify 24/7 Operation of AHU-1, AHU-2, and AHU-3 During the Summer Break Period

5.3.1 Description of Finding

AHU-1, AHU-2, and AHU-3 all ran 24/7 from July 7th to September 1st, 2025. Figure 4 shows a data log of the AHU-2 supply fan status, as an example, showing continuous operation from July 7th to September 1st. It is assumed that these units were manually overridden during this period to force continuous operation.

AE-AH2-SF-SS-RT (28RT8)

	ON	OFF	On Duration	Off Duration
11	Tue, September 9, 2025, 06:45:32 AM	Tue, September 9, 2025, 04:00:01 PM	09:14:29	01:26:53
12	Mon, September 8, 2025, 06:45:40 AM	Mon, September 8, 2025, 04:00:08 PM	09:14:28	14:45:24
13	Sun, September 7, 2025, 06:33:21 PM	Mon, September 8, 2025, 02:24:43 AM	07:51:22	04:20:57
14	Fri, September 5, 2025, 06:45:34 AM	Sun, September 7, 2025, 08:11:44 AM	49:26:10	10:21:37
15	Fri, September 5, 2025, 12:10:37 AM	Fri, September 5, 2025, 12:43:38 AM	00:33:01	06:01:56
16	Thu, September 4, 2025, 06:45:32 AM	Thu, September 4, 2025, 11:09:16 PM	16:23:44	01:01:21
17	Wed, September 3, 2025, 06:45:33 AM	Thu, September 4, 2025, 03:01:22 AM	20:15:49	03:44:10
18	Wed, September 3, 2025, 01:58:53 AM	Wed, September 3, 2025, 02:27:32 AM	00:28:39	04:18:01
19	Tue, September 2, 2025, 06:45:38 AM	Wed, September 3, 2025, 01:10:29 AM	18:24:51	00:48:24
20	Wed, August 13, 2025, 07:22:40 AM	Mon, September 1, 2025, 08:32:40 PM	469:10:00	10:12:58
21	Mon, July 7, 2025, 07:05:03 AM	Wed, August 13, 2025, 07:20:33 AM	888:15:30	00:02:07
22	Tue, July 1, 2025, 12:39:33 PM	Tue, July 1, 2025, 11:48:35 PM	11:09:02	127:16:28
23	Mon, June 30, 2025, 06:45:32 AM	Tue, July 1, 2025, 02:52:11 AM	20:06:39	09:47:22
24	Fri, June 27, 2025, 06:45:36 AM	Fri, June 27, 2025, 04:00:01 PM	09:14:25	62:45:31
25	Thu, June 26, 2025, 06:45:35 AM	Thu, June 26, 2025, 04:00:01 PM	09:14:26	14:45:35
26	Wed, June 25, 2025, 06:45:35 AM	Wed, June 25, 2025, 04:00:00 PM	09:14:25	14:45:35
27	Tue, June 24, 2025, 06:45:33 AM	Tue, June 24, 2025, 06:01:45 PM	11:16:12	12:43:50
28	Mon, June 23, 2025, 06:45:35 AM	Mon, June 23, 2025, 04:00:05 PM	09:14:30	14:45:28

Figure 4: Data Log of AHU-2 Supply Fan Status, Showing Continuous Operation from July 7, 2025, to September 1, 2025.

5.3.2 Measure Description

Rectify AHU-1, AHU-2, and AHU-3 24/7 operation during summer break period and control AHUs based on purge schedule.

Savings assume that AHU-1, AHU-2, and AHU-3 and running from 2:00 AM to 8:00 AM in July and August.

5.4 *Measure 4: Reduce AHU-1 and AHU-2 Weekly Schedules*

5.4.1 Description of Finding

AHU-1 and AHU-2, serving the fieldhouse and gym, respectively, are both scheduled to run from 7:00 AM to 4:00 PM, Monday to Friday. Both units are programmed with optimum start heating and cooling sequences, which allow the AHUs to start up to 1.5 hours before the scheduled start times to pre-cool or pre-warm the space to a comfortable room temperature.

School does not start until 8:45 AM and it is assumed that these spaces are mostly unoccupied before then.

SD70-AE/AE-AH1-WS (29WS1)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Or1	Or2
1-ON	07:00	07:00	07:00	07:00	07:00				
OFF	16:00	16:00	16:00	16:00	16:00				
2-ON									
OFF									
3-ON									
OFF									
4-ON									
OFF									

Figure 5: AHU-1 Weekly Schedule Set on DDC System

5.4.2 Measure Description

Reduce the AHU-1 and AHU-2 weekly schedules to align with occupancy.

Savings assume AHU-1 and AHU-2 can be scheduled to run from 8:00 AM to 4:00 PM, Monday to Friday.

5.5 Measure 5: Increase AHU-1 and AHU-2 Unoccupied Cooling Setpoints

5.5.1 Description of Finding

AHU-1 and AHU-2, serving the fieldhouse and gym, respectively, each have unoccupied cooling setpoints of 24°C. If the zone temperature in a space served by either AHU increases above 24°C during unscheduled hours, the AHU will start in unoccupied cooling mode, and run until the zone temperature has dropped below 24°C. Most other spaces in the building have unoccupied cooling setpoints of 28°C.

During warm weather periods, particularly in June and September, zone temperatures are often above 24°C at the end of the occupancy schedule in these spaces. AHU-1 and AHU-2 typically run continuously for several hours once they are enabled in unoccupied cooling mode but provide very little cooling because the outdoor air temperature is still near the zone temperature.

Figure 6 shows a data log of AHU-1 unoccupied cooling run-time in September 2025. In total, AHU-1 ran for approximately 106 hours in unoccupied cooling mode from September 1 – September 19.

Figure 7 shows a DDC trend log of the AHU-1 room temperature and outdoor air temperature (OAT) during a period where AHU-1 was running in unoccupied cooling mode on September 16, 2025. On this day, AHU-1 ran for 5 hours in unoccupied cooling mode from 4:00 PM to 9:00 PM. The AHU-1 room temperature continued to increase after the end of the occupancy schedule due to high OAT during this period, even with the supply fan running continuously. The cooling impact of the AHU-1 after-hours runtime on this day was negligible.

The cooling that AHU-1 and AHU-2 can provide is dependent on OAT. It is more effective for these units to provide cooling early in the morning rather than in the afternoon and evening when the OAT is typically higher. Both AHUs are programmed with cooling optimum start programs that allow them to enable before their scheduled start times to pre-cool their respective spaces, as needed.

29VAR16-RT (29RT10)

	ON	OFF	On Duration	Off Duration
1	Fri, September 19, 2025, 04:00:00 PM	Fri, September 19, 2025, 07:23:26 PM	03:23:26	
2	Tue, September 16, 2025, 04:00:00 PM	Tue, September 16, 2025, 09:07:53 PM	05:07:53	66:52:07
3	Sat, September 13, 2025, 03:15:45 PM	Sat, September 13, 2025, 06:14:27 PM	02:58:42	69:45:33
4	Fri, September 12, 2025, 04:00:00 PM	Fri, September 12, 2025, 07:20:30 PM	03:20:30	19:55:15
5	Thu, September 11, 2025, 04:00:01 PM	Thu, September 11, 2025, 06:42:45 PM	02:42:44	21:17:15
6	Wed, September 10, 2025, 04:00:00 PM	Wed, September 10, 2025, 08:28:24 PM	04:28:24	19:31:37
7	Tue, September 9, 2025, 04:00:00 PM	Wed, September 10, 2025, 12:11:31 AM	08:11:31	15:48:29
8	Mon, September 8, 2025, 04:00:00 PM	Tue, September 9, 2025, 01:32:59 AM	09:32:59	14:27:01
9	Sun, September 7, 2025, 01:46:39 PM	Mon, September 8, 2025, 06:51:38 AM	17:04:59	09:08:22
10	Sat, September 6, 2025, 12:51:39 PM	Sun, September 7, 2025, 03:08:46 AM	14:17:07	10:37:53
11	Fri, September 5, 2025, 04:00:00 PM	Sat, September 6, 2025, 05:02:19 AM	13:02:19	07:49:20
12	Thu, September 4, 2025, 04:00:00 PM	Thu, September 4, 2025, 09:10:53 PM	05:10:53	18:49:07
13	Wed, September 3, 2025, 04:00:00 PM	Wed, September 3, 2025, 11:25:42 PM	07:25:42	16:34:18
14	Tue, September 2, 2025, 04:00:00 PM	Tue, September 2, 2025, 10:35:55 PM	06:35:55	17:24:05
15	Mon, September 1, 2025, 04:00:00 PM	Mon, September 1, 2025, 07:31:19 PM	03:31:19	20:28:41

Figure 6: Data Log of AHU-1 Unoccupied Cooling Operation

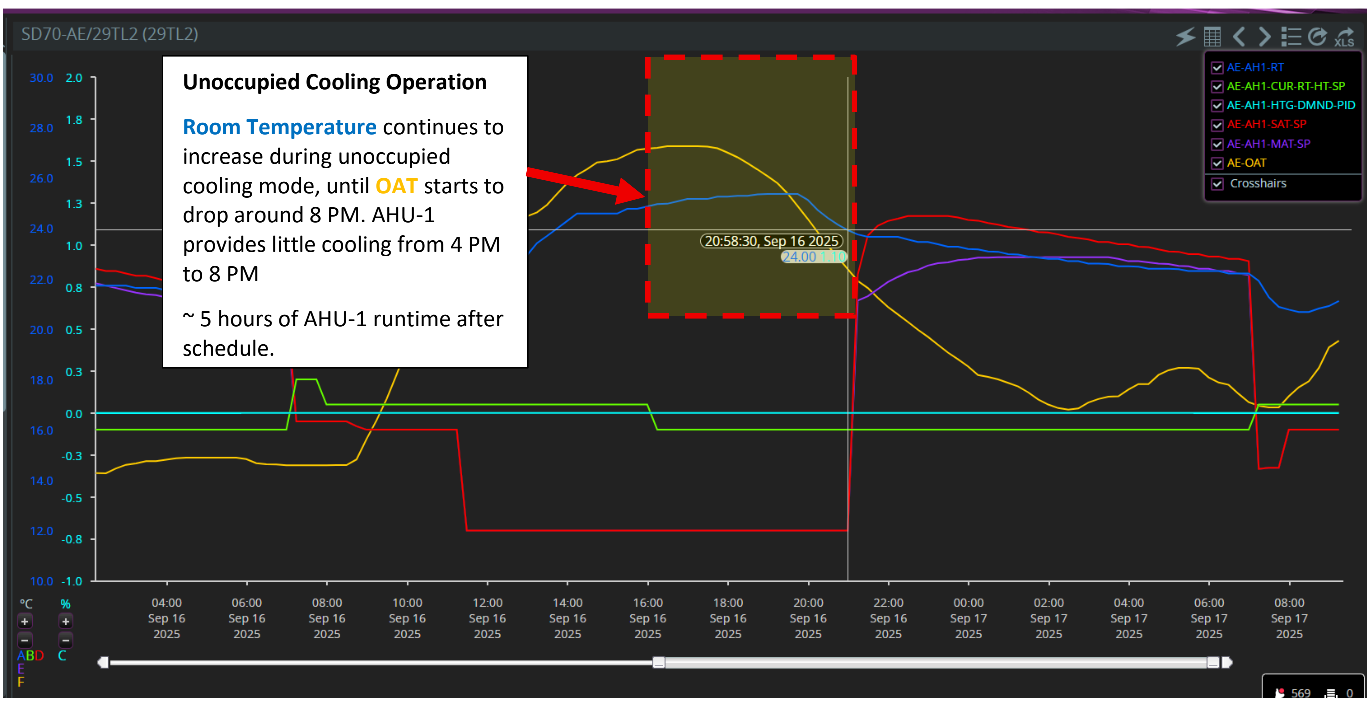


Figure 7: DDC Trend Log of AHU-1 Room Temperature (DARK BLUE), Room Temperature Setpoint (GREEN), and Outdoor Air Temperature (YELLOW)

5.5.2 Measure Description

Increase the unoccupied cooling setpoint for AHU-1 and AHU-2 to reduce unoccupied cooling mode run-time.

5.6 Measure 6: Close Outdoor Air Dampers in Unoccupied Heating and Heating Optimum Start Modes

5.6.1 Description of Finding

AHU-1, AHU-2, AHU-3, and all unit ventilators were found to be operating in unoccupied heating mode and heating OS mode with their outdoor air dampers open to their minimum positions.

AHU-3 was in unoccupied heating mode on October 8th, 2025, from 4:05 AM to 5:00 AM. Figure 8 shows a DDC trend log of the AHU-3 outdoor air damper over this period. The outdoor air damper was open to its minimum position of 10%.

During unoccupied hours, outdoor air ventilation is not required, and outdoor air dampers can be fully closed, reducing the ventilation heating load.

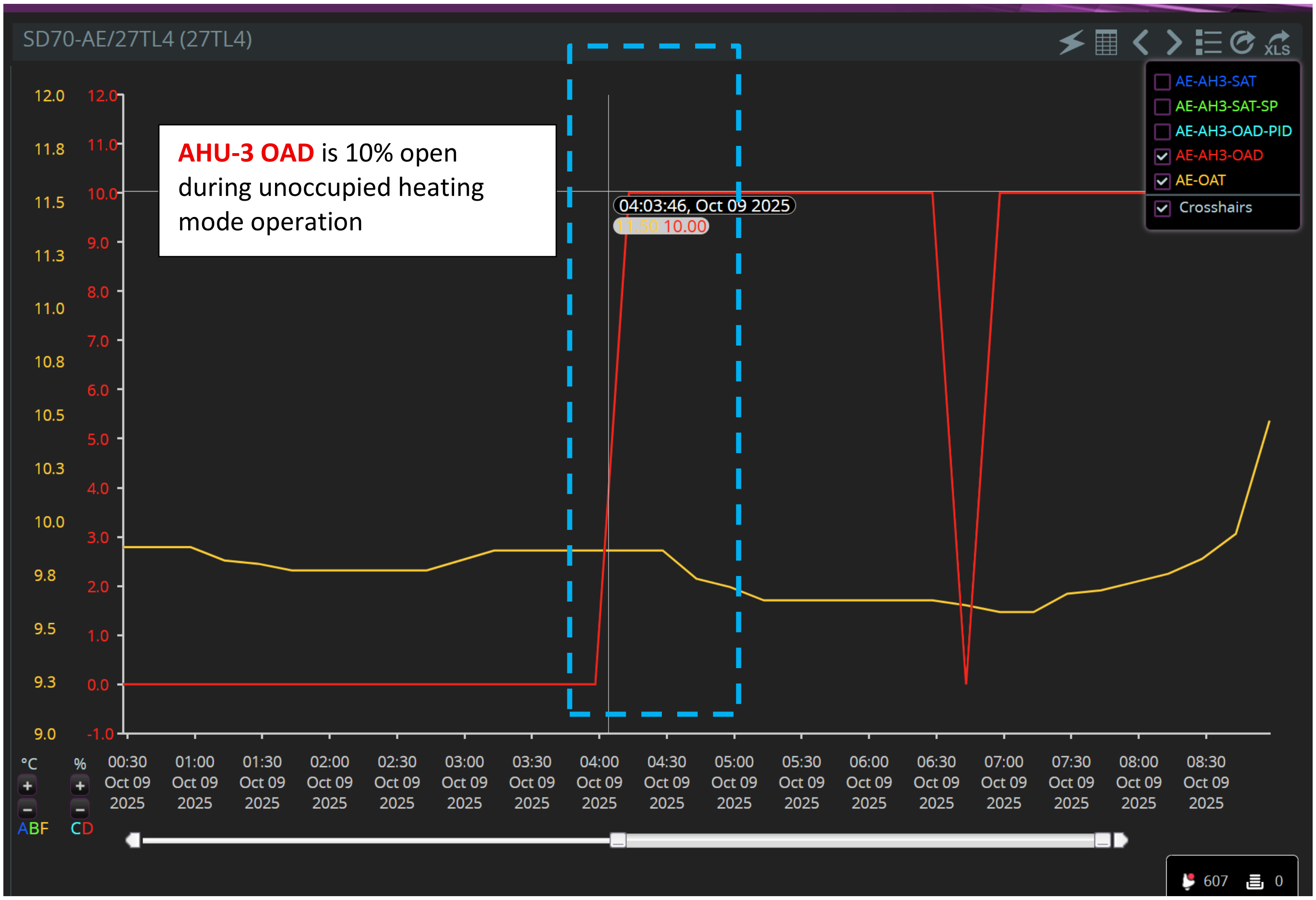


Figure 8: DDC Trend Log of AHU-3 Outdoor Air Damper (RED) and Outdoor Air Temperature (YELLOW)

5.6.2 Measure Description

Program the AHU-1, AHU-2, AHU-3, and unit ventilator outdoor air dampers closed during unoccupied heating and heating OS modes.

5.7 Measure 7: Adjust Unit Ventilator Heating Coil Valve Control in Heating OS Mode

5.7.1 Description of Finding

Unit ventilators are programmed with a heating OS mode. The heating OS mode allows unit ventilators to start up to 1.5 hours before their scheduled start time to pre-heat spaces to their occupied zone temperature setpoint. Unit ventilators are typically scheduled from 6:45 AM to 4:00 PM, Monday to Friday.

Many unit ventilators were observed to be starting in heating optimum start mode almost every day from October 1st onwards. For example, Figure 10 shows a data log for the UV-9 supply fan status from October 1st – October 9th, 2025, showing that the unit was enabled at 5:15 AM every morning during this period.

On the days when UV-9 started in heating OS mode, the room temperature was typically observed to be only slightly below the room temperature setpoint. For example, Figure 11 shows a DDC trend log of the UV-7 room temperature and room temperature setpoint on October 8th, 2025. UV-7 started at 5:15 AM in heating OS mode on this day when the room temperature was 0.5°C below setpoint. Figure 12 shows a DDC trend log of the UV-7 heating coil valve (HCV) position over the same period. The UV-7 HCV was open to approximately 55% for the duration of the heating OS operation.

Unit ventilator run-time in heating OS mode could be reduced if the UV HCVs were programmed to open more during this operating mode, increasing the rate at which the room temperature is able to reach the occupied temperature setpoint.

SD70-AE/AE-UV9-WS (16WS1)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Or1	Or2
1-ON	06:45	06:45	06:45	06:45	06:45				
OFF	16:00	16:00	16:00	16:00	16:00			00:05	

Figure 9: UV-9 Weekly Schedule Set on DDC System

AE-UV9-SF-SS-RT (16RT1)

	ON	OFF	On Duration	Off Duration
1	Thu, October 9, 2025, 05:15:47 AM			
2	Wed, October 8, 2025, 05:15:47 AM	Wed, October 8, 2025, 03:59:59 PM	10:44:12	13:15:48
3	Tue, October 7, 2025, 05:15:47 AM	Tue, October 7, 2025, 03:59:59 PM	10:44:12	13:15:48
4	Mon, October 6, 2025, 05:15:45 AM	Mon, October 6, 2025, 03:59:59 PM	10:44:14	13:15:48
5	Fri, October 3, 2025, 05:15:47 AM	Fri, October 3, 2025, 03:59:59 PM	10:44:12	61:15:46
6	Thu, October 2, 2025, 05:15:47 AM	Thu, October 2, 2025, 04:00:00 PM	10:44:13	13:15:47
7	Wed, October 1, 2025, 05:15:47 AM	Wed, October 1, 2025, 03:59:59 PM	10:44:12	13:15:48

Figure 10: Data Log for UV-9 Supply Fan Status, Showing UV-9 Starting in Heating Optimum Start Mode Every Day at 5:15 AM from October 1 – 9, 2025

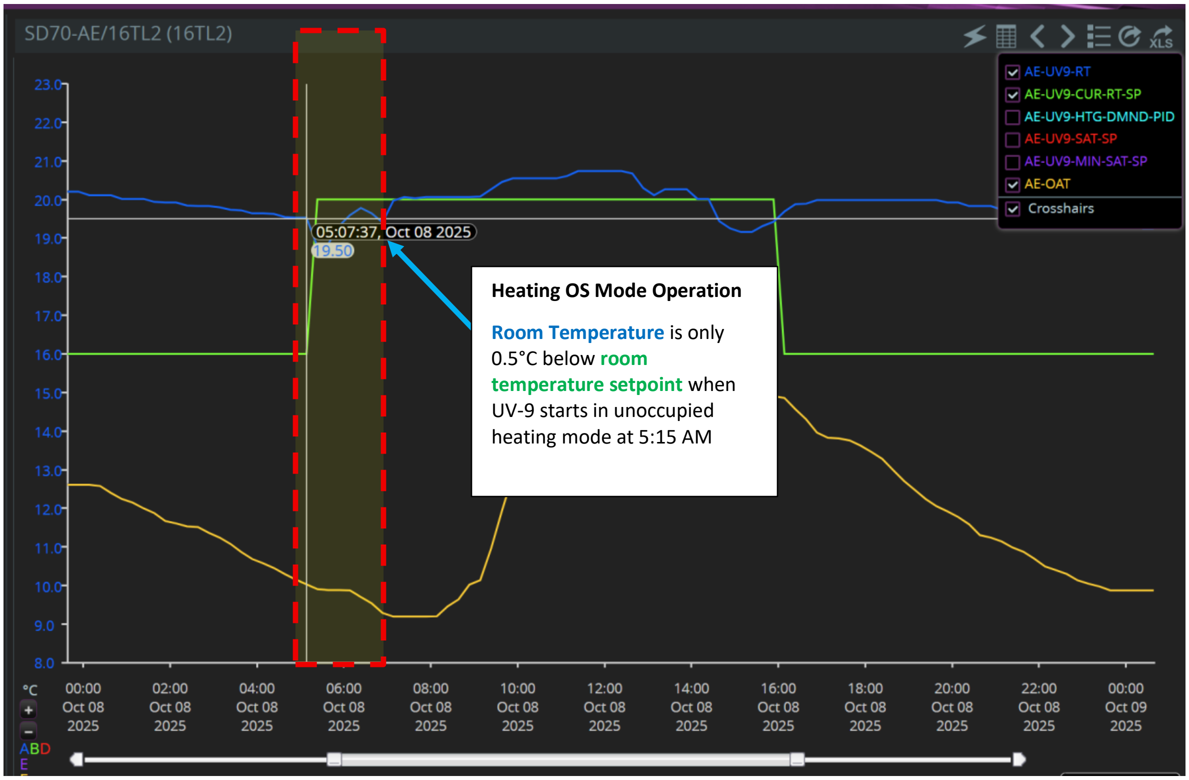


Figure 11: DDC Trend Log Data of UV-9 Room Temperature (BLUE), Room Temperature Setpoint (GREEN), and Outdoor Air Temperature (YELLOW) on October 8th, 2025.

Figure 12: DDC Trend Log Data of UV-9 Heating Coil Valve (RED) and OAT (YELLOW)

5.7.2 Measure Description

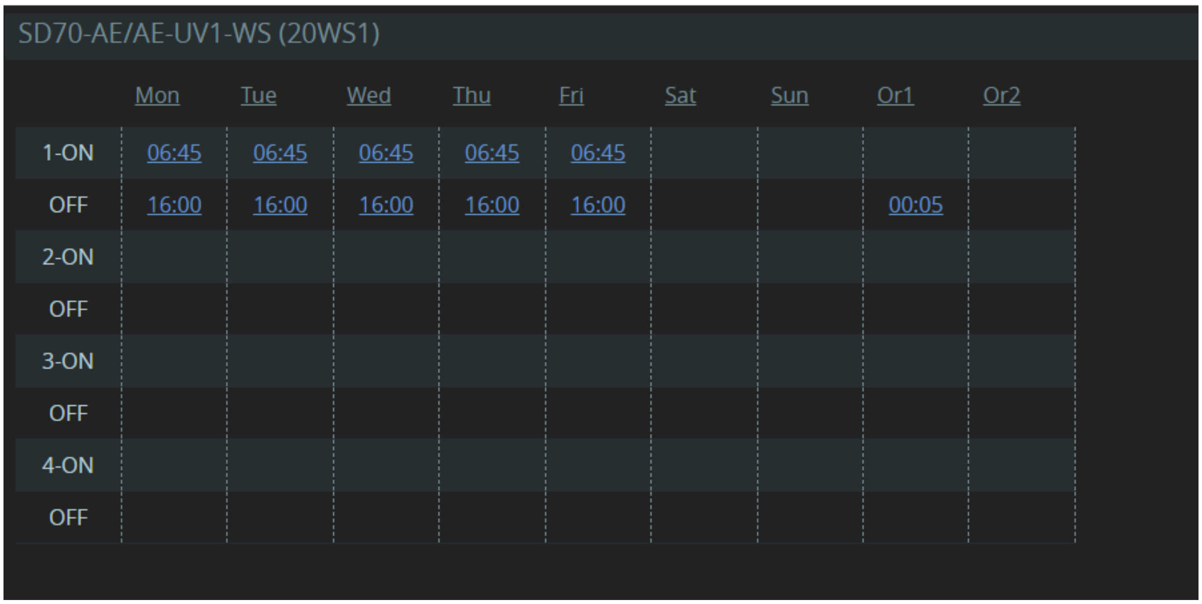
Adjust the heating coil valve control for unit ventilators in heating OS mode to increase the rate of room temperature increase.

5.8 Measure 8: Reduce Unit Ventilator Weekly Schedules

5.8.1 Description of Finding

Unit ventilators, serving individual classrooms, are typically scheduled from 6:45 AM to 4:00 PM, Monday to Friday. For example, Figure 13 shows the weekly schedule for UV-1 set on the building automation system (BAS) as of October 2025. All unit ventilators are programmed with heating and cooling optimum start logic that allows them to enable up to 1.5 hours before their scheduled start time for pre-cooling and pre-heating.

It is expected that most classrooms are unoccupied before 8:00 AM, and that most unit ventilator schedules can be reduced to better align with building occupancy.



SD70-AE/AE-UV1-WS (20WS1)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Or1	Or2
1-ON	06:45	06:45	06:45	06:45	06:45				
OFF	16:00	16:00	16:00	16:00	16:00			00:05	
2-ON									
OFF									
3-ON									
OFF									
4-ON									
OFF									

Figure 13: UV-1 Weekly Schedule as Set on the Building Automation System

5.8.2 Measure Description

Reduce unit ventilator schedules to align with classroom occupancy.

Extending maximum start time in optimum start mode, if needed, to ensure classrooms are at comfortable temperatures for morning occupancy.

6.0 Measures to be considered for Future Implementation

This section provides an overview of each measure that was identified but **was not selected** as part of this C. Op. project. These measures either require further investigation or were determined to have lengthy payback periods. Energy savings and estimated retrofit costs were not quantified for the measures presented in this section.

6.1 Measure 1: Rectify Heating Distribution Pump VFD Speed Control

6.1.1 Description of Finding

The hot water distribution pumps, P-3 and P-4, are each equipped with a variable speed drive (VFD). Programming is in place which is intended to reset the P-3 and P-4 VFD speeds based on the average position of downstream heating coil control valve (HCV) positions.

The P-3 and P-4 VFD speed resets are currently programmed to reset the VFD speeds based on binary variables, AE-AH3-OA-HTG-ALLOWD and AE-AH3-OA-CLG-ALLOWD, respectively. As a result, the P-3 and P-4 VFD speeds are always controlling their minimum allowable speed of 35%.

Figure 14 shows a screenshot of the heating water system BAS graphic, highlighting the P3 and P4 VFD speeds and average HCV positions. The average HCV positions are showing as “Yes” and “No”, where an average valve position would typically be shown as a percentage value. Both pumps are controlling to their minimum speeds of 35%.

Figure 15 shows a screenshot of programming controlling P-3, highlighting the VFD speed reset. The VFD speed reset is controlled by AE-AH3-OA-HTG-ALLOWD, which is a binary value, returning a value of zero or one.

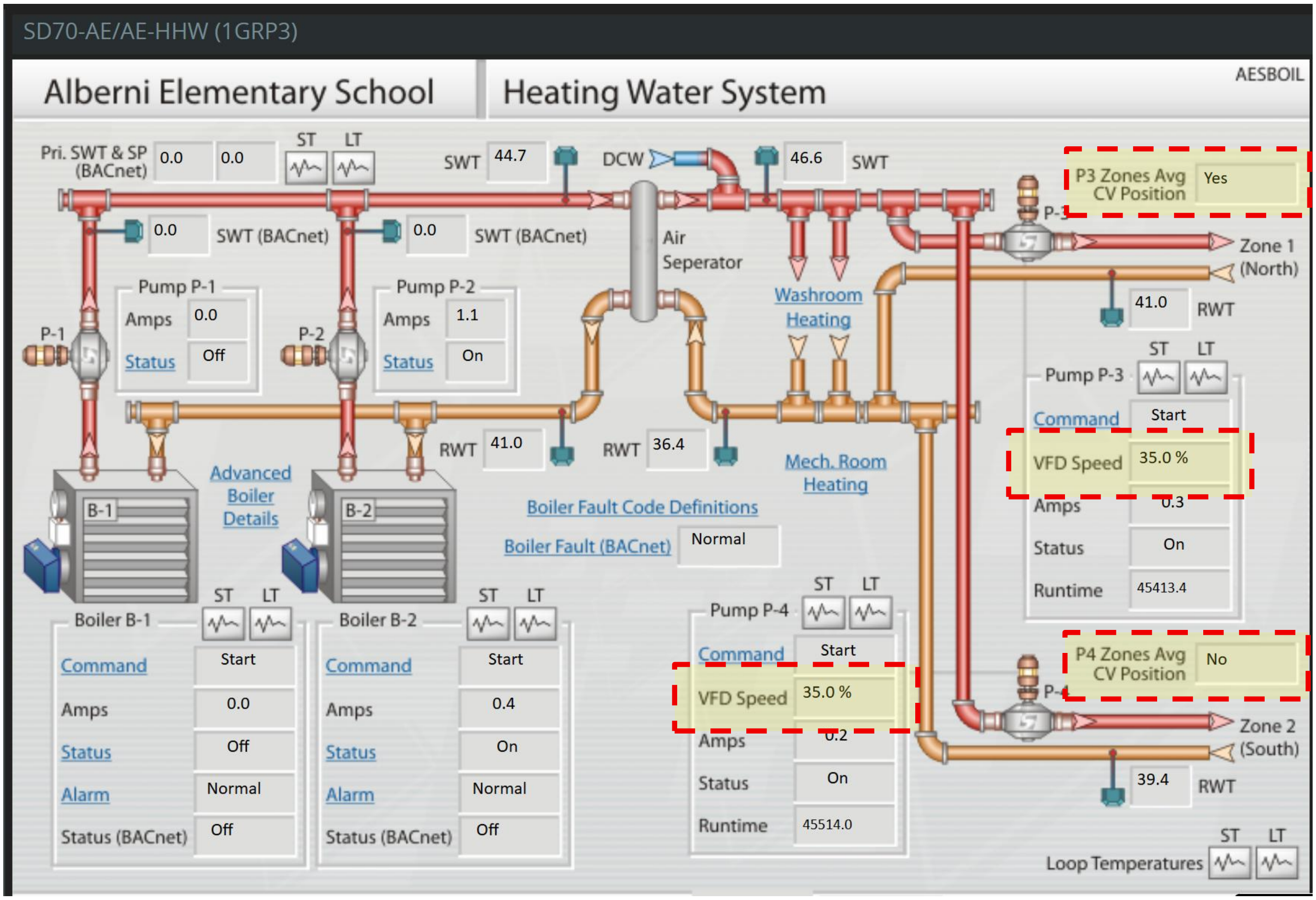


Figure 14: Screenshot of Building Automation System Graphics for Hot Water Distribution System, Highlighting P-3 and P-4 Pump Speeds and Average Control Valve Positions

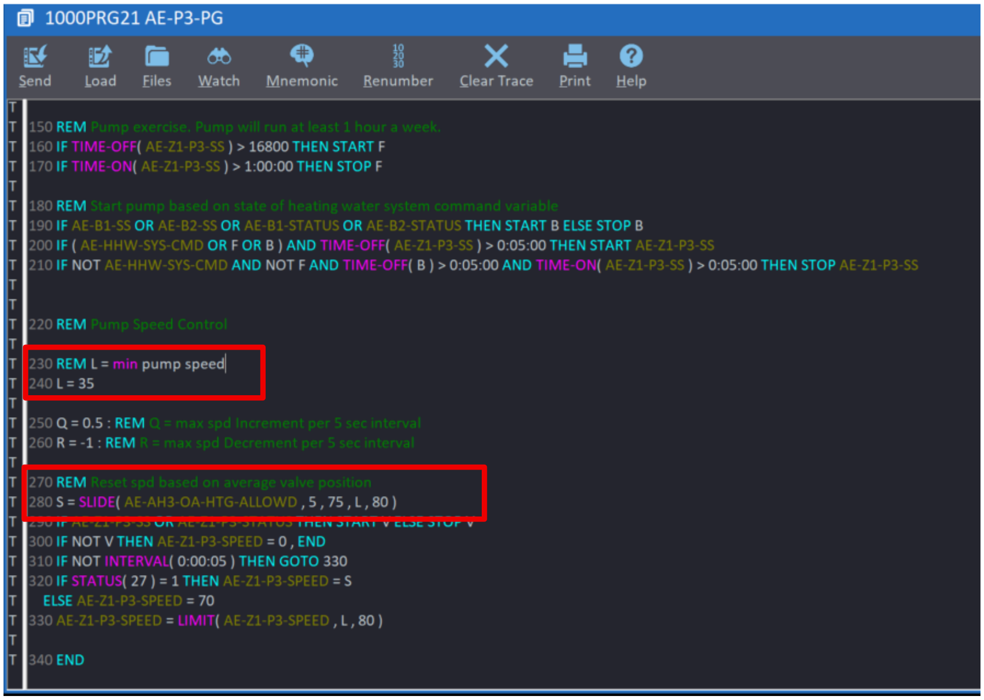


Figure 15: Screenshot of Control Program 1000.PRG.21, Which Control Hot Water Distribution Pump P-3

6.1.2 Measure Description

Control the P-3 and P-4 VFD speeds based on the average heating control valve position.

Implementation of this measure will result in both P-3 and P-4 running at higher VFD speeds, resulting in an increase in electricity consumption. Updating the speed control of these pumps is expected to improve control and tenant comfort during colder weather conditions.

7.0 Next Steps – Implementation Phase and Completion Phase

7.1 Implementation Phase

To continue in the program, the owner is responsible for implementing the selected bundle of measures that pay back in two years or less. Using the *Recommissioning Report* for implementation allows flexibility in how the selected measures are implemented. Options include: utilize in-house building staff, hire the C.Op Provider to implement or provide technical assistance, contract with outside service contractors, or any combination of the above.

7.2 Completion Phase

C.Op Service provider will follow up after implementation of the selected measures and **update** this *Recommissioning report and Recommissioning Workbook*.

The updated report for the implemented measures includes but not limited to: date of completion of each measure, new or improved sequences of operation, the energy savings impact of the measures, the requirements for ongoing maintenance and monitoring of the measures, and contact information for the service provider, in house staff, and contractors responsible for the implementation. When feasible, verification data should include trends or functional test results, though other methods, such as copies of invoices, site visit reports, and before/after photos, may be acceptable.

The C.Op Service Provider will conduct an in-house (teleconference) session for the Applicant and the appropriate building operations personnel covering the new documentation, measures that were implemented, and requirements for ongoing maintenance and monitoring. Document the attendance of the building operations staff.

The *updated Recommissioning Workbook* and *updated Recommissioning Report* will be submitted to the owner and the program for review. See Appendix B: Completion Phase Summary Table for more details on implemented measures.

8.0 Appendix A: Investigation Phase Summary Table

Investigation Phase Summary				Investigation Phase							
				Energy Savings			Cost Savings	Financial		Est. GHG Reduction	
ECM #	Measure Title	Measure History	Include cost	Demand (kW)	Electrical (kWh/yr)	Fuel (GJ)	Total ($/yr)	Estimated Measure Cost ($)	Simple Payback (yrs)	tonnes CO2e/yr	Enter "x" if DESELECT for implementation
ECM-1	Update the Holiday Calendar	New	1	-	2,362	18	$ 403	$ -	-	0.9	
ECM-2	Reduce the Purge Mode Calendar and Update Cooling OS Programming	New	1	-	1,037	-	$ 107	$ 1,900	17.8	0.0	
ECM-3	Rectify 24/7 Operation of AHU-1, AHU-2, and AHU-3 During Summer Break	New	1	1	9,883	-	$ 1,122	$ -	-	0.1	
ECM-4	Reduce AHU-1 and AHU-2 Weekly Schedules	New	1	-	1,358	2	$ 161	$ -	-	0.1	
ECM-5	Increase AHU-1 and AHU-2 Unoccupied Cooling Setpoints	New	1	-	1,114	-	$ 115	$ -	-	0.0	
ECM-6	Program OADs Closed in Unoccupied Heating and Heating Optimum Start Modes	New	1	-	-	17	$ 153	$ 1,000	6.5	0.9	
ECM-7	Adjust Unit Ventilator HCV Control in Heating OS Mode	New	1	-	805	-	$ 83	$ 2,400	28.9	0.0	
ECM-8	Reduce Unit Ventilator Weekly Schedules	New	1	-	1,918	6	$ 252	$ 1,000	4.0	0.3	
			TOTAL (Previous, still working):	-	-	-	$ -	n/a	n/a	-	
			TOTAL (All potential measures for Implementation):	1	18,478	44	$ 2,396	$ 6,300	2.6	2.4	
			TOTAL (Selected measures only):	**1**	**18,478**	**44**	**$ 2,396**	**$ 6,300**	**2.6**	**2.4**	
							Implementation cap @$0.25/ft2	$ 12,621			

9.0 Appendix B: Completion Phase Summary Table

To be completed during the completion phase.

10.0 Appendix C: Sample Training Outline

The Commissioning Provider (C.Op Provider) may customize the outline for the training and developing the training materials. Before preparing the training outline and materials, the C.Op Provider should assess the related level of knowledge of the building operators, to set up the training accordingly. For reference, the Program provides the following sample outline for the training:

- Background on the energy use of this particular building
    - Present Energy Utilization Index
    - Describe Operating Schedules and Owner's operating requirements
- RCx investigation process used in this building
    - Describe the methods used to identify problems and deficiencies
    - Review the RCx Workbook
- Implementation process in this building
    - Describe the measures that were implemented and by whom
    - Walk around the building to look at any physical changes or step through the new control sequences at the operator workstation
    - Provide as many details about implementation as necessary to describe what was done
    - Describe improved performance that these measures will create (show trends if available)
- O&M requirements
    - Describe the O&M requirements needed to keep these improvements working
    - Describe how the staff can be aware of energy efficiency opportunities and begin looking for additional savings potential

The C.Op Provider should follow the outline to prepare materials, as necessary, to hand out at the training session.

11.0 Appendix D: Training Completion Form

Project ID

Facility Information

Company Name	Building Name(s)	
Facility Address	City	Province

Training Details

Location	Date
Commissioning Provider/Trainer	

Materials Attached

☐ Agenda
☐ Materials used for training
☐ List of individuals who attended

COMMISSIONING PROVIDER SIGNATURE

By signing this Training Completion Form, I verify that this training took place with the listed attendees.	
Commissioning Provider (print name):	
Signature:	Date:

FACSIMILE/SCANNED SIGNATURES: Facsimile transmission of any signed original document, and the retransmission of any signed facsimile transmission, shall be the same as delivery of the original signed document. Scanned original documents transmitted to BC Hydro as an attachment via electronic mail shall be the same as delivery of the original signed document. At the request of BC Hydro, C.Op Provider shall confirm documents with a facsimile transmitted signature or a scanned signature by providing an original document.

Targeted Documentation

O & M Manual

O & M Manual updated	☐	Describe updates below and attach copies of new or amended portions
O & M Manual not updated	☐	Province reasons below
Building has no O & M Manual	☐	

Building Plans ("as-builts")

Building Plans updated	☐	Describe below
Wiring diagrams updated	☐	Describe below
No plans or diagrams updated	☐	Describe below

EMS Programming

New sequences of operation on file	☐	Specify location of file and attach copy
Printed screenshots on file	☐	Specify location of file and attach copy

Equipment Manuals

Manuals for new equipment are on file ☐	Describe below (attach copy if applicable)

Checklist of subjects discussed at training

Explain investigation process and how measures were identified	☐
Describe implemented measures, and how they are reducing energy usage	☐
Building walkthrough to show implemented measures	☐
Describe methods for monitoring and maintaining optimum system performance related to implemented measures	☐
Describe scenarios where system setting changes would be required, and how to maintain optimum energy efficiency, e.g., seasonal-based manual adjustments to setpoints.	☐

List of Individuals Who Attended

Name	**Title**	**Building (address or name)**	**Contact information (e-mail and/or phone number)**

Continuous Optimization Investigation Report

School District 70 | E.J. Dunn Elementary School
3500 Argyle Street, Port Alberni, BC V9Y 3A8
BCH Project #: BCH-11742
Prism Project #: 2025021

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Version	Updated on	Phase
v0.1	December 9, 2025	Investigation Draft

Limits of Liability

This report was prepared by Prism Engineering Limited for School District 70. The material in it reflects our professional judgement considering the information available to us at the time of preparation. The savings calculations are estimates of savings potential and are not guaranteed. The impact of building changes, building use changes, new equipment, additional computers, and weather needs to be considered when evaluating savings. Without express written permission, any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Prism Engineering Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Document Authentication

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TABLE OF CONTENTS

1.0 Introduction

Prism Engineering is pleased to present the results of the Investigation Phase that was conducted as part of BC Hydro's Continuous Optimization for Commercial Buildings Program for E.J. Dunn Elementary School. The objective of an Investigation is to identify deficiencies and improvements in the operation of a facility's mechanical equipment, lighting, and related controls, and determine opportunities for corrective action that reduce energy consumption and preserve the indoor environmental quality.

This document is a complete record of the work performed at this facility, including the in-depth investigation of the building systems and the implementation of selected measures to optimize building performance.

The Recommissioning Investigation Report provides an overview of the recommendations for the implementation of measures. This information is not considered a specification or detailed sequence of operations. The intent is to provide an overview of the recommendation that can be built upon during the implementation phase as part of any detailed design that may be required. Certain measures may require further investigation and specification for the correct implementation by the owner or the DDC contractor.

Seven recommended retrofits were identified as a part of this investigation. The proposed measures will be reviewed in a meeting with School District 70 and Prism Engineering representatives to determine which measures will be implemented.

Recommended retrofits for implementation include:

- Measure 1: Rectify 24/7 Operation of AHU-1
- Measure 2: Update the Holiday Calendar
- Measure 3: Reduce AC-1 Schedule
- Measure 4: Program Unit Ventilator OADs Closed in Unoccupied Heating and Heating OS Modes
- Measure 5: Reduce Unit Ventilator Weekly Schedules
- Measure 6: Implement a Demand Based Reset for the Building E Primary Hot Water Supply Temperature Setpoint
- Measure 7: Enable the Building E Heating Distribution Pumps Based on Heating Demand

These measures are presented in the Investigation Summary Table (see Appendix A).

2.0 Project Overview

Project Information

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RCx Project File #	**BCH-11742**
Date of Workbook Update	05-Dec-2025
Organization	School District 70
Building Name	E.J. Dunn Elementary
Building Type	Large School
Location (City)	Port Alberni
Owner Contact	Alex Taylor
Investigation Phase start date	09-Sep-2025
Participated in previous BCH RCx program?	No
Previous RCx File #	
Previous RCx completion date	

Building Information

Facility Area (ft2)	58,383		
Annual elec consumption (kWh)	285,487	4.9	kWh/ft^2
Annual elec costs ($)	$ 32,423	$ 0.11	Avg. $/kWh
Fuel type	Natural Gas		
Annual fuel consumption (GJ)	1,755	8.3	$ekWh/ft^2$
Annual fuel cost ($)	$ 22,110	$ 12.6	Avg. $/GJ
Total GHG emissions (tCO2e/yr)	87		
Total Energy Cost	$ 54,533	$ 0.93	$\$/ft^2$
Energy Use Intensity (ekWh/ft2)	13.2		
Year for energy data above	2024		

3.0 Savings Summary

Savings Summary	Previous, still working	New + Previous, rectify + Previous, documented					
		Identified		Selected		Implemented	
# of measures	0	7		7		0	
	Re-claim Savings	Total Savings	% Savings	Total Savings	% Savings	Total Savings	% Savings
Electrical savings (kWh/yr)	-	27,098	9.5%	27,098	9.5%	-	0.0%
Fuel savings (GJ/yr)	-	248	14.2%	248	14.2%	-	0.0%
Cost savings ($)	$ -	$ 4,978	9.1%	$ 4,978	9.1%	$ -	0.0%
Estimated GHG reduction (tCO2e/yr)	-	12.7	14.6%	12.7	14.6%	-	0.0%
# of Abandoned measures	**0**						

4.0 Brief Description of Existing System

This section contains a brief description of the existing HVAC and Controls system. The information is intended to provide a general overview only.

4.1 Facility Description

E.J. Dunn Elementary School consists of six separate buildings, each one story above grade, and has a total floor area of 58,383 ft^2.

The six buildings are described below and labelled in Figure 1.

- Building A – Woodshop, Mini Gymnasium, Classrooms
- Building B – Administration Office
- Building D – Classrooms
- Building E – Mechanical Room, Storage
- Building F – Family Hub
- Building G – Large Gymnasium

Figure 1: Labelled Satellite Image of E.J. Dunn Elementary School

4.2 Mechanical Systems Description

4.2.1 Heating Systems

4.2.1.1 Building E Boiler System

The building E boiler systems serves terminal units including unit ventilator heating coils, re-heat coils, and hydronic convectors (wall-mounted and baseboards).

The piping configuration consists of a primary boiler loop and three secondary heating distribution loops. The secondary loops are hydraulically separated from the primary loop by a low-loss header. Boiler 1 serves the primary loop, while Boiler 2 is piped off the secondary distribution supply, as shown in Figure 2.

The building E boilers were installed in 2011.

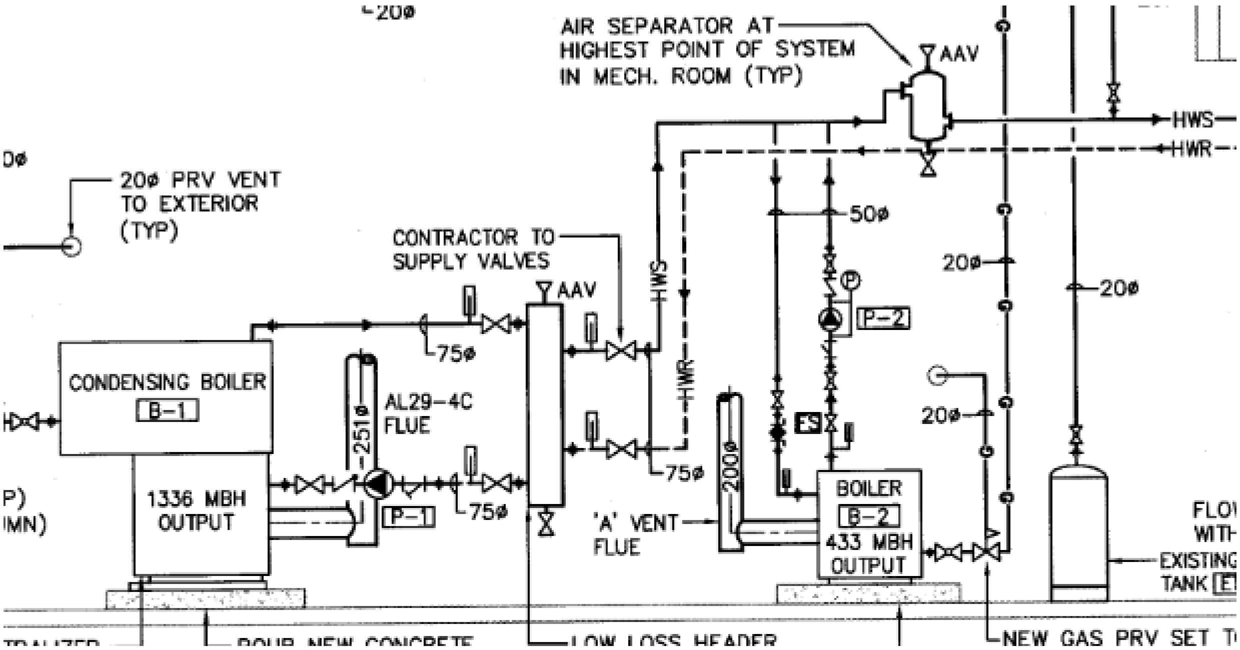

Figure 2: Piping Schematic of the Building E Boiler System

Table 1: Summary of Building E Boilers

Tag	Make/Model	Heating Output (MBH)	Notes
B-1	Viessmann Vitocrossal 300 CT3-37	1,336	Loop #1 – Bldg. E Loop #2 – Bldg. D Loop #3 – Bldg. A, B, F Condensing.
B-2	Viessman Vitorond 200 VD2A-195	673	Loop #1 – Bldg. E Loop #2 – Bldg. D Loop #3 – Bldg. A, B, F Non-Condensing.

Table 2: Summary of Building E Boiler System Hot Water Distribution Pumps

Tag	Description	Power	Flow (GPM)	Notes
P-B1	Boiler 1 Primary Circulator	620 W	Unknown	Constant speed.
P-B2	Boiler 2 Primary Circulator	244 W	Unknown	Constant speed.
P-3	Loop #1 – Bldg. E	Unknown	3	Constant speed.
P-4	Loop #2 – Bldg. D	570 W	45	Constant speed.
P-5	Loop #3 – Bldg. A, B, F	1,100 W	60	Constant speed.

4.2.1.2 Gymnasium Boiler System

The gymnasium heating system consists of a primary boiler loop and two secondary loops – one serving the music room and change-room terminal units, and one serving the AHU-1 heating coil.

AHU-1 is equipped with a 3-way valve and served by a constant volume booster pump, while the other terminal unit heating coils are equipped with 2-way valves.

The gymnasium boiler was installed in 2011.

Table 3: Summary of the Gymnasium Boiler

Tag	Make/Model	Heating Output (MBH)	Notes
B-1	Viessmass Vitorond 200 VD2A-125	432	Gymnasium Boiler Serves Music Room/Change Room Heating Loop, and AHU-1 Non-Condensing.

Table 4: Summary of Gymnasium Boiler System Hot Water Distribution Pumps

Tag	Description	Power	Flow (GPM)	Notes
P-1X	B-1 (Gym) Primary Circulator	85 W	30	Constant speed.
P-2X	AHU-1 Circulator	276 W	21	Variable speed.
P-3X	Music Room / Change Room Heating Loop	1/2 hp	10	Constant speed.

4.2.2 Ventilation

Ventilation is provided to the gymnasium by one air handling unit (AHU), while unit ventilators provide ventilation to individual classrooms, staff rooms, the admin office, and other miscellaneous spaces. Ventilation is provided to the building F kitchen by a roof-top make-up air unit (MUA).

Various fractional exhaust fans serve each building.

Table 5: Summary of Air Handling Units and Packaged Roof-top Units

Tag	Service Area	Power (HP)	Flow (CFM)	Notes
AHU-1	Gym	2 x 3.75 hp	Est. 10,000	CO_2 control. Variable speed fans.

Tag	Service Area	Power (HP)	Flow (CFM)	Notes
				Mixed-air unit. Hydronic heating coil. No cooling.
MUA-1	F-Building – Kitchen	1.5 hp	1,780	Constant speed fan. Gas burner, 150 MBH heating capacity. Not controlled on DDC system.

Table 6: Summary of Unit Ventilators

Tag	Make/Model	Power (HP)	Flow (CFM)	Notes
UV (Typical - Bldg A, B, F, E, G)	Temspec HUV 1600	3/4	1,600	CO_2 and occupancy sensor control. Constant speed fans. Mixed-air units. Hydronic heating coil.
UV (Typical - Bldg D)	Apollo UV 1200-HH	1/2 hp	1,200	Refurbished in 2025. CO_2 and occupancy sensor control. Variable speed fans. Mixed-air units. Hydronic heating coil.

4.2.3 Cooling

Cooling is provided to the admin office, computer lab, classroom 119, and building F library by four packaged roof-top units (RTUs). These units run year-round, providing supply air to hydronic heating coils during cold weather periods for space heating.

AC-3 and AC-4 nameplate data was not visible during the site visit, and the operations team was unable to provide technical data for these units. The motor power and air flow rating of these two units was estimated to be the same as AC-1 for the purpose of preparing energy savings calculations related to this report.

Table 7: Summary of Packaged Roof-top Units

Tag	Service Area	Power (HP)	Flow (CFM)	Notes
AC-1	B-Building - Office	1.44 hp	1,500	Carrier 50FC-A06A2A5A0F0A0 Packaged roof-top unit. Constant speed fan. Integrated economizer. 5-ton cooling capacity. Single scroll compressor, single stage cooling.
AC-2	D-Building – Computer Lab & Adjacent Office	1.76 hp	1,800	Carrier 50FC-M07A2A5A6F0A0 Packaged roof-top unit. Constant speed fan.

Tag	Service Area	Power (HP)	Flow (CFM)	Notes
				Integrated economizer. 6-ton cooling capacity. Single scroll compressor, 2 stage cooling. Heating provided by downstream re-heat coils.
AC-3	D-Building Classroom 119	Est. 1.44 hp	Est. 1,500	Packaged roof-top unit. Constant speed fan. Integrated economizer. DX cooling coil & hydronic heating coil.
AC-4	F-Building - Library	Est. 1.44 hp	Est. 1,500	Packaged roof-top-unit. Constant speed fan. Mixed-air unit. DX cooling coil & hydronic heating coil.

4.2.4 Domestic Hot Water System

Domestic hot water (DHW) is generated by an electric water heater located in the gymnasium boiler room and re-circulated by a re-circulation pump.

Table 8: Summary of DHW System

Tag	Make/Model	Heating Input
DHW	GSW G9-50SDE-30 250	6 kW

4.2.5 Controls System

The mechanical systems in this building are controlled by a Direct Digital Control (DDC) Building Automation System (BAS). The system is manufactured by Reliable Controls.

Building D unit ventilators and associated DDC controls were replaced in 2025.

5.0 Measures Selected for Implementation

This section provides an overview of new measures identified in this Round of Investigation, including recommendations for implementation, and updates post implementation.

For each measure, costs, savings and payback calculations can be referenced in the *Investigation Summary Table* (see Appendix A).

5.1 Measure 1: Rectify 24/7 Operation of AHU-1

5.1.1 Description of Finding

AHU-1, which serves the gymnasium, has been running 24/7 since August 25th, 2025, due to a manual override on the supply fan command. The manual override is highlighted in Figure 3.

During unoccupied hours, this unit can be disabled, resulting in a reduction in natural gas use associated with ventilation and electricity use associated with fan run-time.

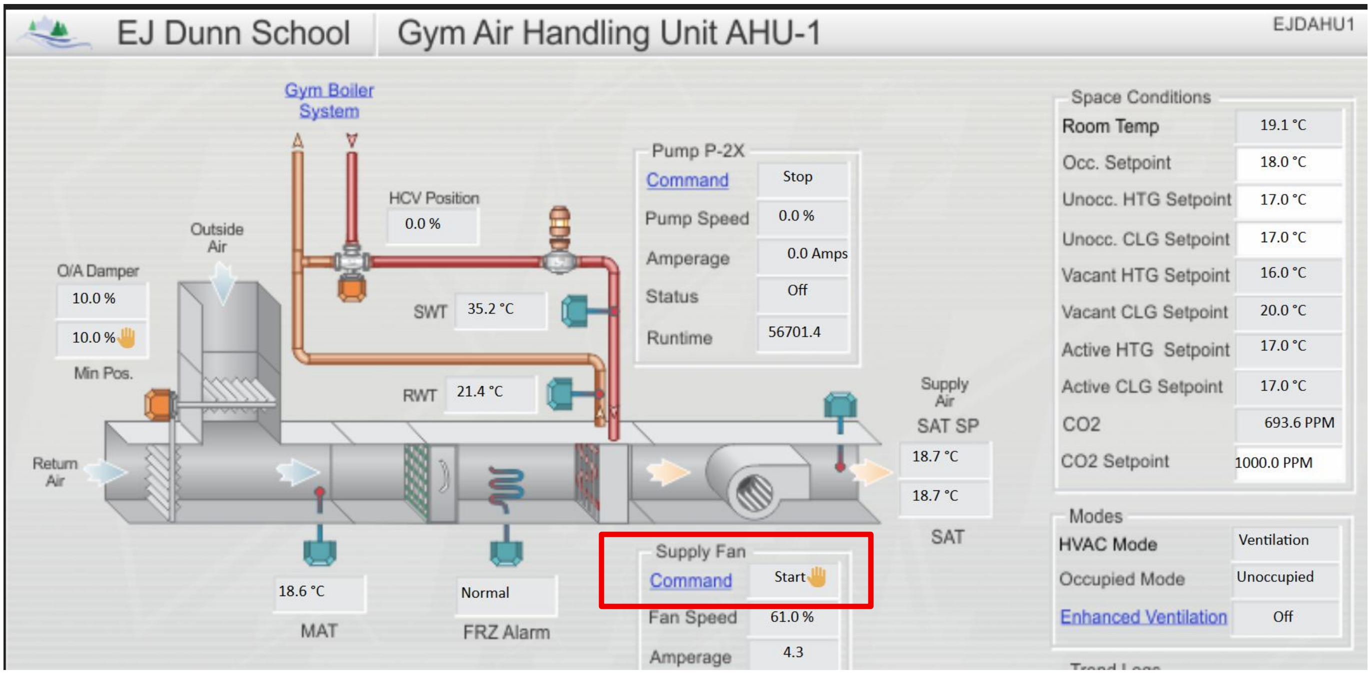

Figure 3: Screenshot of the AHU-1 Building Automation System Graphic, Highlighting a Manual Override on the Supply Fan Command

5.1.2 Measure Description

Remove the manual override on the AHU-1 supply fan command and restore scheduled operation.

5.2 Measure 2: Update the Holiday Calendar

5.2.1 Description of Finding

The four RTUs, AHU-1, and unit ventilator weekly schedules are disabled on statutory holidays and during school break periods by a holiday calendar setup on the building automation system (BAS). The holiday calendar currently captures one statutory holiday (January 1), the summer break period in July and August, and three days during the winter break period (December 24, 25, and 26), as shown in Figure 4.

As per the 2025-2026 school calendar, the school is closed from December 22, 2025, to January 3, 2026, and from March 9, 2026, to March 22, 2026.

Figure 4: Screenshot of the EJ Dunn Elementary Holiday Calendar Set on the Building Automation System

5.2.2 Measure Description

Expand the holiday calendar to include the winter and spring break periods, and any statutory holidays that are not already scheduled.

Savings assume that the school is unoccupied during the winter and spring break periods, and that AHU-1, the four RTUs, and all unit ventilators can be scheduled off for the entirety of these periods.

5.3 *Measure 3: Reduce AC-1 Schedule*

5.3.1 Description of Finding

AC-1, serving the admin office in building B, is currently scheduled to run from 7:30 AM to 10:00 PM, Monday to Friday, as shown in Figure 5.

It is assumed that the admin office is typically unoccupied from 5:00 PM to 10:00 PM, Monday to Friday.

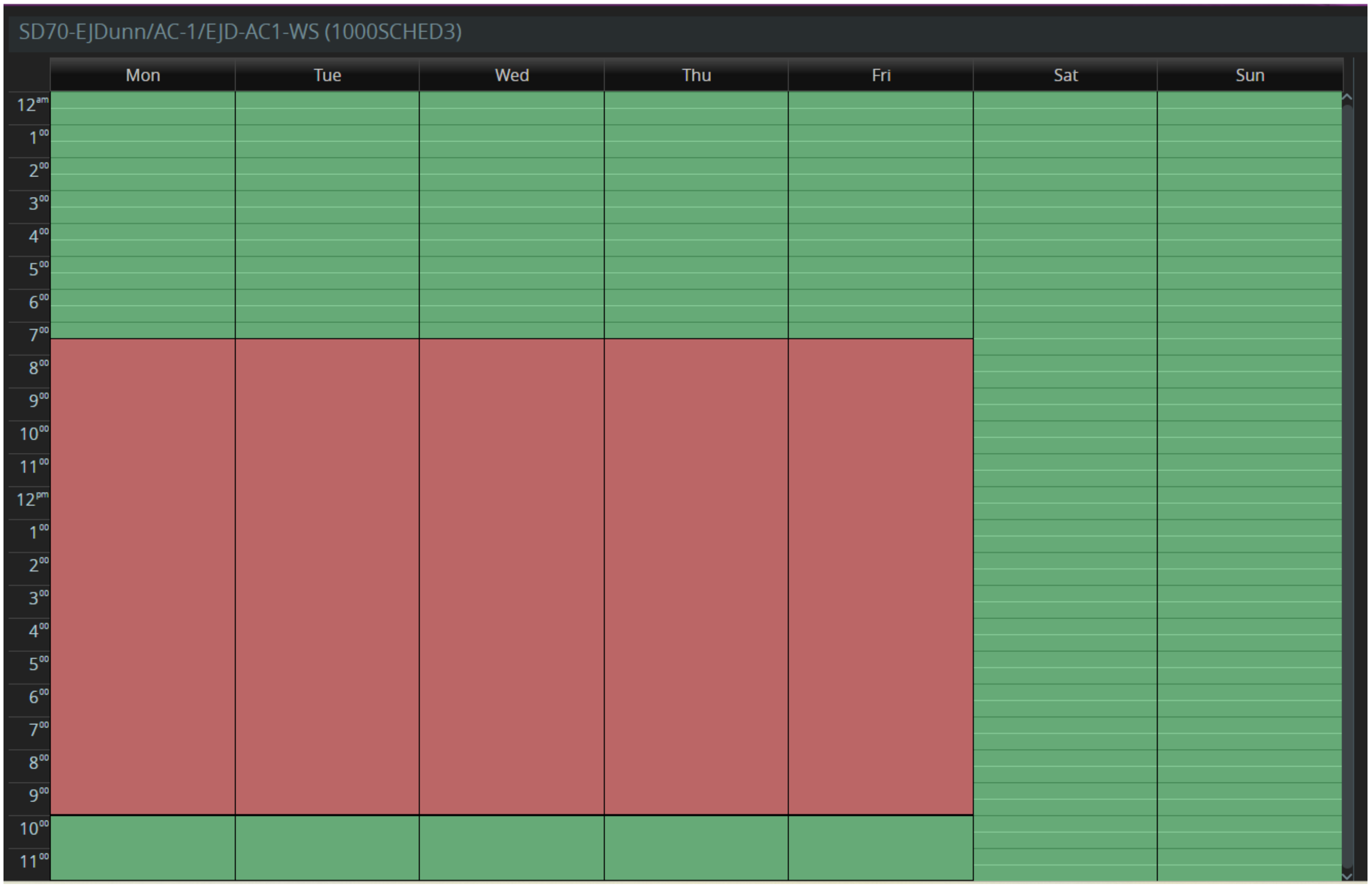

Figure 5: Screenshot of AC-1 (Admin Office) Schedule set on BAS

5.3.2 Measure Description

Reduce the AC-1 schedule to align with building B admin office occupancy.

5.4 Measure 4: Program Unit Ventilator OADs Closed in Unoccupied Heating and Heating OS Modes

5.4.1 Description of Finding

All unit ventilators in buildings A, B, E, F, and G were found to be operating in unoccupied heating mode and heating OS mode with their outdoor air dampers (OAD) open to their minimum positions. As an example, Figure 6 shows a DDC trend log of the UV-B1 OAD during a period on October 14, 2025, where UV-B1 was enabled in heating OS mode from 5:15 AM – 6:45 AM. The OAD was open to its minimum position of 10% during this period.

During unoccupied hours, outdoor air ventilation is not required, and OADs can be 0% open, eliminating the ventilation heating load.

The building D unit ventilators, which were upgraded in the summer of 2025, were found to have their OADs closed during unoccupied heating and heating OS modes, so are not part of this measure.

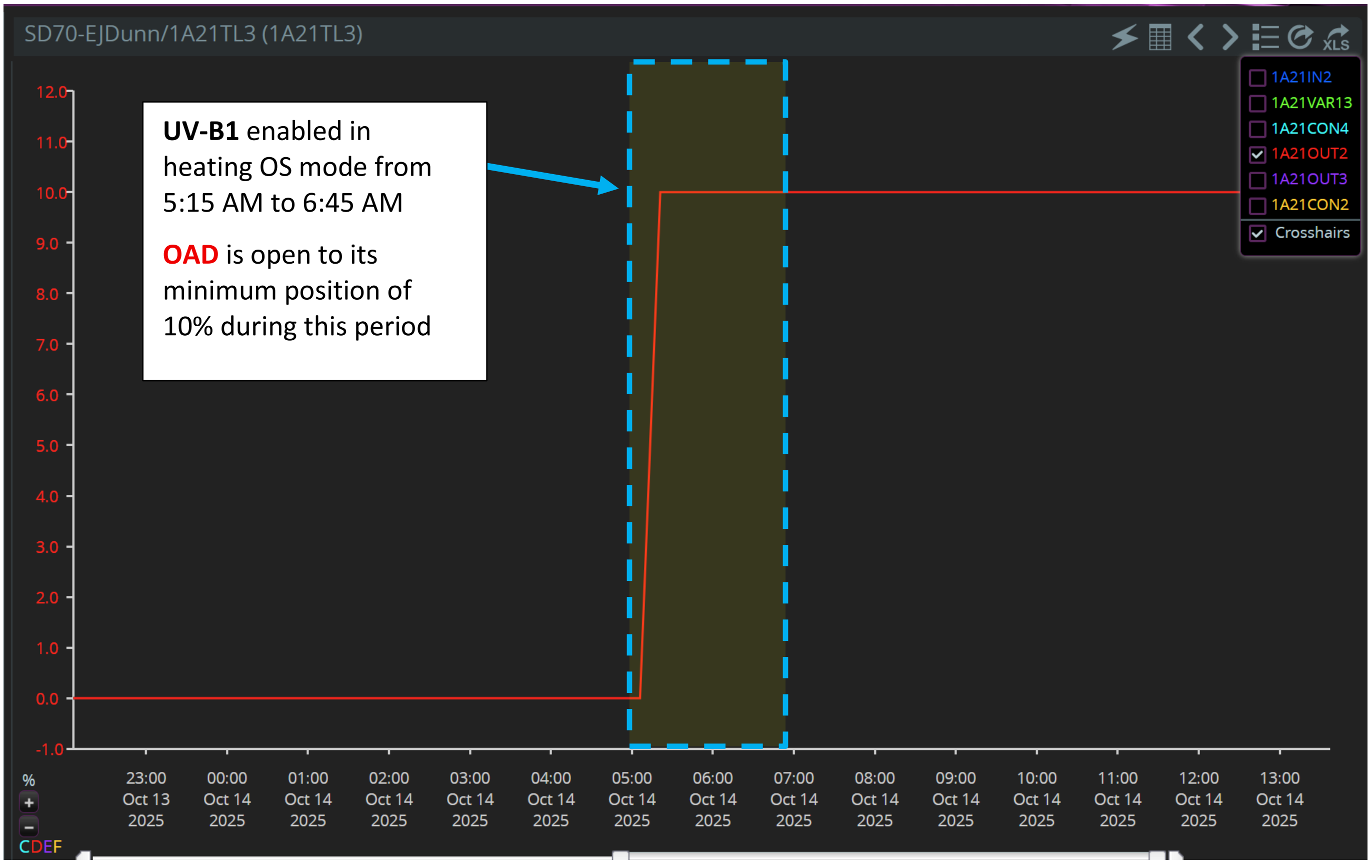

Figure 6: DDC Trend Log of UV-B1 Outdoor Air Damper Position, Highlighting a Period of Operation in Heating OS Mode on October 14, 2025.

5.4.2 Measure Description

Program unit ventilator outdoor air dampers in buildings A, B, E, F, and G closed during unoccupied heating and heating OS modes.

5.5 Measure 5: Reduce Unit Ventilator Weekly Schedules

5.5.1 Description of Finding

Unit ventilators in buildings A, B, E, F, and G are typically scheduled from 6:45 AM to 4:00 PM, Monday to Friday, and unit ventilators in building D are typically scheduled from 7:00 AM to 4:00 PM. For example, Figure 7 shows the weekly schedule for UV-A3 set on the building automation system (BAS) as of October 2025. All unit ventilators are programmed with heating and cooling optimum start logic that allows them to enable up to 1.5 hours before their scheduled start time for pre-cooling and pre-heating.

It is expected that most of the school is unoccupied before 8:00 AM, and that unit ventilator schedules can be reduced to better align with building occupancy.

SD70-EJDunn/EJD-A3-WS (1A25WS1)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Or1	Or2
1-ON	06:45	06:45	06:45	06:45	06:45				
OFF	16:00	16:00	16:00	16:00	16:00			00:05	
2-ON									
OFF									
3-ON									
OFF									
4-ON									
OFF									

Figure 7: UV-A3 Weekly Schedule, as Set on the Building Automation System

5.5.2 Measure Description

Reduce individual unit ventilator schedules to align with building occupancy.

If needed, update the maximum allowable start time in heating OS mode for unit ventilators, such that spaces are at a comfortable temperature when occupants arrive.

5.6 Measure 6: Implement a Demand Based Reset for the Building E Primary Hot Water Supply Temperature Setpoint

5.6.1 Description of Finding

The building E heating plant is enabled 24/7 from October 1 – May 31 when outdoor air temperature is below 15°C. When the heating plant is enabled, the boiler 1 hot water supply temperature (HWST) was observed to be maintained at 75-80°C, year-round.

Figure 8 shows as trend log of the boiler 1 supply and return water temperatures, and the boiler 1 reset. The HWST does not respond to changes in the boiler 1 reset, and the supply temperature is consistently maintained at 75-80°C. The boiler 1 reset is controlled based on outdoor air temperature (OAT).

During low heating load conditions, the building's heating load can be met with a lower HWST, significantly improving the efficiency of the condensing boiler (boiler 1).

Based on natural gas utility data and Port Alberni weather station data, boiler 1 has enough heating capacity to meet most of the system's year-round heating load.

Boiler 2 is a non-condensing boiler.

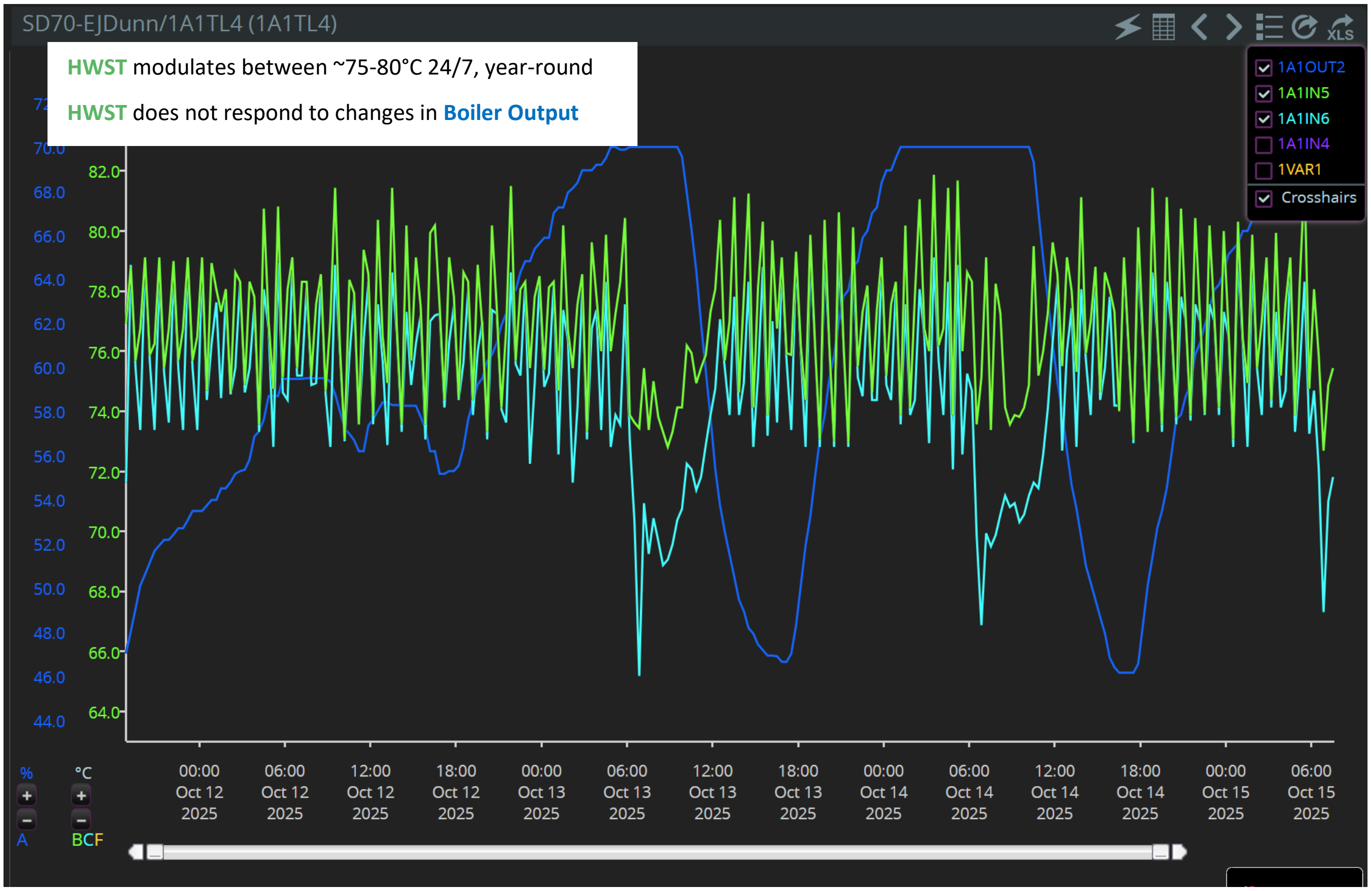

Figure 8: Building E Boiler 1 Entering Water Temperature (LIGHT BLUE), Boiler 1 Leaving Water Temperature (GREEN), and Boiler 1 Reset (DARK BLUE) from October 11 - 15, 2025

5.6.2 Measure Description

Implement a demand-based reset for the boiler 1 HWST setpoint, such that the boiler 1 HWST is reduced during low heating demand periods.

Stage the boilers such that boiler 2 is only enabled if boiler 1 is unable to meet the system heating demand. Programming will need to be in place such that the boiler 2 minimum RWT is maintained when boiler 2 is engaged.

Estimated implementation costs assume that no upgrades will be required to the local boiler controllers.

5.7 Measure 7: Enable the Building E Heating Distribution Pumps Based on Heating Demand

5.7.1 Description of Finding

The building E primary and secondary heating loops are currently enabled 24/7 when outdoor air temperature is below 15°C.

During unoccupied hours, there is typically no heating demand in the building, except for when unit ventilators are running in unoccupied heating mode. During these periods when there is no heating demand, the boilers, circulation pumps, and secondary loop distribution pumps can be disabled, resulting in a reduction in electricity use associated with pump run-time, and a reduction in natural gas use associated with pipe losses and boiler standby losses.

Boiler 1 is a condensing boiler and can operate at low return water temperature, while boiler 2 is a non-condensing boiler that requires high return water temperatures.

5.7.2 Measure Description

Program the building E boilers and distribution pumps to enable/disable based on heating demand. Program boiler 1 to re-heat the hot water loop during a morning warmup period before allowing boiler 2 to enable.

Estimated natural gas savings are from a reduction in boiler standby losses. Natural gas savings associated with pipe losses are not included in estimated savings.

6.0 Next Steps – Implementation Phase and Completion Phase

6.1 Implementation Phase

To continue in the program, the owner is responsible for implementing the selected bundle of measures that pay back in two years or less. Using the *Recommissioning Report* for implementation allows flexibility in how the selected measures are implemented. Options include: utilize in-house building staff, hire the C.Op Provider to implement or provide technical assistance, contract with outside service contractors, or any combination of the above.

6.2 Completion Phase

C.Op Service provider will follow up after implementation of the selected measures and **update** this *Recommissioning report and Recommissioning Workbook*.

The updated report for the implemented measures includes but not limited to: date of completion of each measure, new or improved sequences of operation, the energy savings impact of the measures, the requirements for ongoing maintenance and monitoring of the measures, and contact information for the service provider, in house staff, and contractors responsible for the implementation. When feasible, verification data should include trends or functional test results, though other methods, such as copies of invoices, site visit reports, and before/after photos, may be acceptable.

The C.Op Service Provider will conduct an in-house (teleconference) session for the Applicant and the appropriate building operations personnel covering the new documentation, measures that were implemented, and requirements for ongoing maintenance and monitoring. Document the attendance of the building operations staff.

The *updated Recommissioning Workbook* and *updated Recommissioning Report* will be submitted to the owner and the program for review. See Appendix B: Completion Phase Summary Table for more details on implemented measures.

7.0 Appendix A: Investigation Phase Summary Table

Investigation Phase Summary				Investigation Phase							
				Energy Savings			Cost Savings	Financial		Est. GHG Reduction	
ECM #	Measure Title	Measure History	Include cost	Demand (kW)	Electrical (kWh/yr)	Fuel (GJ)	Total ($/yr)	Estimated Measure Cost ($)	Simple Payback (yrs)	tonnes CO2e/yr	Enter "x" if DESELECT for implementation
ECM-1	Rectify 24/7 Operation of AHU-1	New	1	-	11,977	24	$ 1,442	$ -	-	1.3	
ECM-2	Update the Holiday Calendar	New	1	-	4,260	39	$ 785	$ -	-	2.0	
ECM-3	Reduce AC-1 Schedule	New	1	-	1,024	-	$ 106	$ -	-	0.0	
ECM-4	Program Unit Ventilator OADs Closed in Unoccupied Heating and Heating OS Modes	New	1	-	-	11	$ 100	$ 1,900	19.1	0.6	
ECM-5	Reduce Unit Ventilator Weekly Schedules	New	1	-	3,912	17	$ 550	$ 1,000	1.8	0.9	
ECM-6	Implement a Demand Based Reset for the Building E Primary Hot Water Supply Temperature Setpoint	New	1	-	-	138	$ 1,211	$ 9,300	7.7	6.9	
ECM-7	Enable the Building E Heating Water Distribution Pumps Based on Heating Demand	New	1	-	5,925	20	$ 786	$ 5,600	7.1	1.1	
			TOTAL (Previous, still working):	-	-	-	$ -	n/a	n/a	-	
			TOTAL (All potential measures for Implementation):	-	27,098	248	$ 4,978	$ 17,800	3.6	12.7	
			TOTAL (Selected measures only):	**-**	**27,098**	**248**	**$ 4,978**	**$ 17,800**	**3.6**	**12.7**	
							Implementation cap @$0.25/ft2	$ 14,596			

8.0 Appendix B: Completion Phase Summary Table

To be completed during the completion phase.

9.0 Appendix C: Sample Training Outline

The Commissioning Provider (C.Op Provider) may customize the outline for the training and developing the training materials. Before preparing the training outline and materials, the C.Op Provider should assess the related level of knowledge of the building operators, to set up the training accordingly. For reference, the Program provides the following sample outline for the training:

- Background on the energy use of this particular building
    - Present Energy Utilization Index
    - Describe Operating Schedules and Owner's operating requirements
- RCx investigation process used in this building
    - Describe the methods used to identify problems and deficiencies
    - Review the RCx Workbook
- Implementation process in this building
    - Describe the measures that were implemented and by whom
    - Walk around the building to look at any physical changes or step through the new control sequences at the operator workstation
    - Provide as many details about implementation as necessary to describe what was done
    - Describe improved performance that these measures will create (show trends if available)
- O&M requirements
    - Describe the O&M requirements needed to keep these improvements working
    - Describe how the staff can be aware of energy efficiency opportunities and begin looking for additional savings potential

The C.Op Provider should follow the outline to prepare materials, as necessary, to hand out at the training session.

10.0 Appendix D: Training Completion Form

Project ID

Facility Information

Company Name	Building Name(s)	
Facility Address	City	Province

Training Details

Location	Date
Commissioning Provider/Trainer	

Materials Attached

☐ Agenda
☐ Materials used for training
☐ List of individuals who attended

COMMISSIONING PROVIDER SIGNATURE

By signing this Training Completion Form, I verify that this training took place with the listed attendees.	
Commissioning Provider (print name):	
Signature:	Date:

FACSIMILE/SCANNED SIGNATURES: Facsimile transmission of any signed original document, and the retransmission of any signed facsimile transmission, shall be the same as delivery of the original signed document. Scanned original documents transmitted to BC Hydro as an attachment via electronic mail shall be the same as delivery of the original signed document. At the request of BC Hydro, C.Op Provider shall confirm documents with a facsimile transmitted signature or a scanned signature by providing an original document.

Targeted Documentation

O & M Manual

O & M Manual updated ☐	Describe updates below and attach copies of new or amended portions
O & M Manual not updated ☐	Province reasons below
Building has no O & M Manual ☐	

Building Plans ("as-builts")

Building Plans updated ☐	Describe below
Wiring diagrams updated ☐	Describe below
No plans or diagrams updated ☐	Describe below

EMS Programming

New sequences of operation on file ☐	Specify location of file and attach copy
Printed screenshots on file ☐	Specify location of file and attach copy

Equipment Manuals

Manuals for new equipment are on file ☐	Describe below (attach copy if applicable)

Checklist of subjects discussed at training

Explain investigation process and how measures were identified	☐
Describe implemented measures, and how they are reducing energy usage	☐
Building walkthrough to show implemented measures	☐
Describe methods for monitoring and maintaining optimum system performance related to implemented measures	☐
Describe scenarios where system setting changes would be required, and how to maintain optimum energy efficiency, e.g., seasonal-based manual adjustments to setpoints.	☐

List of Individuals Who Attended

Name	Title	Building (address or name)	Contact information (e-mail and/or phone number)

Continuous Optimization Investigation Report

School District 70 | Tsuma-as Elementary School
5055 Compton Rd, Port Alberni, BC V9Y 7B5

BCH Project #: BCH-11743
Prism Project #: 2025021

Prism Engineering
Changing systems for a better world

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prismengineering.com

Version	Updated on	Phase
v0.1	December 9, 2025	Investigation Draft

Limits of Liability

This report was prepared by Prism Engineering Limited for School District 70. The material in it reflects our professional judgement considering the information available to us at the time of preparation. The savings calculations are estimates of savings potential and are not guaranteed. The impact of building changes, building use changes, new equipment, additional computers, and weather needs to be considered when evaluating savings. Without express written permission, any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Prism Engineering Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Document Authentication

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<tr><td>Date:</td><td>November 17, 2025</td><td>Date:</td><td>November 28, 2025</td></tr>
<tr><td colspan="4">Professional of Record</td></tr>
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TABLE OF CONTENTS

1.0 Introduction

Prism Engineering is pleased to present the results of the Investigation Phase that was conducted as part of BC Hydro's Continuous Optimization for Commercial Buildings Program for Alberni Elementary School. The objective of an Investigation is to identify deficiencies and improvements in the operation of a facility's mechanical equipment, lighting, and related controls, and determine opportunities for corrective action that reduce energy consumption and preserve the indoor environmental quality.

This document is a complete record of the work performed at this facility, including the in-depth investigation of the building systems and the implementation of selected measures to optimize building performance.

The Recommissioning Investigation Report provides an overview of the recommendations for the implementation of measures. This information is not considered a specification or detailed sequence of operations. The intent is to provide an overview of the recommendation that can be built upon during the implementation phase as part of any detailed design that may be required. Certain measures may require further investigation and specification for the correct implementation by the owner or the DDC contractor.

Ten recommended retrofits were identified as a part of this investigation. The proposed measures will be reviewed in a meeting with School District 70 and Prism Engineering representatives to determine which measures will be implemented.

Recommended retrofits for implementation include:

- Measure 1: Rectify 24/7 Unit Ventilator Summer Operation;
- Measure 2: Rectify UV-30 24/7 Operation;
- Measure 3: Reduce the Purge Mode;
- Measure 4: Program OADs Closed in Unoccupied Heating and Heating OS Modes;
- Measure 5: Reduce Unoccupied Heating Setpoints for AHU-2 and AHU-3;
- Measure 6: Update AHU-2 and AHU-3 Re-heat Control in Unoccupied Heating Mode;
- Measure 7: Adjust Unit Ventilator HCV and Re-Heat Control in Heating Optimum Start Mode;
- Measure 8: Adjust UV-6 Unoccupied Cooling Setpoint;
- Measure 9: Implement a Demand Based Reset for the Primary Hot Water Supply Temperature Setpoint;
- Measure 10: Enable the Heating Plant Based on Heating Demand;

These measures are presented in the Investigation Summary Table (see Appendix A).

Other measures that were identified but not selected as part of this C. Op. project are outlined in section 6.0.

2.0 Project Overview

Project Information

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RCx Project File #	**BCH-11744**		
Date of Workbook Update	17-Nov-2025		
Organization	School District 70		
Building Name	Tsuma-as Elementary School		
Building Type	Large School		
Location (City)	Port Alberni		
Owner Contact	Alex Taylor		
Investigation Phase start date	09-Sep-2025		
Participated in previous BCH RCx program?	No		
Previous RCx File #			
Previous RCx completion date			

Building Information

Facility Area (ft2)	58,997		
Annual elec consumption (kWh)	362,568	6.1	kWh/ft^2
Annual elec costs ($)	$ 40,483	$ 0.11	Avg. $/kWh
Fuel type	Natural Gas		
Annual fuel consumption (GJ)	1,074	5.1	ekWh/ft^2
Annual fuel cost ($)	$ 13,260	$ 12.4	Avg. $/GJ
Total GHG emissions (tCO2e/yr)	56		
Total Energy Cost	$ 53,744	$ 0.91	$/ft^2
Energy Use Intensity (ekWh/ft2)	11.2		
Year for energy data above	2024		

3.0 Savings Summary

Savings Summary	Previous, still working	New + Previous, rectify + Previous, documented					
		Identified		Selected		Implemented	
# of measures	0	10		10		0	
	Re-claim Savings	Total Savings	% Savings	Total Savings	% Savings	Total Savings	% Savings
Electrical savings (kWh/yr)	-	33,165	9.1%	33,165	9.1%	-	0.0%
Fuel savings (GJ/yr)	-	166	15.4%	166	15.4%	-	0.0%
Cost savings ($)	$ -	$ 4,877	9.1%	$ 4,877	9.1%	$ -	0.0%
Estimated GHG reduction (tCO2e/yr)	-	8.6	15.6%	8.6	15.6%	-	0.0%
# of Abandoned measures	**0**						

4.0 Brief Description of Existing System

This section contains a brief description of the existing HVAC and Controls system. The information is intended to provide a general overview only.

4.1 Facility Description

Tsuma-as Elementary School is two stories above grade and has a floor area of 58,997 ft^2.

A major heating and ventilation system upgrade was completed in 2004. The east side of the building was converted into a daycare 2019, which included the addition of three new packaged roof-top units.

4.2 Mechanical Systems Description

4.2.1 Heating System

Heating water is provided by a hydronic boiler system serving terminal units including air handling unit heating coils, unit ventilator heating coils, re-heats, and hydronic convectors (wall-mounted and baseboards). The existing boilers were installed in 2004.

The piping configuration consists of a primary boiler loop and multiple secondary loops, including three heating distribution loops and one domestic hot water (DHW) heating loop. The secondary loops are hydraulically separated from the primary loop via a low-loss header.

Each secondary loop serves a distinct set of terminal units. The heating coils in the air handling units (AHUs) are controlled by 3-way valves, while most reheat coils, unit ventilators, and convector heaters use 2-way valves.

Table 1: Summary of Boilers

Tag	Make/Model	Heating Output (MBH)	Type
B-1	IBC SL 40-399	399	Condensing
B-2	IBC SL 40-399	399	Condensing
B-3	IBC SL 40-399	399	Condensing

Table 2: Summary of Heating Distribution Pumps

Tag	Description	Power	Flow (GPM)	Head (ft)	Notes
P-1	B-1 Primary Circulator	157 W	Unknown	Unknown	Constant speed.
P-2	B-2 Primary Circulator	157 W	Unknown	Unknown	Constant speed.
P-3	B-3 Primary Circulator	157 W	Unknown	Unknown	Constant speed.
P-5	DHW – Source Side of Heat Exchanger	450 W	Unknown	Unknown	Constant speed.
P-6	Vocational Wing	1.5 hp	60	52	Variable speed.
P-7	Gym/Administration	1.5 hp	60	52	Variable speed.
P-8	Two Story Wing	1.5 hp	90	40	Variable speed.
P-9	DHW – Load Side of Heat Exchanger	90 W	Unknown	Unknown	Constant speed.

Tag	Description	Power	Flow (GPM)	Head (ft)	Notes
P-AHU-1	AHU-1 heating coil	1/4 hp	Unknown	Unknown	Constant speed.

4.2.2 Ventilation

Ventilation is provided to the gymnasium, admin office, mall area, and the daycare by six air handling units. Unit ventilators provide ventilation to most individual classrooms and the upper mini gym area.

Various fractional horsepower exhaust fans serve the building.

Table 3: Summary of Air Handling Units and Packaged Roof-top Units

Tag	Service Area	Fan Power (HP)	Flow (CFM)	Notes
AHU-1	Gym	5 hp	Unknown	Mixed-air unit. CO_2 and occupancy sensor control. Constant speed supply fan. Hydronic heating coil.
AHU-2	Office	1.8 hp	1,800	Packaged Roof-top unit with air-side economizer. Constant speed supply fan. Two scroll compressors. DX cooling, 6-ton cooling capacity. Heating provided by downstream hydronic re-heats.
AHU-3	Mall, Art Room, Gym Stage	5 hp	Unknown	Mixed-air unit. Constant speed supply fan. DX cooling. Heating provided by downstream hydronic re-heats.
AHU-4	B/A School Care 115-117	1 hp	1,200	Packaged Roof-top unit with air-side economizer. CO_2 and occupancy sensor control. Constant speed supply fan. DX coil, reversible heat pump. 3-ton cooling capacity. 34 MBH heating capacity. One scroll compressor, single stage cooling. Hydronic heating coil. Additional heating provided by downstream re-heats.
AHU-5	Daycare 100-102	1 hp	1,800	Packaged Roof-top unit with air-side economizer. CO_2 and occupancy sensor control. Constant speed supply fan.

Tag	Service Area	Fan Power (HP)	Flow (CFM)	Notes
				DX coil, reversible heat pump. 3-ton cooling capacity. 34 MBH heating capacity. One scroll compressor, single stage cooling. Hydronic heating coil.
AHU-6	Daycare 105-110	2 hp	1,080	Packaged Roof-top unit with air-side economizer. CO_2 and occupancy sensor control. Constant speed supply fan. DX coil, reversible heat pump. 4-ton cooling capacity. 46 MBH heating capacity. One scroll compressor, single stage cooling. Additional heating is provided by downstream hydronic re-heats.

Table 4: Summary of Typical Unit Ventilators

Tag	Make/Model	Power (HP)	Flow (CFM)	Notes
UV (Typical)	Temspec HUV 1200	1/2	1,200	CO_2 and occupancy sensor control. Constant speed fans. Mixed-air units. Hydronic heating coil. UV-14, UV-15, and UV-16 are each equipped with a DX cooling coil.

4.2.3 Domestic Hot Water System

Domestic hot water (DHW) is provided by the boiler plant through a plate-and-frame heat exchanger, unless the boiler plant is disabled during warm weather periods. When the boiler plant is disabled, DHW is provided by two electric water heaters.

There is a DHW re-circulation pump.

Tag	Quantity	Make/Model	Heating Input (kW)
DHW	2	Bradford White RE265T6-1NCWW	4.5 kW

4.2.4 Controls System

The mechanical systems in this building are controlled by a Direct Digital Control (DDC) Building Automation System (BAS). The system is manufactured by Reliable Controls.

5.0 Measures Selected for Implementation

This section provides an overview of new measures identified in this Round of Investigation, including recommendations for implementation, and updates post implementation.

For each measure, costs, savings and payback calculations can be referenced in the *Investigation Summary Table* (see Appendix A).

5.1 Measure 1: Rectify 24/7 Unit Ventilator Summer Operation

5.1.1 Description of Finding

Most unit ventilators, serving classrooms, the daycare, and other miscellaneous spaces throughout the school, were observed to be running 24/7 from July 3, 2025, to July 30, 2025. It is assumed that these units were manually overridden during this period.

Figure 1 shows the supply fan status of UV-7 over this period as an example, showing 24/7 operation.

AWN-UV7-SF-SS-RT (1A7RT1)

	ON	OFF	On Duration	Off Duration
42	Wed, August 20, 2025, 02:07:16 AM	Wed, August 20, 2025, 07:25:00 AM	05:17:44	18:42:16
43	Tue, August 19, 2025, 02:07:14 AM	Tue, August 19, 2025, 07:25:01 AM	05:17:47	18:42:15
44	Mon, August 18, 2025, 02:07:16 AM	Mon, August 18, 2025, 07:25:00 AM	05:17:44	18:42:14
45	Fri, August 15, 2025, 02:07:16 AM	Fri, August 15, 2025, 07:25:00 AM	05:17:44	66:42:16
46	Thu, July 3, 2025, 02:07:17 AM	Wed, July 30, 2025, 02:04:42 PM	659:57:25	372:02:34
47	Wed, July 2, 2025, 02:07:17 AM	Wed, July 2, 2025, 07:25:00 AM	05:17:43	18:42:17
48	Mon, June 30, 2025, 10:45:19 AM	Mon, June 30, 2025, 05:00:00 PM	06:14:41	33:07:17
49	Mon, June 30, 2025, 02:07:17 AM	Mon, June 30, 2025, 10:35:16 AM	08:27:59	00:10:03
50	Fri, June 27, 2025, 02:07:17 AM	Fri, June 27, 2025, 05:00:00 PM	14:52:43	57:07:17

Figure 1: Screenshot of UV-7 Supply Fan Status Log, Showing 24/7 Operation from July 3, 2025 - July 30, 2025

5.1.2 Measure Description

Schedule unit ventilators to reflect building occupancy in July.

Savings assume that unit ventilators are enabled from 2:00 AM to 7:00 AM in July, as per the purge mode calendar, in the retrofit case.

5.2 Measure 2: Rectify UV-30 24/7 Operation

5.2.1 Description of Finding

UV-30, serving classroom 219, has been running close to 24/7 since February 2022. Figure 2 shows a data log of the UV-30 supply fan status, showing multiple periods of continuous operation over several weeks. The cause of the continuous operation is unknown.

AWN-UV30-SF-SS-RT (1A30RT1)

	ON	OFF	On Duration	Off Duration
1	Fri, September 19, 2025, 09:02:34 AM			
2	Mon, September 15, 2025, 03:44:10 PM	Fri, September 19, 2025, 08:29:42 AM	88:45:32	00:32:52
3	Mon, June 30, 2025, 10:45:18 AM	Mon, September 15, 2025, 03:34:09 PM	1852:48:51	00:10:01
4	Fri, May 30, 2025, 01:28:40 PM	Mon, June 30, 2025, 10:35:16 AM	741:06:36	00:10:02
5	Wed, May 14, 2025, 10:01:18 AM	Fri, May 30, 2025, 01:04:08 PM	387:02:50	00:24:32
6	Mon, April 14, 2025, 12:42:43 PM	Wed, May 14, 2025, 09:51:19 AM	717:08:36	00:09:59
7	Thu, February 27, 2025, 03:59:04 PM	Mon, April 14, 2025, 12:32:43 PM	1100:33:39	00:10:00
8	Mon, January 27, 2025, 04:34:41 PM	Thu, February 27, 2025, 03:49:03 PM	743:14:22	00:10:01
9	Mon, December 23, 2024, 04:23:28 PM	Mon, January 27, 2025, 04:24:39 PM	840:01:11	00:10:02
10	Wed, December 4, 2024, 09:46:42 AM	Mon, December 23, 2024, 04:13:27 PM	462:26:45	00:10:01
11	Thu, November 21, 2024, 04:40:05 PM	Wed, December 4, 2024, 09:36:39 AM	304:56:34	00:10:03
12	Thu, October 24, 2024, 01:05:06 PM	Thu, November 21, 2024, 04:30:04 PM	675:24:58	00:10:01
13	Fri, October 11, 2024, 01:36:03 PM	Thu, October 24, 2024, 12:55:05 PM	311:19:02	00:10:01
14	Tue, July 16, 2024, 02:29:50 PM	Fri, October 11, 2024, 01:26:03 PM	2086:56:13	00:10:00
15	Tue, June 25, 2024, 12:05:18 PM	Tue, July 16, 2024, 02:15:39 PM	506:10:21	00:14:11
16	Wed, May 8, 2024, 10:13:41 AM	Tue, June 25, 2024, 11:55:19 AM	1153:41:38	00:09:59
17	Fri, November 17, 2023, 10:16:29 AM	Wed, May 8, 2024, 10:03:40 AM	4151:47:11	00:10:01
18	Mon, October 23, 2023, 11:49:19 AM	Fri, November 17, 2023, 10:06:28 AM	598:17:09	00:10:01
19	Wed, October 4, 2023, 01:24:56 PM	Mon, October 23, 2023, 11:39:19 AM	454:14:23	[illegible]

Figure 2: UV-30 Supply Fan Status Log, Showing Long Periods of Unscheduled Continuous Operation

5.2.2 Measure Description

Restore UV-30 programmed operation.

The cause of the continuous operation of UV-30 is unknown. Estimated implementation costs for this measure assume that programmed operation of this unit can be restored without replacing any UV-30 components or its DDC controller.

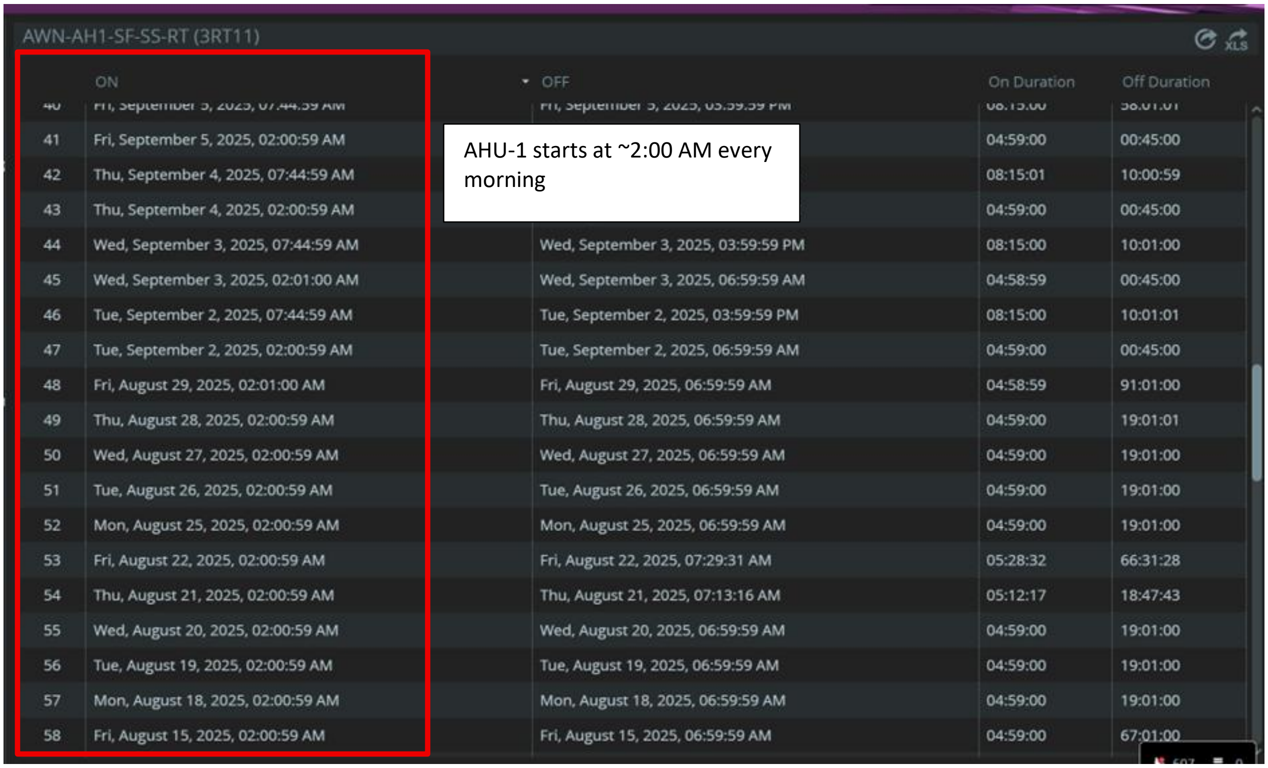
5.3 *Measure 3: Reduce the Purge Mode Calendar and Update Cooling OS Programming*

5.3.1 Description of Finding

Purge mode is currently enabled from May 1 – September 30. When purge mode is active, AHU-1, AHU-2, AHU-3, and all unit ventilators are enabled from approximately 2:00 AM to 7:00 AM with their respective outdoor air dampers open to 100%. As an example, Figure 3 shows a DDC data log of the AHU-1 supply fan status from August 15, 2025 – September 5, 2025, showing that the supply fan started at 2:00 AM every day during this period.

AHU-1, AHU-2, AHU-3, and all unit ventilators are also programmed with cooling optimum start (OS) logic, which allows these units to start as early as 6:00 AM, if needed, to ensure their respective spaces are at comfortable room temperatures when they become occupied.

Figure 4 shows Port Alberni weather data for May – September, averaged over a 4-year period from 2021-2025. Weather conditions are typically significantly cooler in May, early June, and late September, compared to peak summer conditions. It is expected that purge mode is over-cooling the building during these periods.



	ON	OFF	On Duration	Off Duration
40	Fri, September 5, 2025, 07:44:59 AM	Fri, September 5, 2025, 03:59:59 PM	08:15:00	58:01:01
41	Fri, September 5, 2025, 02:00:59 AM		04:59:00	00:45:00
42	Thu, September 4, 2025, 07:44:59 AM		08:15:01	10:00:59
43	Thu, September 4, 2025, 02:00:59 AM		04:59:00	00:45:00
44	Wed, September 3, 2025, 07:44:59 AM	Wed, September 3, 2025, 03:59:59 PM	08:15:00	10:01:00
45	Wed, September 3, 2025, 02:01:00 AM	Wed, September 3, 2025, 06:59:59 AM	04:58:59	00:45:00
46	Tue, September 2, 2025, 07:44:59 AM	Tue, September 2, 2025, 03:59:59 PM	08:15:00	10:01:01
47	Tue, September 2, 2025, 02:00:59 AM	Tue, September 2, 2025, 06:59:59 AM	04:59:00	00:45:00
48	Fri, August 29, 2025, 02:01:00 AM	Fri, August 29, 2025, 06:59:59 AM	04:58:59	91:01:00
49	Thu, August 28, 2025, 02:00:59 AM	Thu, August 28, 2025, 06:59:59 AM	04:59:00	19:01:01
50	Wed, August 27, 2025, 02:00:59 AM	Wed, August 27, 2025, 06:59:59 AM	04:59:00	19:01:00
51	Tue, August 26, 2025, 02:00:59 AM	Tue, August 26, 2025, 06:59:59 AM	04:59:00	19:01:00
52	Mon, August 25, 2025, 02:00:59 AM	Mon, August 25, 2025, 06:59:59 AM	04:59:00	19:01:00
53	Fri, August 22, 2025, 02:00:59 AM	Fri, August 22, 2025, 07:29:31 AM	05:28:32	66:31:28
54	Thu, August 21, 2025, 02:00:59 AM	Thu, August 21, 2025, 07:13:16 AM	05:12:17	18:47:43
55	Wed, August 20, 2025, 02:00:59 AM	Wed, August 20, 2025, 06:59:59 AM	04:59:00	19:01:00
56	Tue, August 19, 2025, 02:00:59 AM	Tue, August 19, 2025, 06:59:59 AM	04:59:00	19:01:00
57	Mon, August 18, 2025, 02:00:59 AM	Mon, August 18, 2025, 06:59:59 AM	04:59:00	19:01:00
58	Fri, August 15, 2025, 02:00:59 AM	Fri, August 15, 2025, 06:59:59 AM	04:59:00	67:01:00

Figure 3: AHU-1 Supply Fan Status Data Log, Showing the Supply Fan Running from 2:00 AM to 7:00 AM Every Weekday Morning from August 15th - September 5th

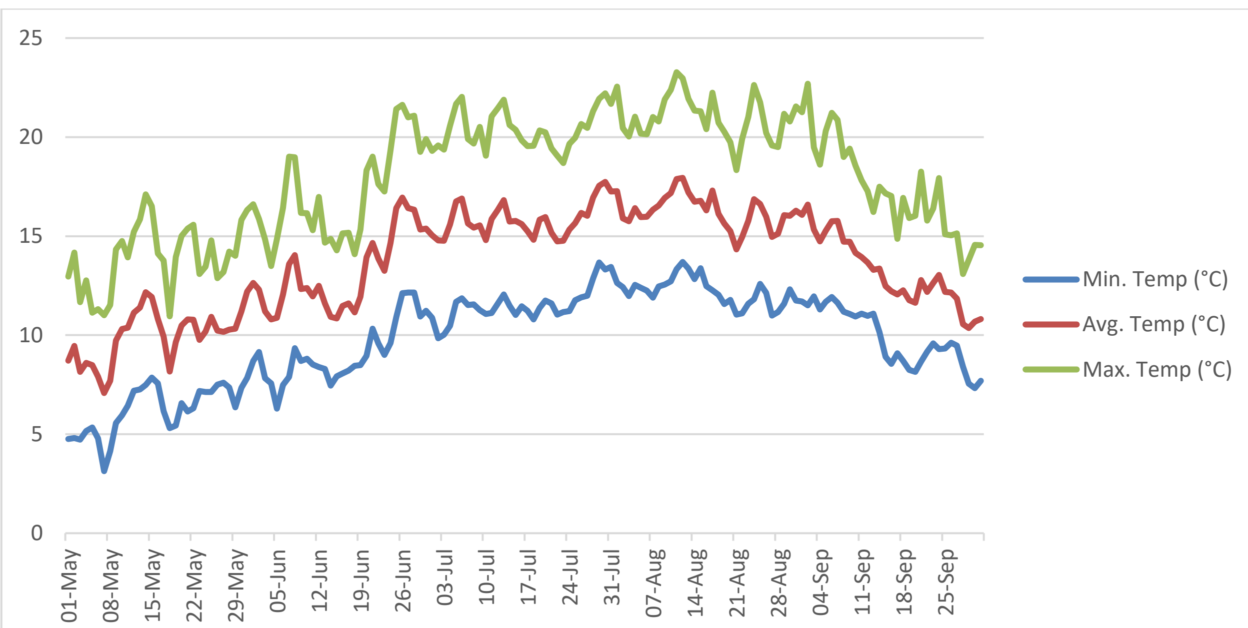


Figure 4: May – September Daily Minimum, Maximum, and Average Outdoor Air Temperature from Port Alberni Weather Station, Averaged Over a 4-year Period from 2021-2025

5.3.2 Measure Description

Reduce the purge mode calendar.

Update the cooling OS maximum start-time, allowing AHUs and unit ventilators to start earlier than allowed by existing programming, as needed. Update the cooling OS target room temperature setpoint such that spaces are cooled beyond the occupied zone temperature setpoint.

Savings assume that purge mode can be limited to mid-June – mid-September.

5.4 Measure 4: Program OADs Closed in Unoccupied Heating and Heating OS Modes

5.4.1 Description of Finding

AHU-1, AHU-2, AHU-3, and all unit ventilators were found to be operating in unoccupied heating mode and heating OS mode with their outdoor air dampers (OAD) open to their minimum positions.

Figure 5 shows a data log of AHU-2 running in unoccupied heating mode. AHU-2 was in unoccupied heating mode from 1:58 AM October 5th, 2025 to 7:00 AM October 6th, 2025. Figure 6 shows a DDC trend log of the AHU-2 OAD over this same period where AHU-2 was in unoccupied heating mode. The OAD was open to its minimum position of 5% during this period.

During unoccupied hours, outdoor air ventilation is not required, and OADs can be closed, reducing the ventilation heating load.

2VAR13-RT (2RT11)

	ON	OFF	On Duration	Off Duration
1	Sun, October 5, 2025, 01:58:39 AM	Mon, October 6, 2025, 06:59:59 AM	29:01:20	
2	Sat, October 4, 2025, 12:16:47 AM	Sat, October 4, 2025, 12:44:49 PM	12:28:02	13:13:50
3	Fri, October 3, 2025, 12:44:10 AM	Fri, October 3, 2025, 06:59:59 AM	06:15:49	17:16:48
4	Wed, October 1, 2025, 09:26:08 PM	Thu, October 2, 2025, 06:59:59 AM	09:33:51	17:44:11

Figure 5: Data Log of AHU-2 Unoccupied Heating Mode Runtime.

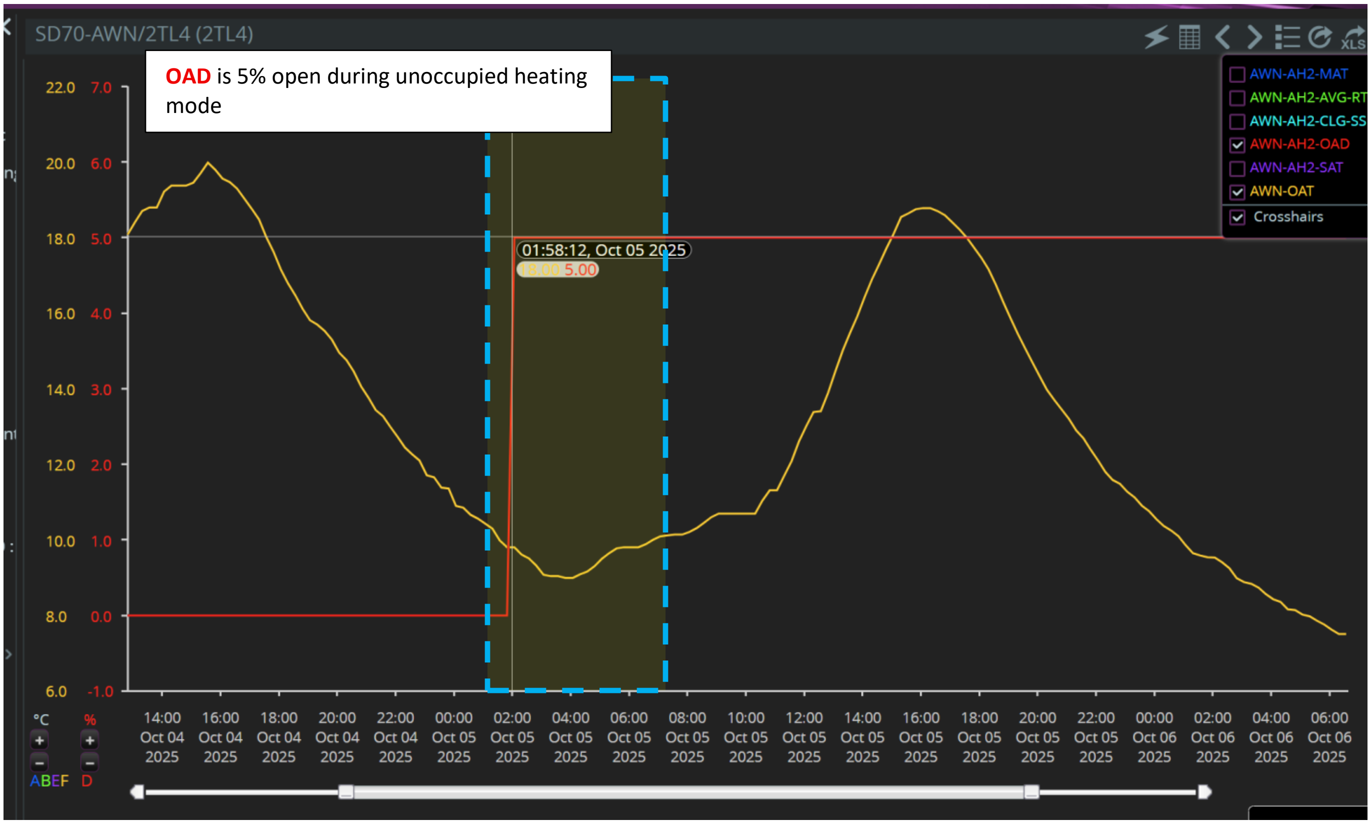


Figure 6: DDC Trend Log of AHU-2 Outdoor Air Damper (RED) and Outdoor Air Temperature (YELLOW)

5.4.2 Measure Description

Program the AHU-1, AHU-2, AHU-3, and unit ventilator outdoor air dampers closed during unoccupied heating and heating OS modes.

5.5 Measure 5: Reduce Unoccupied Heating Setpoints for AHU-2 and AHU-3

5.5.1 Description of Finding

AHU-2 and AHU-3 each have unoccupied heating setpoints of 20°C. If a zone temperature served by either AHU drops below 20°C during unscheduled AHU hours, the AHU will start, and the associated re-heat will provide heating to maintain a 20°C zone temperature. Figure 7 shows a screenshot of the AHU-3 BAS graphics, highlighting the unoccupied heating setpoint of 20°C.

Maintaining higher unoccupied room temperatures increases envelope heating losses during unoccupied periods, leading to higher gas usage. Most other spaces in the school have an unoccupied heating setpoint of 16°C.

Figure 7: Screenshot of the AHU-3 BAS Graphics, Highlighting the Unoccupied Heating Setpoint

5.5.2 Measure Description

Reduce the AHU-2 and AHU-3 unoccupied heating setpoints to align with the rest of the building.

5.6 *Measure 6: Update AHU-2 and AHU-3 Re-heat Control in Unoccupied Heating Mode*

5.6.1 Description of Finding

AHU-2 and AHU-3 are enabled in unoccupied heating mode if any of their respective zone temperatures drop below the unoccupied heating setpoint. If a zone temperature drops below the unoccupied heating setpoint, the associated re-heat will modulate to maintain the unoccupied heating setpoint. Figure 8 shows a DDC trend log for the zone served by re-heat coil D, downstream of AHU-2, during a period where AHU-2 was running in unoccupied heating mode. The trend log data shows that the HCV opens to 100% when the zone temperature drops below the unoccupied heating setpoint, and then immediately closes when the zone temperature exceeds the unoccupied heating setpoint.

AHU-2 and AHU-3 are programmed to run in unoccupied heating mode until the minimum zone temperature is 1°C above the unoccupied heating setpoint. Since the HCVs are controlled to maintain the unoccupied heating setpoint, rather than exceeding the setpoint by 1°C, AHU-2 and AHU-3 typically run continuously until the next scheduled start time once they are enabled in unoccupied heating mode. Figure 9 shows a data log of AHU-2 unoccupied heating mode, showing periods of significant after-hours run-time everyday over a five-day period in October. For example, AHU-2 ran continuously from Sunday October 4, 2025, at 1:58 AM until Monday October 6, 2025, at 7:00 AM (29 hours of unoccupied fan runtime).

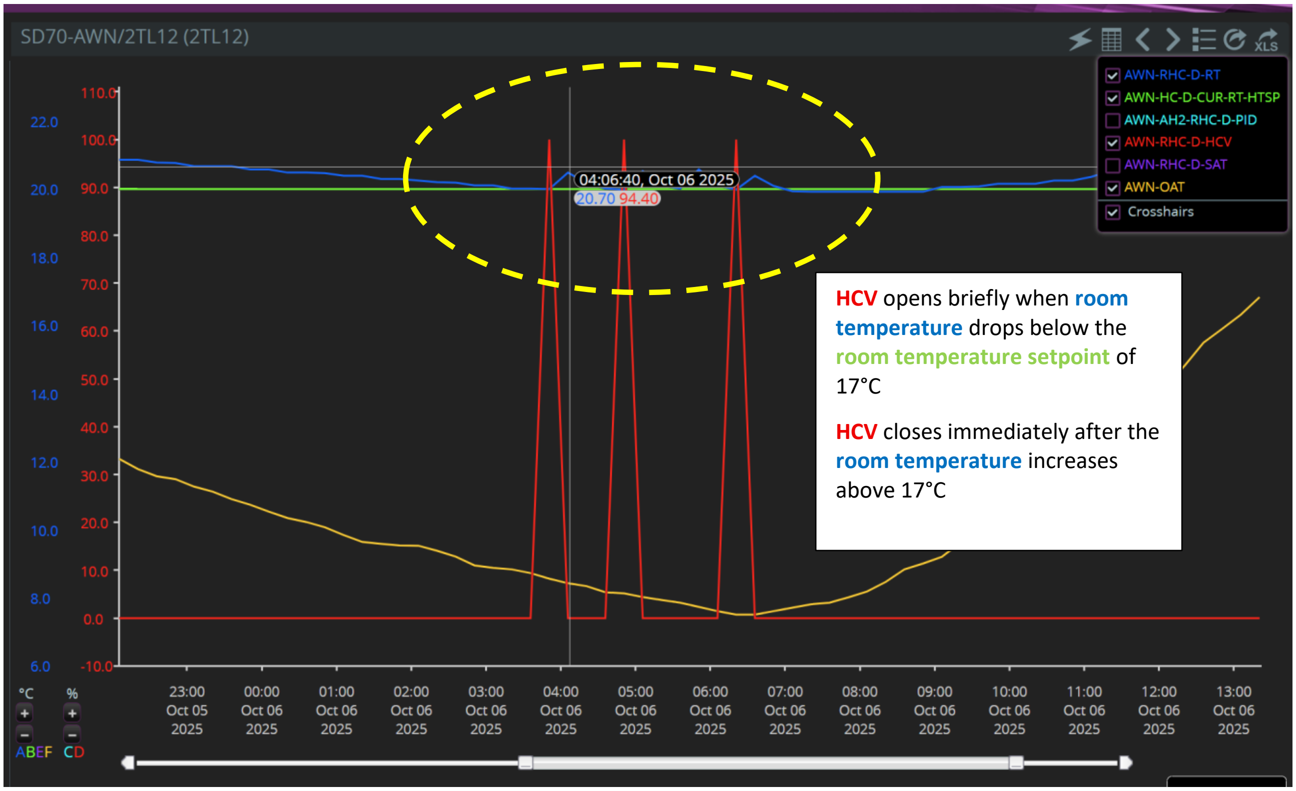


Figure 8: DDC Trend Log Data for Re-Heat Coil D, Downstream of AHU-2, Showing Room Temperature (BLUE), Room Temperature Setpoint (GREEN), Heating Coil Valve Position (RED), and Outdoor Air Temperature (YELLOW)

2VAR13-RT (2RT11) — 29 hours of unoccupied fan runtime

	ON	OFF	On Duration	Off Duration
1	Sun, October 5, 2025, 01:58:39 AM	Mon, October 6, 2025, 06:59:59 AM	29:01:20	
2	Sat, October 4, 2025, 12:16:47 AM	Sat, October 4, 2025, 12:44:49 PM	12:28:02	13:13:50
3	Fri, October 3, 2025, 12:44:10 AM	Fri, October 3, 2025, 06:59:59 AM	06:15:49	17:16:48
4	Wed, October 1, 2025, 09:26:08 PM	Thu, October 2, 2025, 06:59:59 AM	09:33:51	17:44:11

Figure 9: Data Log of AHU-2 Unoccupied Heating Mode Runtime

5.6.2 Measure Description

Reprogram the AHU-2 and AHU-3 re-heat unoccupied mode operation to reheat their zones enough to minimize AHU-2 and AHU-3 unoccupied runtimes.

5.7 Measure 7: Adjust Unit Ventilator HCV and Re-Heat Control in Heating Optimum Start Mode

5.7.1 Description of Finding

Unit ventilators, AHU-1, AHU-2, and AHU-3 are programmed with a heating OS mode. The heating OS mode allows these units to start as early as 6:00 AM to pre-heat spaces to their occupied zone temperature setpoint before their scheduled start time.

Many unit ventilators were observed to be starting in heating optimum start mode almost every day from October 1st onwards. For example, Figure 10 shows a data log for the UV-19 supply fan status from October 1st – October 8th, 2025, showing that the unit was enabled at 6:00 AM most mornings during this period.

On the days when UV-19 started in heating OS mode, the room temperature was typically observed to be only slightly below the room temperature setpoint. Figure 11 shows a DDC trend log of the UV-19 room temperature and room temperature setpoint on October 8th, 2025. UV-19 started at 6:06 AM in heating OS mode on this day when the room temperature was only 0.5°C below setpoint. Figure 12 shows a DDC trend log of the UV-19 heating coil valve (HCV) position over the same period. The UV-19 HCV was only open to approximately 20-30% during the heating OS operation.

Unit ventilator, AHU-1, AHU-2, and AHU-3 run-time in heating OS mode could be reduced if the HCVs were programmed to open more during this operating mode, increasing the rate at which the room temperature is able to increase.

AWN-UV19-SF-SS-RT (1A19RT1)

	ON	OFF	On Duration	Off Duration
1	Wed, October 8, 2025, 06:06:15 AM			
2	Tue, October 7, 2025, 07:18:12 AM	Tue, October 7, 2025, 05:00:00 PM	09:41:48	13:06:15
3	Mon, October 6, 2025, 06:01:03 AM	Mon, October 6, 2025, 05:00:00 PM	10:58:57	14:18:12
4	Fri, October 3, 2025, 06:01:02 AM	[illegible]	10:58:58	61:01:03
5	Thu, October 2, 2025, 06:01:00 AM	[illegible]	10:59:00	13:01:02
6	Wed, October 1, 2025, 06:01:02 AM	Wed, October 1, 2025, 05:00:00 PM	10:58:58	13:01:00

Unit ventilator starts most morning at ~6:00 AM

Figure 10: Data Log for UV-19 Supply Fan Status, Showing UV-19 Starting in Heating Optimum Start Mode Every day from October 1 - 8, 2025

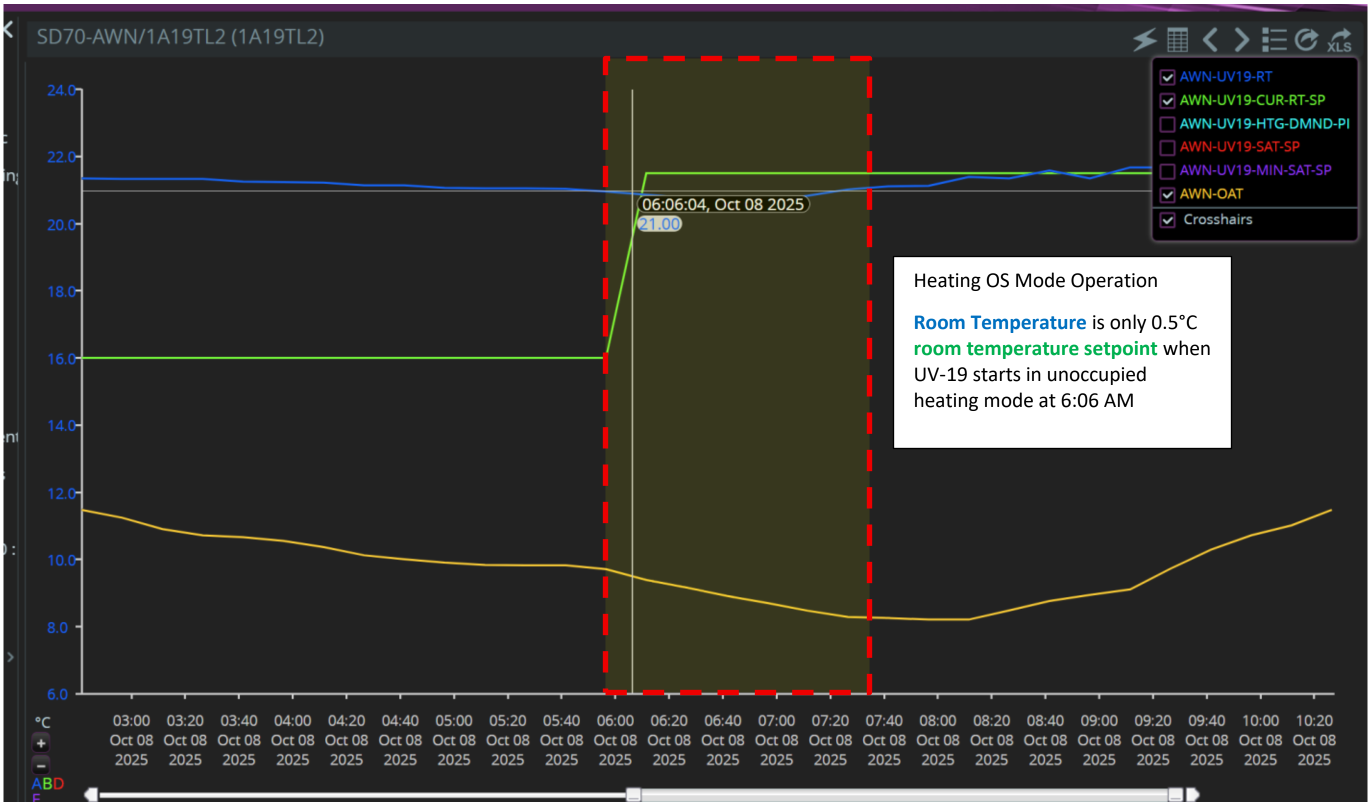


Figure 11: DDC Trend Log Data of UV-19 Room Temperature (BLUE), Room Temperature Setpoint (GREEN), and Outdoor Air Temperature (YELLOW) on October 8th, 2025.

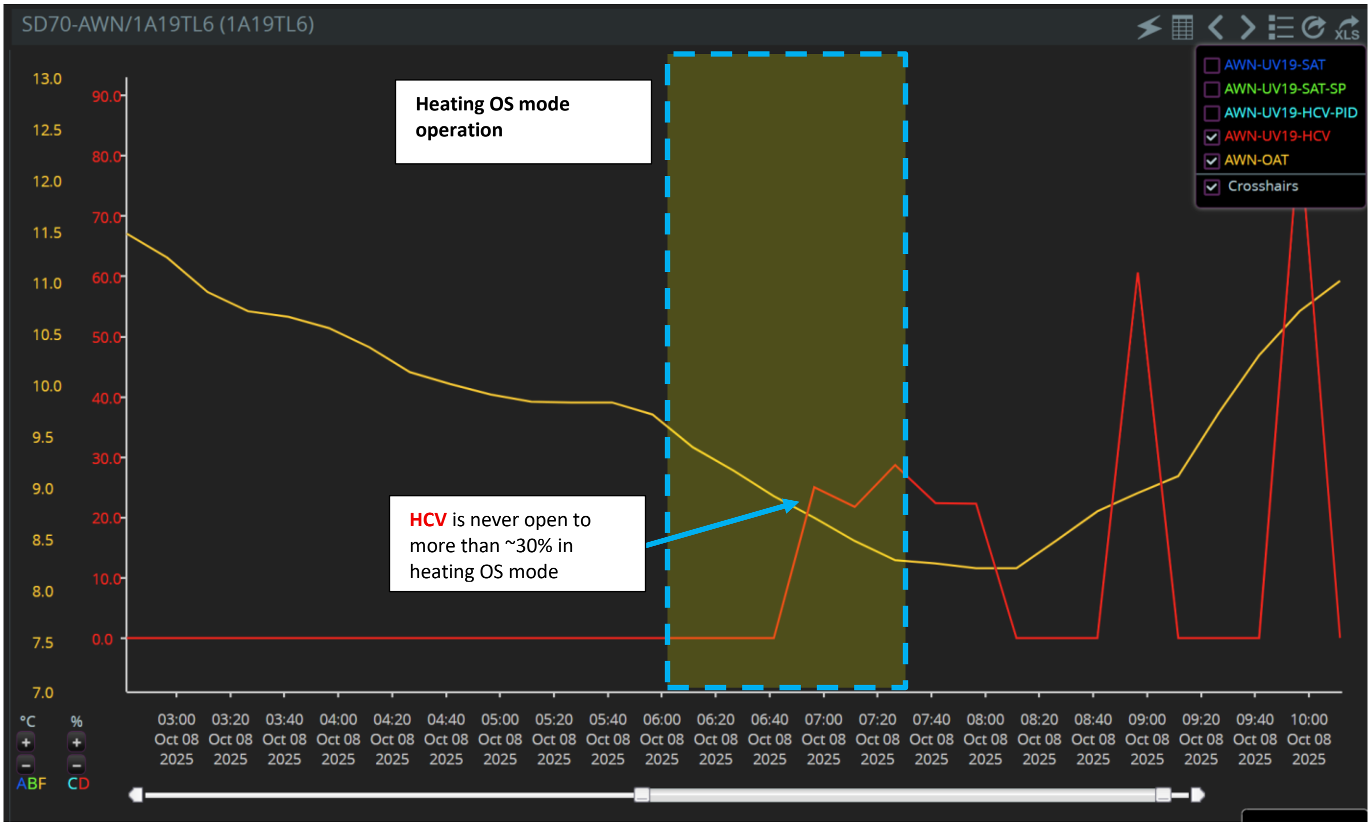


Figure 12: DDC Trend Log Data of UV-19 Heating Coil Valve (RED) and OAT (YELLOW)

5.7.2 Measure Description

Adjust the heating coil valve control for unit ventilators in heating OS mode to increase the rate of room temperature increase.

5.8 Measure 8: Adjust UV-6 Unoccupied Cooling Setpoint

5.8.1 Description of Finding

Unit ventilators are programmed to start in unoccupied cooling mode if the room temperature increases above the unoccupied cooling setpoint during unscheduled hours. In unoccupied cooling mode, the unit ventilator will run continuously until the room temperature meets the unoccupied cooling setpoint. The typical unoccupied cooling setpoint for unit ventilators at the school is 28°C.

The UV-6 unccoupied cooling setpoint is currently set to 15°C, while the occupied room temperature setpoint is set to 20°C. This is causing the unit to run continuously in unoccupied cooling mode every night. Figure 13 shows a screenshot of the BAS graphics for UV-6, highlighting the current occupied room temperature setpoint and unoccupied cooling setpoint. Figure 14 shows a data log for UV-6 unoccupied mode operation, showing that UV-6 was enabled in unoccupied mode during all unscheduled hours from September 22, 2025 – October 7, 2025.

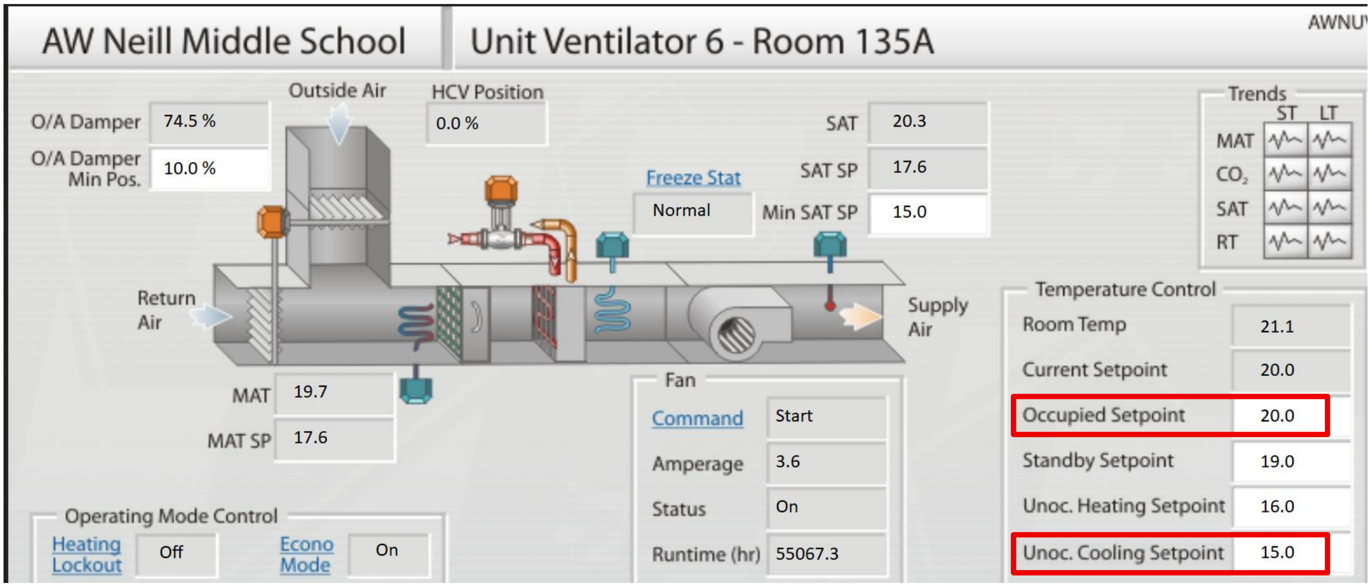


Figure 13: Screenshot of Unit Ventilator 6 BAS Graphics, Highlighting the Unoccupied Cooling Setpoint, and the Occupied Room Temperature Setpoint

AWN-UV6-UNOC-MODE-RT (1A6RT9)

	ON	OFF	On Duration	Off Duration
1	Tue, October 7, 2025, 05:00:00 PM	Wed, October 8, 2025, 07:30:01 AM	14:30:01	
2	Mon, October 6, 2025, 05:00:01 PM	Tue, October 7, 2025, 07:30:01 AM	14:30:00	09:29:59
3	Fri, October 3, 2025, 05:00:00 PM	[illegible]	62:30:01	09:30:00
4	Thu, October 2, 2025, 05:00:01 PM	[illegible]	14:29:59	09:30:00
5	Wed, October 1, 2025, 05:00:00 PM	[illegible]	14:30:00	09:30:01
6	Tue, September 30, 2025, 05:00:00 PM	Wed, October 1, 2025, 06:16:48 AM	13:16:48	10:43:12
7	Tue, September 30, 2025, 07:25:00 AM	Tue, September 30, 2025, 07:30:00 AM	00:05:00	09:30:00
8	Mon, September 29, 2025, 05:00:00 PM	Tue, September 30, 2025, 02:06:00 AM	09:06:00	05:19:00
9	Mon, September 29, 2025, 07:25:00 AM	Mon, September 29, 2025, 07:30:01 AM	00:05:01	09:29:59
10	Fri, September 26, 2025, 05:00:01 PM	Mon, September 29, 2025, 02:06:00 AM	57:05:59	05:19:00
11	Fri, September 26, 2025, 07:25:00 AM	Fri, September 26, 2025, 07:30:00 AM	00:05:00	09:30:01
12	Thu, September 25, 2025, 05:00:00 PM	Fri, September 26, 2025, 02:06:01 AM	09:06:01	05:18:59
13	Thu, September 25, 2025, 07:25:01 AM	Thu, September 25, 2025, 07:30:01 AM	00:05:00	09:29:59
14	Wed, September 24, 2025, 05:00:00 PM	Thu, September 25, 2025, 02:06:01 AM	09:06:01	05:19:00
15	Wed, September 24, 2025, 07:25:01 AM	Wed, September 24, 2025, 07:30:00 AM	00:04:59	09:30:00
16	Tue, September 23, 2025, 05:00:00 PM	Wed, September 24, 2025, 02:06:00 AM	09:06:00	05:19:01
17	Tue, September 23, 2025, 07:25:00 AM	Tue, September 23, 2025, 07:30:00 AM	00:05:00	09:30:00
18	Mon, September 22, 2025, 05:00:01 PM	Tue, September 23, 2025, 02:06:00 AM	09:05:59	05:19:00
19	Mon, September 22, 2025, 07:25:00 AM	Mon, September 22, 2025, 07:30:00 AM	00:05:00	09

UV-6 is running in unoccupied mode every day during review period

Figure 14: Data Log of UV-6 Unoccupied Mode Run-time, Showing the Unit Running in Unoccupied Mode Every day During Unscheduled Hours

5.8.2 Measure Description

Increase the UV-6 unoccupied cooling setpoint to align with other unit ventilators in the building.

5.9 *Measure 9: Implement a Demand Based Reset for the Primary Hot Water Supply Temperature Setpoint*

5.9.1 Description of Finding

The primary heating loop is enabled 24/7 when outdoor air temperature is below 15°C. The primary hot water loop supply water temperature (SWT) is typically between 60-65°C, as shown in Figure 15. The primary hot water supply temperature is controlled by the local boiler controllers.

The boiler plant is configured to serve the building's DHW system, which has a DHW tank temperature setpoint of 55°C. An electric water heater is in place to serve the DHW system when the boiler plant is off. The electric water heater was observed to be enabled year-round, serving the building's full DHW heating load. As a result, the boiler plant primary hot water loop SWT can be reduced below 60°C without affecting the DHW temperature.

During low heating load conditions, the building's heating load can be met with a lower hot water SWT, reducing system heating losses, and improving the efficiency of the condensing boilers.

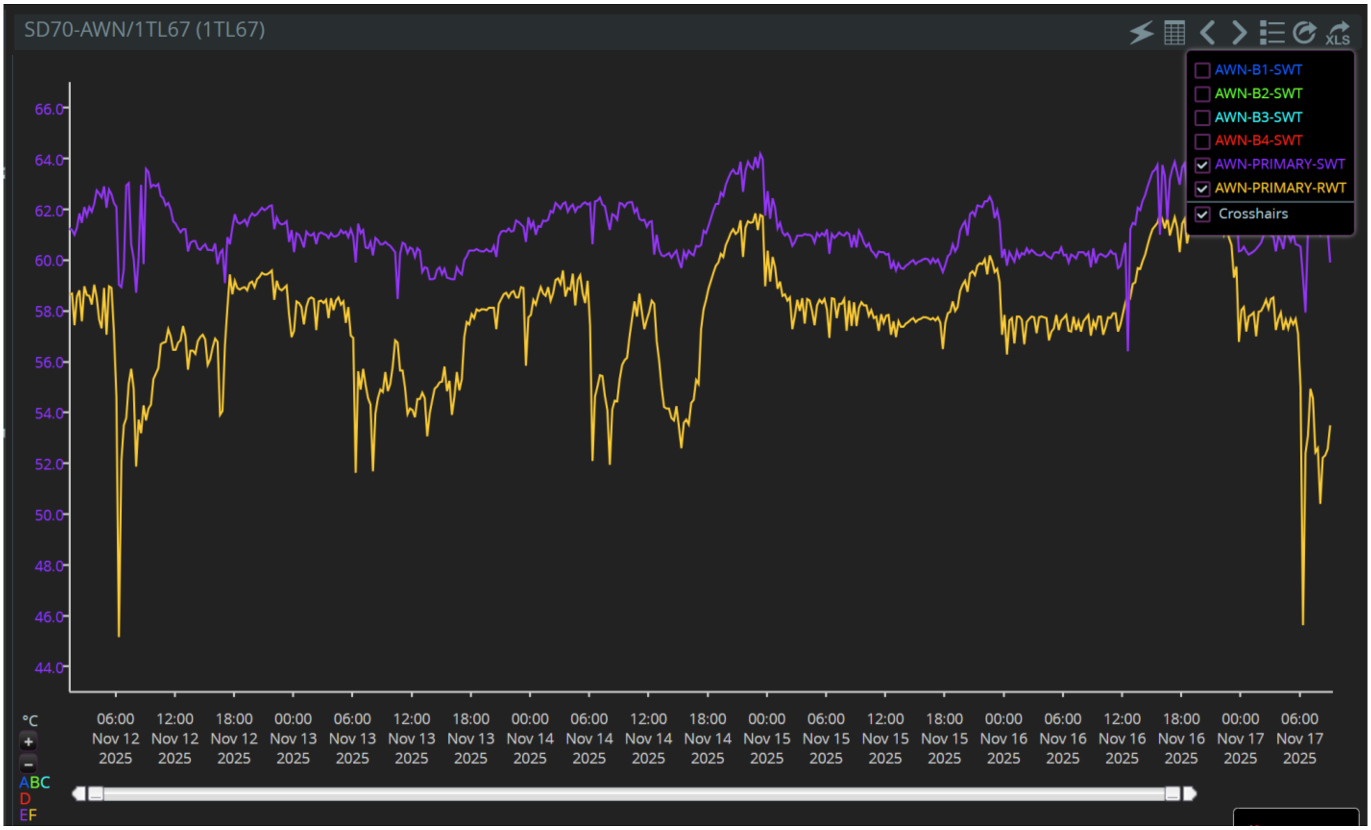


Figure 15: Trend Log of Primary SWT and RWT During a Period in November 2025

5.9.2 Measure Description

Implement a demand-based reset for the primary hot water supply temperature setpoint, such that the primary loop temperature is reduced during low heating demand periods.

This measure assumes that the boiler plant will not be used to serve the DHW system.

Natural gas savings account for improved boiler efficiency due to lower return water temperatures. Natural gas savings associated with reduced heating losses are not accounted for in the estimated savings.

Estimated retrofit costs assume that no upgrades are required to the local boiler controllers.

5.10 Measure 10: Enable the Heating Plant Based on Heating Demand

5.10.1 Description of Finding

The primary heating loop and the secondary hot water distribution pumps are currently enabled 24/7 when outdoor air temperature is below 15°C. For example, Figure 16 shows a trend log of the P-8 distribution pump VFD speed over a period in November 2025, showing that the pump is running 24/7 over this period.

During unoccupied hours, there is typically no heating demand in the building, except for when AHUs and unit ventilators are running in unoccupied heating mode. During these periods when there is no heating demand, the boilers and heating distribution pumps (P-6, P-7, and P-8) can be disabled, enabling as needed if units are running in unoccupied heating mode.

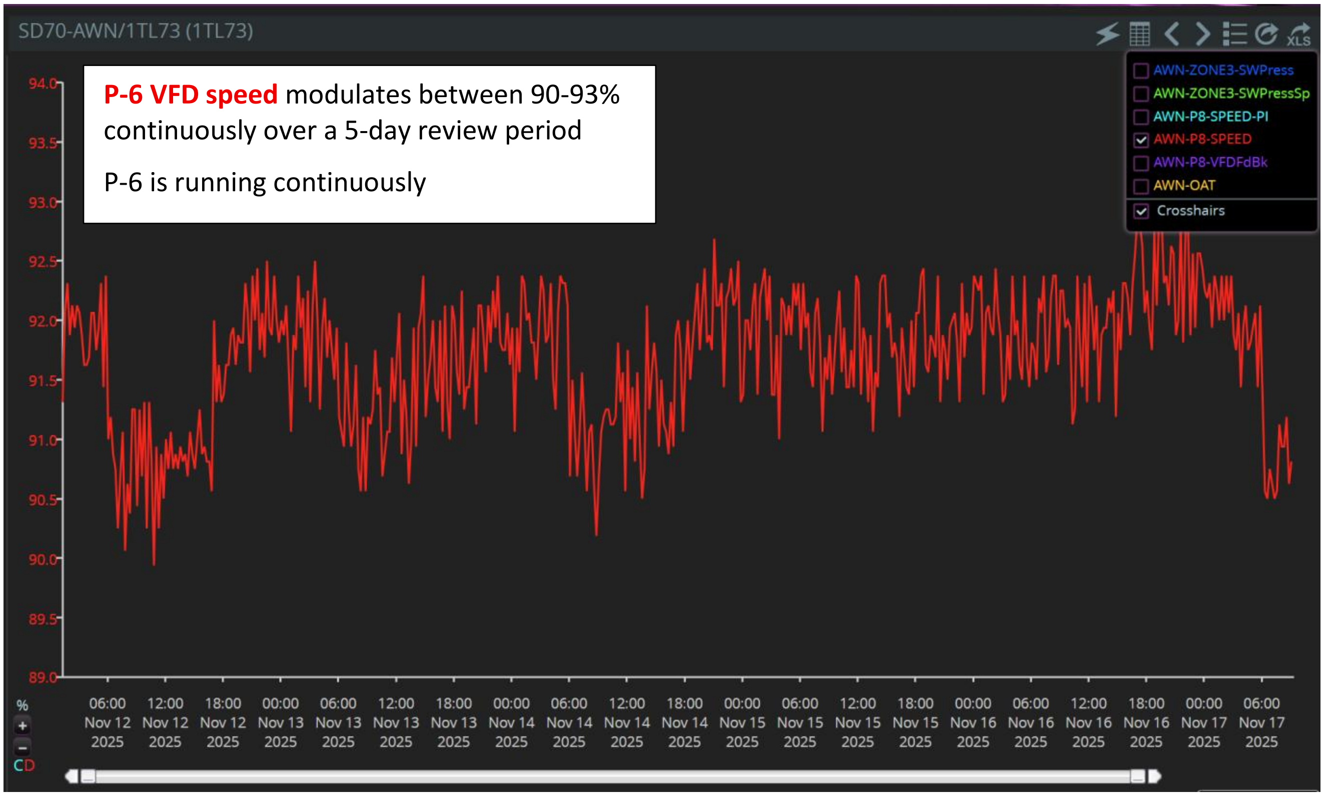


Figure 16: Trend log of P-8 Distribution Pump VFD Speed from November 12 - 17, 2025

5.10.2 Measure Description

Program the boilers and distribution pumps to enable/disable based on heating demand.

6.0 Measures to be considered for Future Implementation

This section provides an overview of each measure that was identified but **was not selected** as part of this C. Op. project. These measures either require further investigation or were determined to have lengthy payback periods. Energy savings and estimated retrofit costs were not quantified for the measures presented in this section.

6.1 Measure 1: Recalibrate Hot Water Distribution Loop Differential Pressure Sensors

6.1.1 Description of Finding

The three hot water distribution pumps (P-6, P-7, and P-8) control their VFD speeds based on readings from differential pressure sensors relative to each loop's differential pressure setpoint.

When the hot water distribution pumps are off, the differential pressure sensors are still measuring pressure in each respective loop, as shown in Figure 17. When there is no flow, differential pressure should be 0 psi. This likely indicates that the differential pressure sensors need to be calibrated.

The P-6 differential pressure sensor is currently overridden to 6 psi. It is assumed that this is a manual intervention used to always control the pump to its maximum VFD speed.

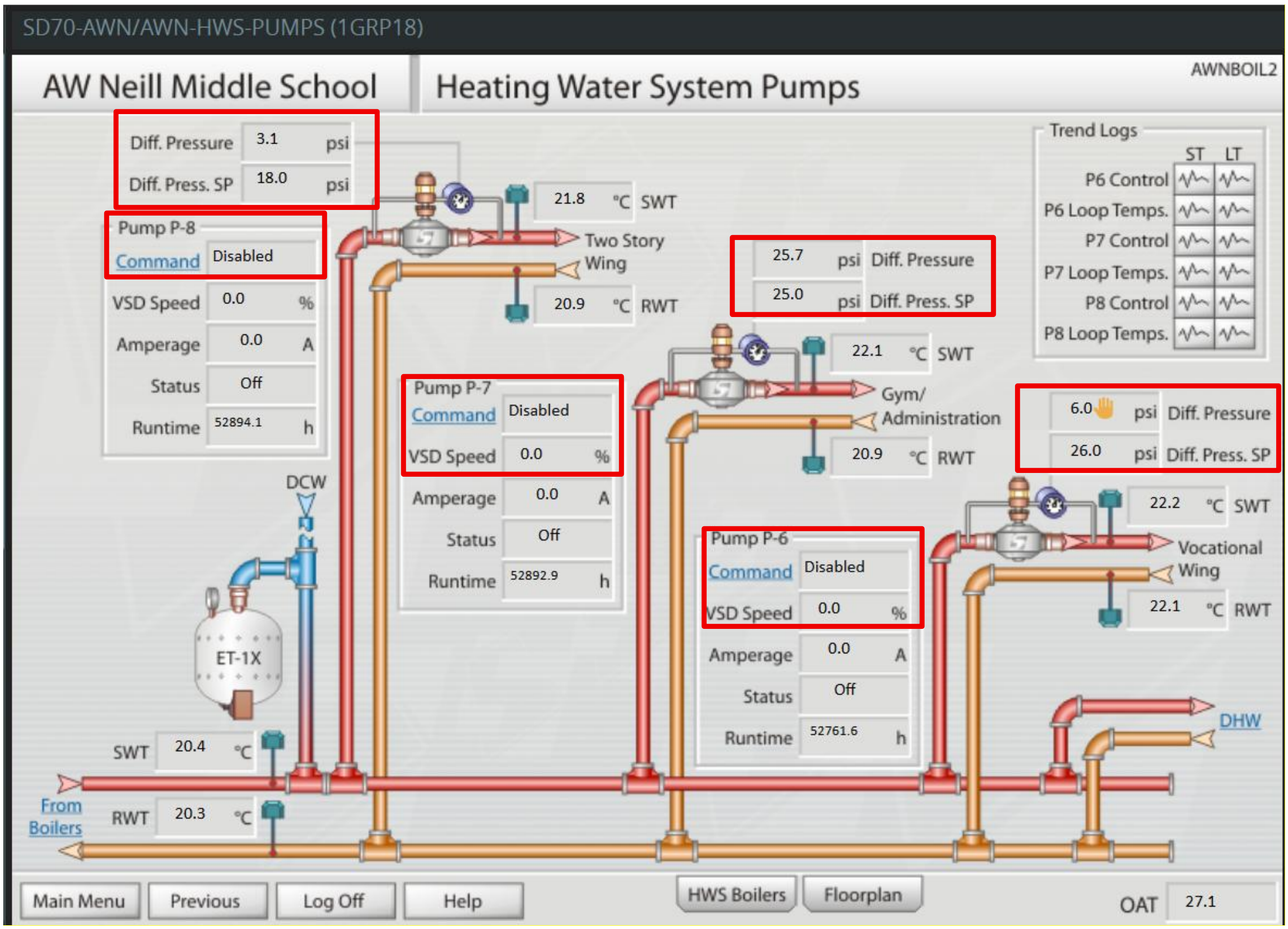


Figure 17: Screenshot of BAS Graphics for Heating Water Distribution System When Pumps are Off

6.1.2 Measure Description

Re-calibrate the hot water distribution loop differential pressure sensors. Once calibrated, remove the 6-psi manual override on the P-6 differential pressure sensor.

Implementation of this measure is not expected to result in a material decrease in energy use; however, it may result in improved occupant comfort, particularly in the areas served by the P-7 distribution loop.

7.0 Next Steps – Implementation Phase and Completion Phase

7.1 Implementation Phase

To continue in the program, the owner is responsible for implementing the selected bundle of measures that pay back in two years or less. Using the *Recommissioning Report* for implementation allows flexibility in how the selected measures are implemented. Options include: utilize in-house building staff, hire the C.Op Provider to implement or provide technical assistance, contract with outside service contractors, or any combination of the above.

7.2 Completion Phase

C.Op Service provider will follow up after implementation of the selected measures and **update** this *Recommissioning report and Recommissioning Workbook*.

The updated report for the implemented measures includes but not limited to: date of completion of each measure, new or improved sequences of operation, the energy savings impact of the measures, the requirements for ongoing maintenance and monitoring of the measures, and contact information for the service provider, in house staff, and contractors responsible for the implementation. When feasible, verification data should include trends or functional test results, though other methods, such as copies of invoices, site visit reports, and before/after photos, may be acceptable.

The C.Op Service Provider will conduct an in-house (teleconference) session for the Applicant and the appropriate building operations personnel covering the new documentation, measures that were implemented, and requirements for ongoing maintenance and monitoring. Document the attendance of the building operations staff.

The *updated Recommissioning Workbook* and *updated Recommissioning Report* will be submitted to the owner and the program for review. See Appendix B: Completion Phase Summary Table for more details on implemented measures.

8.0 Appendix A: Investigation Phase Summary Table

Investigation Phase Summary				Investigation Phase							
				Energy Savings			Cost Savings	Financial		Est. GHG Reduction	
ECM #	Measure Title	Measure History	Include cost	Demand (kW)	Electrical (kWh/yr)	Fuel (GJ)	Total ($/yr)	Estimated Measure Cost ($)	Simple Payback (yrs)	tonnes CO2e/yr	Enter "x" if DESELECT for implementation
ECM-1	Rectify 24/7 Unit Ventilator Summer Operation	New	1	-	5,689	-	$ 587	$ -	-	0.1	
ECM-2	Rectify UV-30 24/7 Operation	New	1	-	2,300	7	$ 301	$ 1,000	3.3	0.4	
ECM-3	Reduce the Purge Mode Calendar and Update the Cooling OS Maximum Start Time	New	1	-	5,109	-	$ 527	$ 1,000	1.9	0.1	
ECM-4	Program OADs Closed in Unoccupied Heating and Heating OS Modes	New	1	-	-	25	$ 220	$ 1,900	8.7	1.2	
ECM-5	Reduce Unoccupied Heating Setpoints for AHU-2 and AHU-3	New	1	-	2,422	15	$ 379	$ -	-	0.8	
ECM-6	Update AHU-2 and AHU-3 Re-Heat Control in Unoccupied Heating Mode	New	1	-	5,668	-	$ 584	$ 2,800	4.8	0.1	
ECM-7	Adjust Unit Ventilator and Re-Heat Coil HCV Control in Heating OS Mode	New	1	-	2,336	-	$ 241	$ 2,800	11.6	0.0	
ECM-8	Adjust UV-6 Unoccupied Cooling Setpoint	New	1	-	2,200	-	$ 227	$ -	-	0.0	
ECM-9	Implement an Demand Based Reset for the Primary HWST-SP	New	1	-	-	71	$ 620	$ 7,400	11.9	3.5	
ECM-10	Enable the Heating Plant Based on Heating Demand	New	1	-	7,440	48	$ 1,192	$ 1,900	1.6	2.5	
			TOTAL (Previous, still working):	-	-	-	$ -	n/a	n/a	-	
			TOTAL (All potential measures for Implementation):	-	33,165	166	$ 4,877	$ 18,800	3.9	8.6	
			TOTAL (Selected measures only):	**-**	**33,165**	**166**	**$ 4,877**	**$ 18,800**	**3.9**	**8.6**	
							Implementation cap @$0.25/ft2	$ 14,749			

9.0 Appendix B: Completion Phase Summary Table

To be completed during the completion phase.

10.0 Appendix C: Sample Training Outline

The Commissioning Provider (C.Op Provider) may customize the outline for the training and developing the training materials. Before preparing the training outline and materials, the C.Op Provider should assess the related level of knowledge of the building operators, to set up the training accordingly. For reference, the Program provides the following sample outline for the training:

- Background on the energy use of this particular building
  - Present Energy Utilization Index
  - Describe Operating Schedules and Owner's operating requirements
- RCx investigation process used in this building
  - Describe the methods used to identify problems and deficiencies
  - Review the RCx Workbook
- Implementation process in this building
  - Describe the measures that were implemented and by whom
  - Walk around the building to look at any physical changes or step through the new control sequences at the operator workstation
  - Provide as many details about implementation as necessary to describe what was done
  - Describe improved performance that these measures will create (show trends if available)
- O&M requirements
  - Describe the O&M requirements needed to keep these improvements working
  - Describe how the staff can be aware of energy efficiency opportunities and begin looking for additional savings potential

The C.Op Provider should follow the outline to prepare materials, as necessary, to hand out at the training session.

11.0 Appendix D: Training Completion Form

Project ID

Facility Information

Company Name		Building Name(s)	
Facility Address		City	Province

Training Details

Location	Date
Commissioning Provider/Trainer	

Materials Attached

☐ Agenda
☐ Materials used for training
☐ List of individuals who attended

COMMISSIONING PROVIDER SIGNATURE

By signing this Training Completion Form, I verify that this training took place with the listed attendees.	
Commissioning Provider (print name):	
Signature:	Date:

FACSIMILE/SCANNED SIGNATURES: Facsimile transmission of any signed original document, and the retransmission of any signed facsimile transmission, shall be the same as delivery of the original signed document. Scanned original documents transmitted to BC Hydro as an attachment via electronic mail shall be the same as delivery of the original signed document. At the request of BC Hydro, C.Op Provider shall confirm documents with a facsimile transmitted signature or a scanned signature by providing an original document.

Targeted Documentation

O & M Manual

O & M Manual updated ☐	Describe updates below and attach copies of new or amended portions
O & M Manual not updated ☐	Province reasons below
Building has no O & M Manual ☐	

Building Plans ("as-builts")

Building Plans updated ☐	Describe below
Wiring diagrams updated ☐	Describe below
No plans or diagrams updated ☐	Describe below

EMS Programming

New sequences of operation on file ☐	Specify location of file and attach copy
Printed screenshots on file ☐	Specify location of file and attach copy

Equipment Manuals

Manuals for new equipment are on file ☐	Describe below (attach copy if applicable)

Checklist of subjects discussed at training

Explain investigation process and how measures were identified	☐
Describe implemented measures, and how they are reducing energy usage	☐
Building walkthrough to show implemented measures	☐
Describe methods for monitoring and maintaining optimum system performance related to implemented measures	☐
Describe scenarios where system setting changes would be required, and how to maintain optimum energy efficiency, e.g., seasonal-based manual adjustments to setpoints.	☐

List of Individuals Who Attended

Name	**Title**	**Building (address or name)**	**Contact information (e-mail and/or phone number)**

Continuous Optimization Investigation Report

School District 70 | Ucluelet Secondary School
Address
BCH Project #: BCH-11744
Prism Project #: 2025021

Prism Engineering
Changing systems for a better world

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Burnaby, BC V5G 4X5
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prismengineering.com

Version	Updated on	Phase
v0.1	December 9, 2025	Investigation Draft

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1.0 Introduction

Prism Engineering is pleased to present the results of the Investigation Phase that was conducted as part of BC Hydro's Continuous Optimization for Commercial Buildings Program for Ucluelet Secondary School. The objective of an Investigation is to identify deficiencies and improvements in the operation of a facility's mechanical equipment, lighting, and related controls, and determine opportunities for corrective action that reduce energy consumption and preserve the indoor environmental quality.

This document is a complete record of the work performed at this facility, including the in-depth investigation of the building systems and the implementation of selected measures to optimize building performance.

The Recommissioning Investigation Report provides an overview of the recommendations for the implementation of measures. This information is not considered a specification or detailed sequence of operations. The intent is to provide an overview of the recommendation that can be built upon during the implementation phase as part of any detailed design that may be required. Certain measures may require further investigation and specification for the correct implementation by the owner or the DDC contractor.

Eight recommended retrofits were identified as a part of this investigation. The proposed measures will be reviewed in a meeting with School District 70 and Prism Engineering representatives to determine which measures will be implemented.

Recommended retrofits for implementation include:

- Measure 1: Implement a Holiday HVAC Schedule
- Measure 2: Update AHU-5 Re-heat Valve Control in Unoccupied Heating Mode
- Measure 3: Rectify RHC-129 Passing Heating Control Valve
- Measure 4: Update AHU-4 OAD and HCV Control
- Measure 5: Enable the Hydronic Distribution Pumps Based on Demand
- Measure 6: Disable the ASHPs when the Hydronic Distribution Pumps are Off
- Measure 7: Reduce the HWST-SP
- Measure 8: Extend ASHP Operation During Low OAT Conditions
- Measure 9: Lockout the Heating Plant During Summer Months
- Measure 10: ASHP Demand Response

These measures are presented in the Investigation Summary Table (see Appendix A).

Other measures that were identified but not selected as part of this C. Op. project are outlined in section 6.0.

2.0 Project Overview

Project Information

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RCx Project File #	**BCH-11744**		
Date of Workbook Update	05-Dec-2025		
Organization	School District 70		
Building Name	Ucluelet Secondary School		
Building Type	Large School		
Location (City)	Ucluelet		
Owner Contact	Alex Taylor		
Investigation Phase start date	20-Jan-2025		
Participated in previous BCH RCx program?	No		
Previous RCx File #			
Previous RCx completion date			

Building Information

Facility Area (ft2)	48,621		
Annual elec consumption (kWh)	306,143	6.3	kWh/ft^2
Annual elec costs ($)	$ 35,798	$ 0.12	Avg. $/kWh
Fuel type	Propane		
Annual fuel consumption (GJ)	1,112	6.4	$ekWh/ft^2$
Annual fuel cost ($)	$ 41,500	$ 37.3	Avg. $/GJ
Total GHG emissions (tCO2e/yr)	71		
Total Energy Cost	$ 77,298	$ 1.59	$\$/ft^2$
Energy Use Intensity (ekWh/ft2)	12.6		
Year for energy data above	2024		

3.0 Savings Summary

Savings Summary	Previous, still working	New + Previous, rectify + Previous, documented					
		Identified		Selected		Implemented	
# of measures	0	10		10		0	
	Re-claim Savings	Total Savings	% Savings	Total Savings	% Savings	Total Savings	% Savings
Electrical savings (kWh/yr)	-	38,191	12.5%	38,191	12.5%	-	0.0%
Fuel savings (GJ/yr)	-	225	20.2%	225	20.2%	-	0.0%
Cost savings ($)	$ -	$ 15,369	19.9%	$ 15,369	19.9%	$ -	0.0%
eduction (tCO2e/yr)	-	16.1	22.6%	16.1	22.6%	-	0.0%
# of Abandoned measures	0						

4.0 Brief Description of Existing System

This section contains a brief description of the existing HVAC and Controls system. The information is intended to provide a general overview only.

4.1 Facility Description

Ucluelet Secondary School (USS) consists of three separate buildings – the administration building, the academic building, and the day care, as shown in Figure 1. Each building is one story above grade, and the school has a combined floor area of 48,621 ft².

Most of the school was built in 2021 as part of a major construction project. It is understood that the daycare building and gymnasium in the administration building are the only portions of the original structure that remain from before the 2021 construction project.

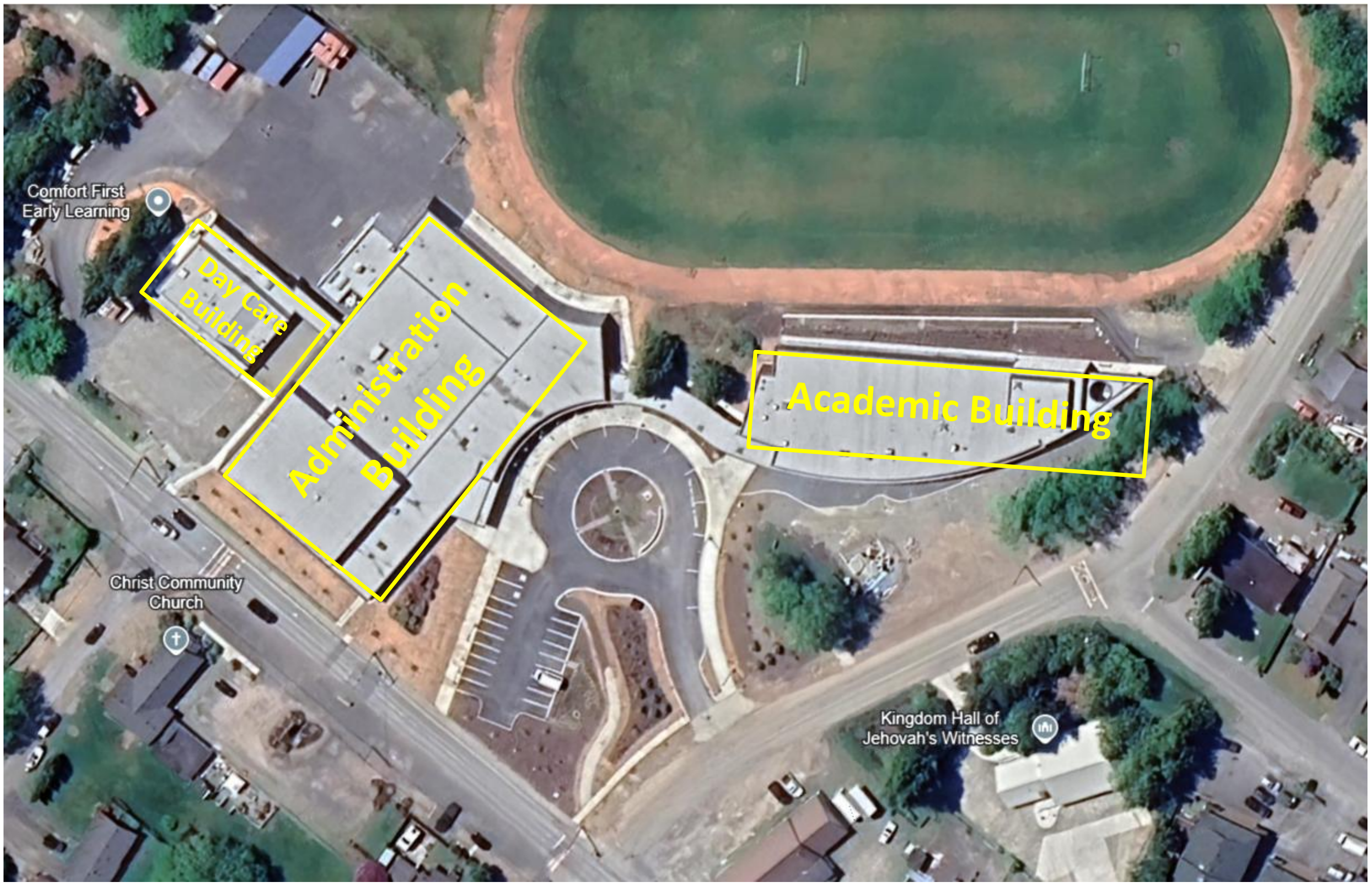

Figure 1: Labelled Satellite Image of Ucluelet Secondary School

4.2 Mechanical Systems Description

4.2.1 Heating and Cooling Plant

Heating is provided by one central plant located in the administration building consisting of four hydronic boilers and two air source heat pumps (ASHP). It serves air handling unit switchover coils, reheat coils, convectors, forced flow heaters, radiant floors, and unit ventilators. The ASHPs were installed in 2021 as part of the major construction project. The boilers were previously installed in the original school building in 2014 but were moved and re-purposed to serve the new heating plant during the 2021 construction project.

The ASHPs are piped to the source side of a buffer tank, while the boilers are piped from the heating water supply on the load side of the buffer tank. The AHUs are equipped with 3-way valves and served by constant volume booster pumps, while the re-heat coils, forced flow unit heaters, and convectors are equipped with 2-way valves. Hot water is distributed to the terminal units by three sets of duty/standby variable speed pumps, as shown in Figure 2.

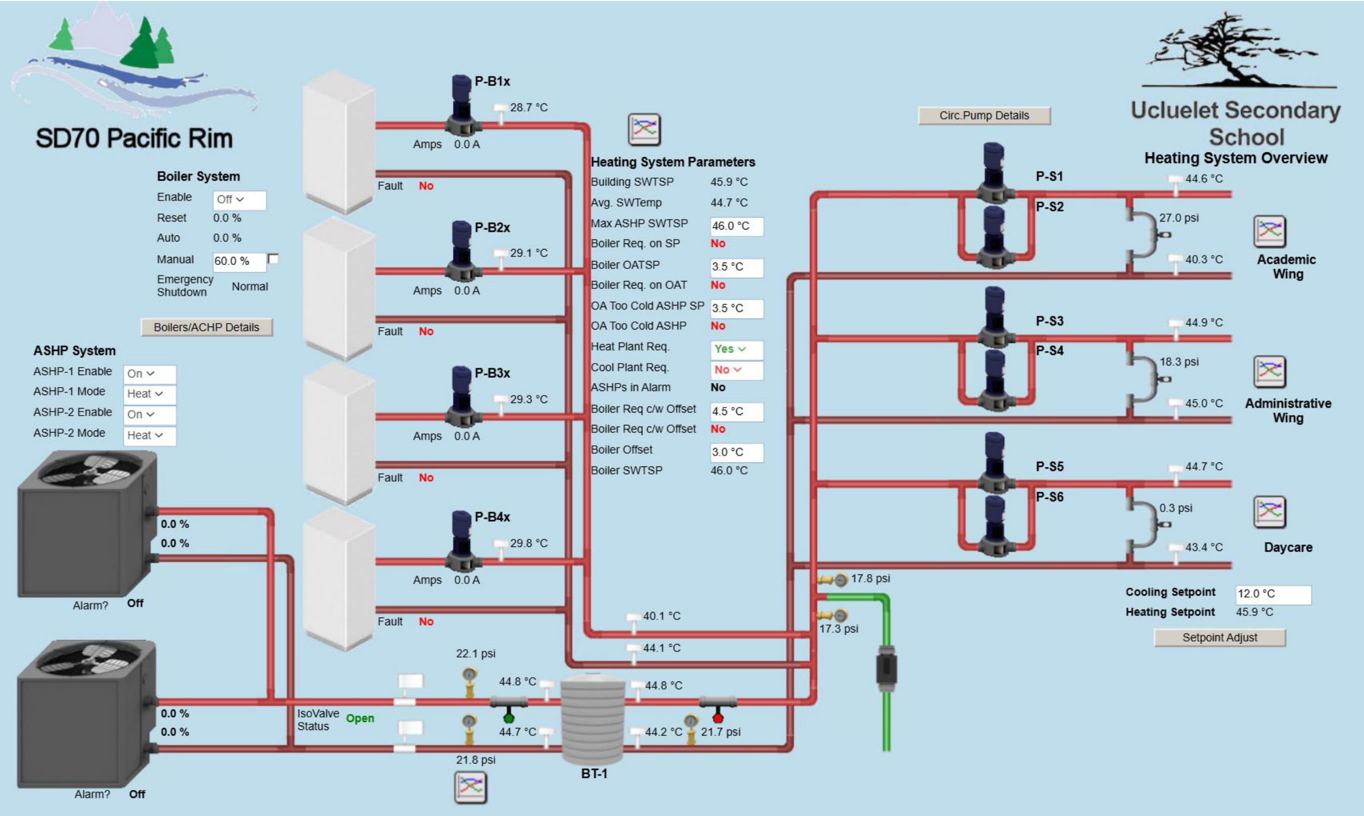

Figure 2: BAS Graphic of Heating Systems

The ASHPs can also provide cooling to the same terminal units during warm weather conditions, however, the cooling schedule was observed to be manually overridden to off on the building automation system (BAS) at the time of review. Based on conversations with the operations team and a review of trend log data, the system is never operated in cooling mode.

At the time of review, the ASHPs were observed to be providing most of the building heating load. The boilers were observed to operate infrequently for supplemental heating during mild weather conditions, only cycling on for short periods, typically at the beginning of the day. Calculations indicate that heat ASHPs provided 78% of the building's space heating from September 2023 – August 2024, with the gas boilers providing the remaining 22%.

Table 1: Summary of Boilers

Tag	Quantity	Make/Model	Heating Output (MBH)	Notes
B-1 – B-4	4	IBC SL-40 399	399	Condensing.

Table 2: Summary of Air Source Heat Pumps

Tag	Quantity	Make/Model	Nominal Cooling Capacity	Nominal Heating Capacity	Notes
ASHP-1 – 2	2	Aermec NLC0675XHAVJ9P2	143 kW @ 35°C OAT	156 kW @ 7°C OAT	- Two scroll compressors. - Built-in circulation pump. - R410A refrigerant.

Table 3: Summary of Hydronic Pumps

Tag	Quantity	Description	Power	Flow (GPM)	Head (ft)	Notes
P-B1 – B4	4	B-1 Primary Circulator	189 W	Unknown	Unknown	Constant speed.
P-S1 – S2	2	Academic Building	2 hp	38.5	70	Variable speed.
P-S3 – S4	2	Admin Building	3 hp	37.4	45	Variable speed.
P-S5 – S6	2	Day Care	600 W	23.4	50	Variable speed.
P-AHU1	1	AHU-1 Changeover Coil	205 W	Unknown	Unknown	Constant speed.
P-AHU3	1	AHU-3 Changeover Coil	178 W	6.0	30	Variable speed.
P-AHU7	1	AHU-7 Changeover Coil	178 W	4.0	30	Variable speed.
P-AHU8	1	AHU-8 Changeover Coil	178 W	7.0	30	Variable speed.
P-AHU9	1	AHU-9 Changeover Coil	178 W	11.0	30	Variable speed.
P-RF1	1	Academic Building Radiant Floor	106 W	4.5	25	Variable speed.
P-RF2	1	Academic Building Radiant Floor	106 W	2.2	Unknown	Variable speed.
P-RF3	1	Admin Building Radiant Floor	106 W	4.0	25	Variable speed.
P-RF4	1	Admin Building Radiant Floor	106 W	3.6	Unknown	Variable speed.

4.2.2 Ventilation

Ventilation is provided to the administration and academic buildings by several air handling units, as described in Table 4 and Table 5.

Ventilation is provided to the day care building by four unit ventilators. Various fractional horsepower exhaust fans serve the buildings.

Table 4: Administration Building Air Handling Unit Summary

Tag	Service Area	Power	Flow (L/s)	Notes
MUA-1	Woodshop E118	3 hp	2,360	Constant speed fan. Mixed-air unit. Hydronic changeover coil. Constant flow system.
AHU-1	Gymnasium	10 hp	4,955	CO_2 and occupancy sensor control. Constant speed fan. Mixed-air unit. Hydronic changeover coil. Constant flow system.
AHU-2	Multipurpose Room E-117	3.6 kW	1,413	CO_2 and occupancy sensor control. Variable speed fan, set at 46%. Mixed-air unit. Hydronic changeover coil. Constant flow system.
AHU-3	Office 129, Seminar 128, Learning 127	3.6 kW	2,475	CO_2 and occupancy sensor control. Variable speed fan, set at 100%. Mixed-air unit. Hydronic changeover coil. Constant flow system with re-heat.
AHU-4	Food and Textiles 123	3.6 kW	1,103	CO_2 and occupancy sensor control. Variable speed fan, set at 61%. Mixed-air unit. Hydronic changeover coil. Constant flow system with re-heat.
AHU-5	Reception 103 VP 106 Meeting 107 Principal 108 Health 111 Office 115	Est. 3.6 kW	794	CO_2 sensor control. Variable speed fan, set at 56%. Mixed-air unit. Hydronic changeover coil. Constant flow system with re-heat.

Tag	Service Area	Power	Flow (L/s)	Notes
	L.A. 116			
AHU-6	NLC 117	Est. 3.6 kW	852	CO_2 and occupancy sensor control. Variable speed fan, set at 48%. Mixed-air unit. Hydronic changeover coil. Constant flow system.
AHU-7	Quiet 121 Special Education 119 Corridor 102 Lobby 101	2 x 3.6 kW	2,707	CO_2 sensor control. Variable speed fan, set at 90%. Mixed-air unit. Hydronic changeover coil. Constant flow system with re-heat.

Table 5: Academic Building Air Handling Unit Summary

Tag	Service Area	Power	Flow (L/s)	Notes
AHU-8	Office 145 Office 146 Staff 147 Class 150 French 151 Class 152 Class 153	2 x 3.6 kW	3,212	CO_2 sensor control. Variable speed fans, set at 72%. Mixed-air unit. Hydronic changeover coil. Constant flow system with re-heat.
AHU-9	Science 154 Science 155 Prep 156 Art 158	Est. 3.6 kW	2,230 (supply) 2,214 (exhaust)	100% O/A Heat Recovery Ventilation Unit. Variable speed fans, Supply and exhaust fan set at 100%. Hydronic changeover coil. Constant flow system with re-heat.
AHU-10	Music 161 Practice 164	3.6 kW	1,169	CO_2 sensor control. Variable speed fan, set at 70%. Mixed-air unit. Hydronic changeover coil. Constant flow system with re-heat.

4.2.3 Domestic Hot Water and Cold-Water Systems

Domestic hot water (DHW) is generated by five instantaneous propane hot water heaters and re-circulated by two re-circulation pumps.

Two domestic cold water (DCW) booster pumps were installed in 2025 to mitigate issues with low water pressure in the school.

Table 6: Summary of Domestic Hot Water Heaters

Tag	Make/Model	Service Area	Heating Input (MBH)
DHW-1	Navien NPE-240A2	Academic Building	13 - 199
DHW-2	Navien NPE-240A2	Academic Building	13 - 199
DHW-3	Navien NPE-240A2	Admin Building	13 - 199
DHW-4	Navien NPE-240A2	Admin Building	13 - 199
DHW-5	Navien NPE-240A2	Admin Building	13 - 199

Table 7: Summary of Domestic Hot Water Re-circulation Pumps

Tag	Description	Power
P-HWR1	Academic Building - DHW Recirculation Pump	150 W
P-HWR2	Admin Building - DHW Recirculation Pump	179 W

Table 8: Summary of Domestic Cold Water Booster Pumps

Tag	Quantity	Description	Power	Flow (L/s)
P-1 – 2	2	DCW Booster Pumps	2.2 hp	6.8

4.2.4 Controls System (includes Lighting Controls if Applicable)

The mechanical systems in this building are controlled by a Direct Digital Control (DDC) Building Automation System (BAS). The system is manufactured by Reliable Controls.

5.0 Measures Selected for Implementation

This section provides an overview of new measures identified in this Round of Investigation, including recommendations for implementation, and updates post implementation.

For each measure, costs, savings and payback calculations can be referenced in the *Investigation Summary Table* (see Appendix A).

5.1 Measure 1: Implement a Holiday HVAC Schedule

5.1.1 Description of Finding

Each air handling unit (AHU) is controlled by a schedule setup on the building automation system (BAS). All AHU schedules are currently set to 8:00 AM – 4:00 PM, Monday to Friday.

There is currently no statutory holiday schedule setup on the BAS, and the AHUs continue to follow their schedule on statutory holidays and during school break periods. As an example, Figure 3 shows a trend log of the AHU-1 supply fan amperage on the 2025 Thanksgiving statutory holiday (October 13, 2025), showing that the AHU-1 was operating from 8:00 AM to 4:00 PM.

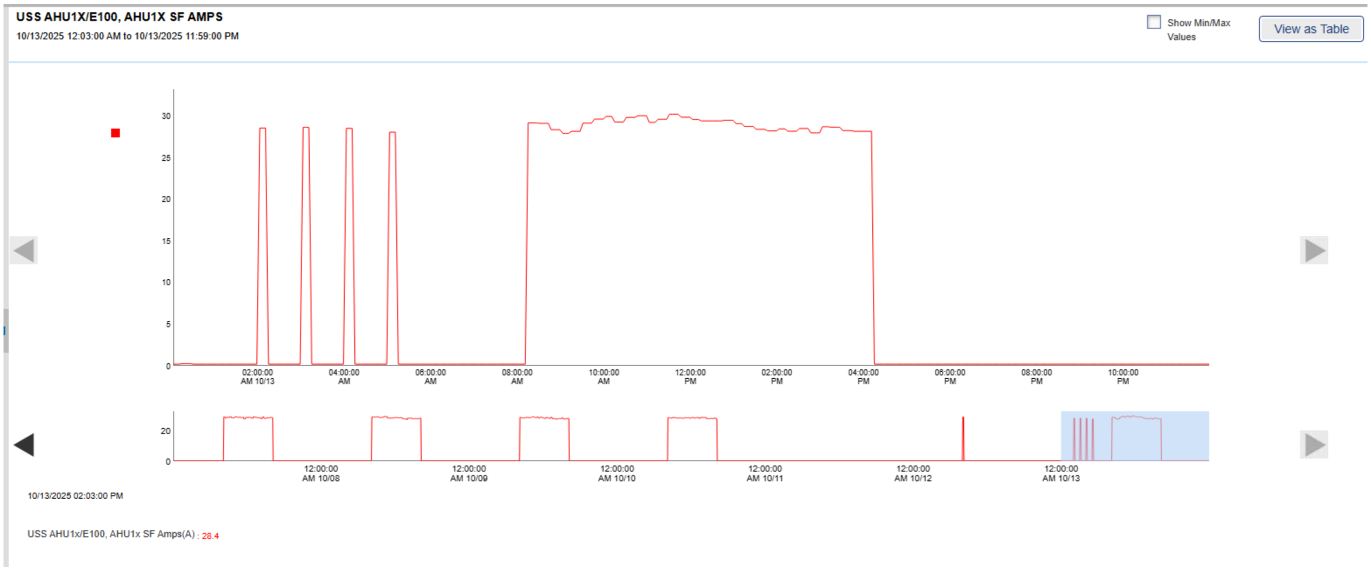

Figure 3: BAS Trend Log of AHU-1 Supply Fan Amperage on the 2025 Thanksgiving Day Statutory Holiday (October 13, 2025)

5.1.2 Measure Description

Implement a holiday HVAC schedule and schedule all AHUs off on statutory holidays and during school break periods.

Savings assume that all AHUs can be turned off on statutory holidays, during the two-week March break period, and the two-week winter break period.

5.2 Measure 2: Update AHU-5 Re-heat Valve Control in Unoccupied Heating Mode

5.2.1 Description of Finding

AHU-5 was observed to be enabled almost every day during non-scheduled hours in unoccupied heating mode. Once AHU-5 is enabled, it was observed to run continuously until the start of the next day's schedule. Figure 4 highlights an instance of AHU-5 operating continuously from 3:35 AM on Saturday, November 1, 2025, until 8:00 AM on Monday, November 3, 2025.

Figure 5 shows a trend log of several zone temperatures in spaces served by AHU-5 when AHU-5 is enabled in unoccupied heating mode on November 1, 2025. The zone temperatures drop when AHU-5 is enabled and then are maintained between 17°C and 18°C until the next occupancy schedule start-time.

It is suspected that AHU-5 is programmed to turn off in unoccupied heating mode when the minimum zone temperature is greater than 18°C. This setpoint is never achieved because re-heat valves are controlling to maintain zone temperatures below 18°C.

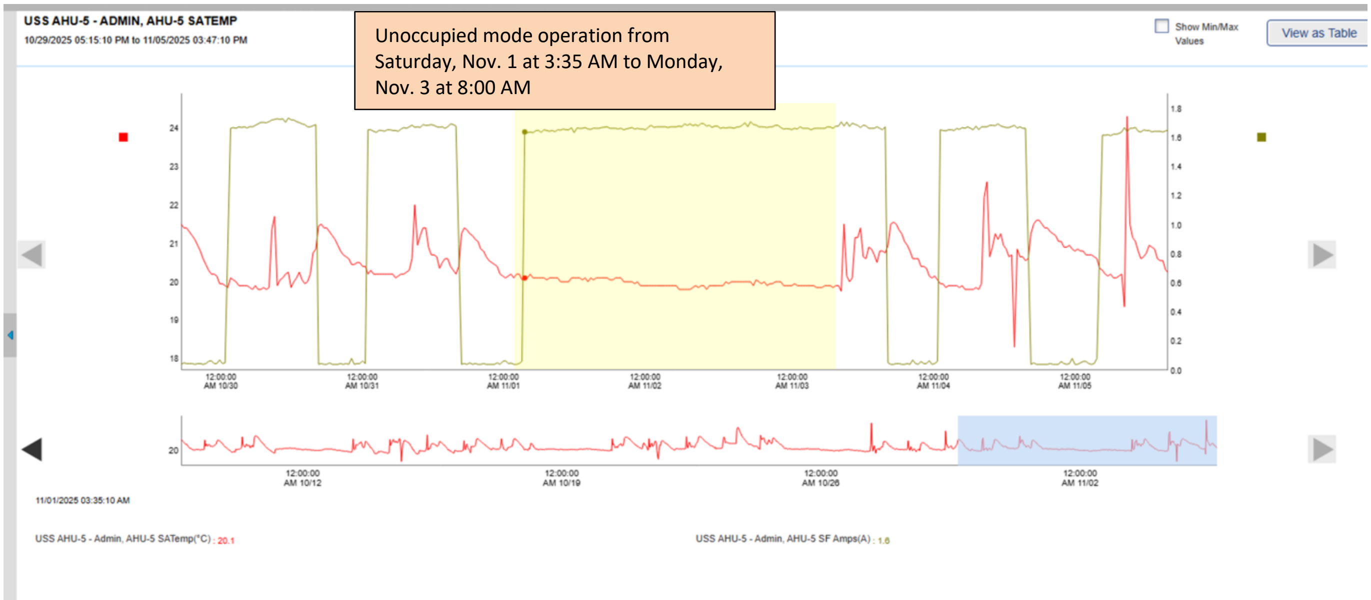

Figure 4: BAS trend log of AHU-5 Supply Fan Amperage (YELLOW) and AHU-5 Supply Air Temperature (RED)

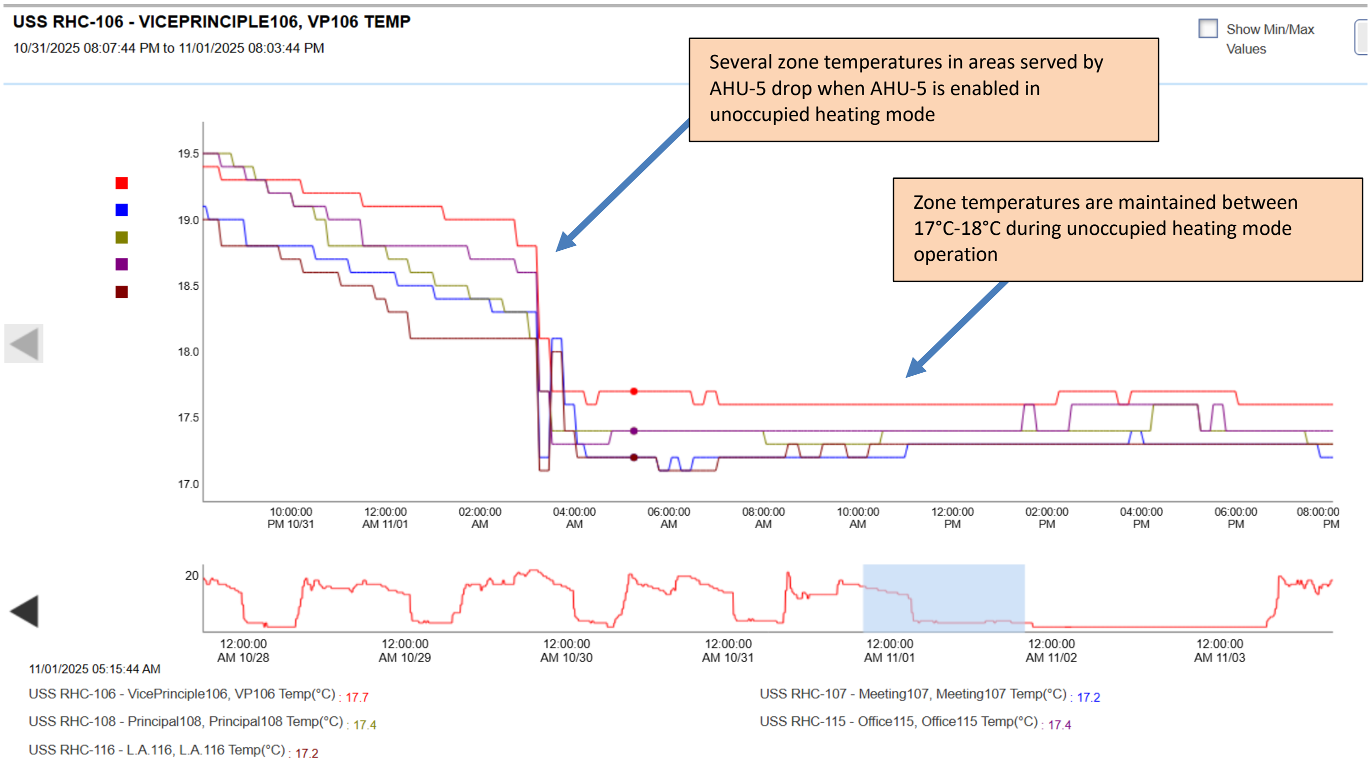

Figure 5: Trend Log of Zone Temperatures in Areas Served by AHU-5 on Nov. 1, 2025

5.2.2 Measure Description

Update the control of the re-heat valves downstream of AHU-5 in unoccupied heating mode, such that AHU-5 is disabled once zone temperatures have sufficiently increased.

5.3 *Measure 3: Rectify RHC-129 Passing Heating Control Valve*

5.3.1 Description of Finding

There are three hydronic re-heat coils downstream of AHU-3. The RHC-129 control valve was observed to be passing, providing heating to supply air when it is commanded to the 0% open position, as shown in Figure 6.

The AHU-3 supply air temperature (SAT) setpoint is controlled to the lowest of the three re-heat SAT setpoints. The zone served by RHC-129 is constantly above its zone temperature setpoint, due to RHC-129 providing heating when commanded to 0% open, which is driving the AHU-3 SAT setpoint to its minimum setpoint of 13°C. This forces the AHU-3 outdoor air damper (OAD) to 100% open, increasing AHU-3's ventilation heating load, and leading to simultaneous heating and cooling.

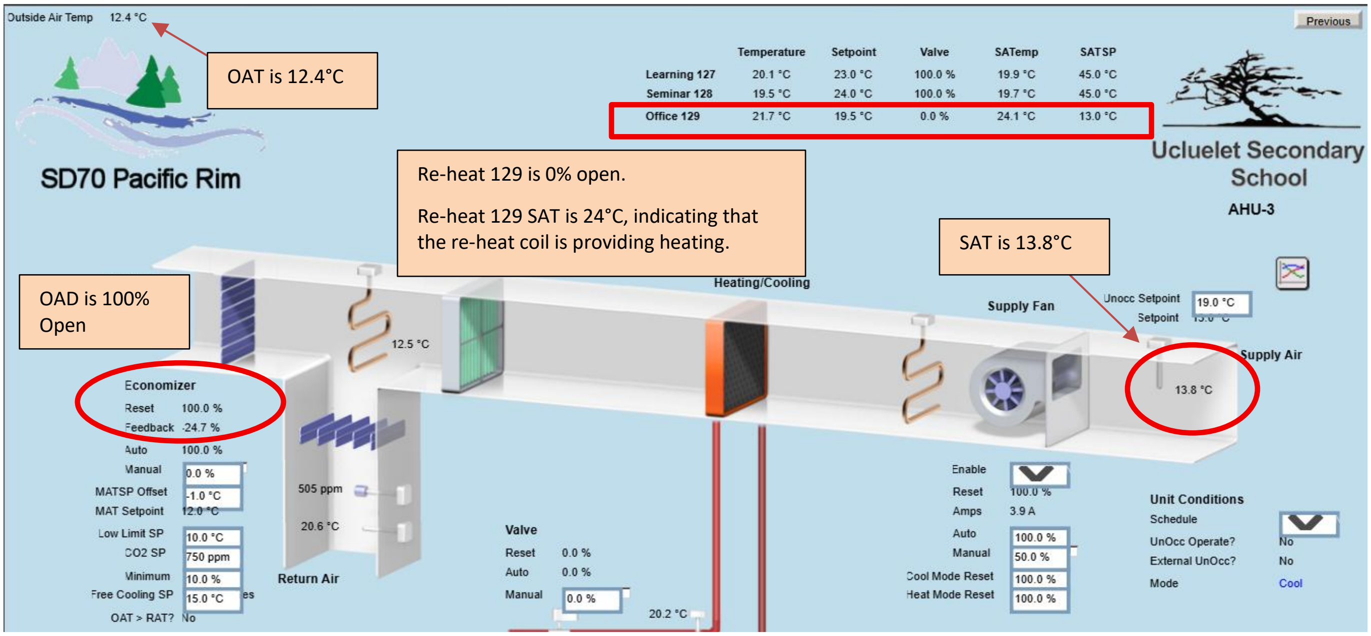

Figure 6: Screenshot of AHU-3 BAS Graphic, Highlighting a Period During Mild Weather Where RHC-129 was 0% Open and Providing Heating

5.3.2 Measure Description

Rectify the RHC-129 passing control valve.

Estimated implementation costs assume that the passing valve can be resolved without replacement of the valve or actuator.

5.4 Measure 4: Update AHU-4 OAD and HCV Control

5.4.1 Description of Finding

The AHU-4 outdoor air damper (OAD) and heating coil valve (HCV) were observed to be opening simultaneously when return air CO_2 readings are below setpoint. The AHU-4 return air CO_2 setpoint is currently set to 750 ppm

The OAD should be at its minimum position (10% open), unless CO_2 levels are above setpoint or air-side free cooling is required. The HCV should be 0% open, unless heating is required. Figure 7 shows a DDC trend log of the AHU-4 return air CO_2 levels, the HCV position, and the MAD position on October 22 ,2025. The return air CO_2 levels never exceed 500 ppm on this day, yet the HCV and MAD were both modulating simultaneously, resulting in unnecessary simultaneous heating and cooling.

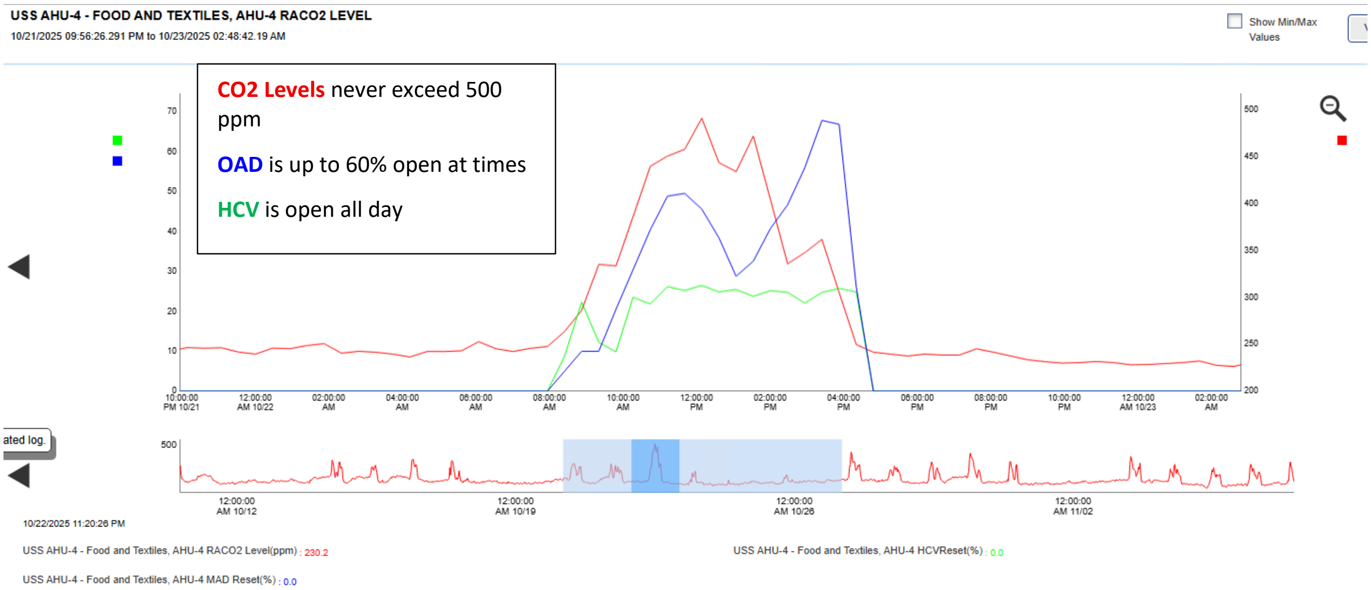

Figure 7: DDC Trend Log of AHU-4 CO2 Levels (RED), AHU-4 MAD Reset (BLUE), and AHU-4 HCV Reset (GREEN)

5.4.2 Measure Description

Review and update the control of the AHU-4 OAD and HCV to reduce simultaneous heating and cooling.

5.5 Measure 5: Enable the Hydronic Distribution Pumps Based on Demand

5.5.1 Description of Finding

The hydronic distribution pumps, P-S1/S2, P-S3/S4, and P-S5/6 are currently enabled 24/7 when outdoor air temperature is below the heating OAT lockout setpoint of 13.5°C. The building was not observed to run in mechanical cooling mode, and the hydronic distribution pumps were observed to be disabled when OAT is above the heating OAT lockout setpoint.

During unoccupied hours, there is typically no heating demand in the building, except for when AHUs are running in unoccupied heating mode. During these periods when there is no heating demand, the distribution pumps can be disabled. If an AHU starts in night setback mode, the associated distribution pumps can be enabled to provide heating until zone temperatures have increased sufficiently.

5.5.2 Measure Description

Program the hydronic distribution pumps to enable/disable based on heating demand.

Estimated savings are based on a reduction in pump run-time. Implementation of this measure will also result in a reduction in system heating losses, which are not quantified in the projected savings.

5.6 Measure 6: Disable the ASHPs when the Hydronic Distribution Pumps are Off

5.6.1 Description of Finding

Both ASHPs were found to be enabled 24/7, year-round. During unoccupied hours, when AHUs are off and terminal unit control valves are closed, the heating/cooling load in the building is negligible. During these periods, the ASHPs can be disabled, allowing their built-in circulation pumps to turn off. Disabling the ASHPs will also reduce compressors cycling, as the compressors frequently cycle on/off during low load conditions to maintain the buffer tank at setpoint. Figure 8 shows a DDC trend log of the buffer tank source side temperatures, and the ASHP-1 and ASHP-2 active power during unoccupied hours on November 3, 2025. During this period, ASHP-2 was frequently cycling on/off to maintain the buffer tank temperature, while both ASHP circulation pumps were running.

Based on the rated heating capacity of the ASHPs and the volume of the buffer tank, the ASHPs can heat the buffer tank from 20°C to 46°C in less than 7 minutes if running at full output, without supplemental heating from the boilers.

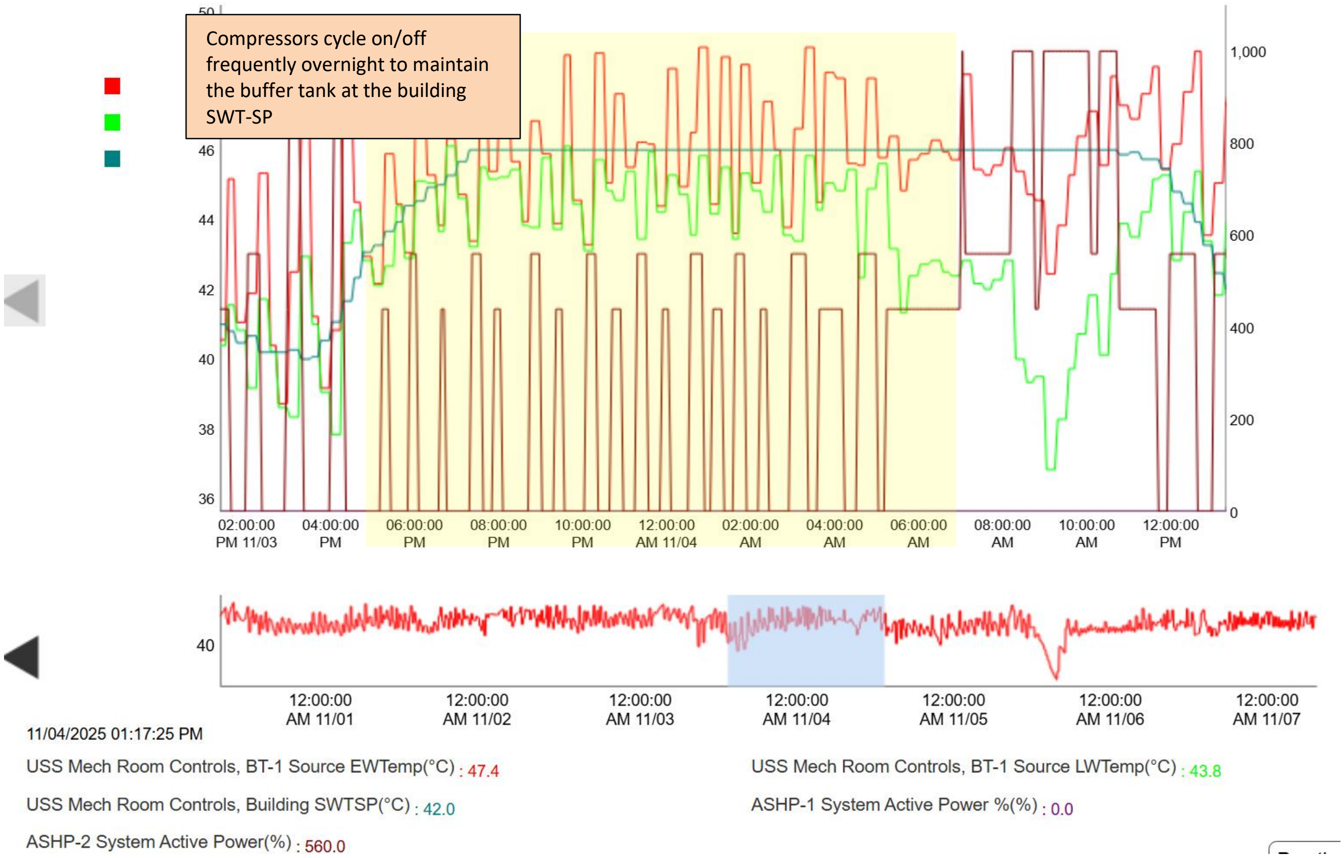

Figure 8: DDC Trend Log of the Buffer Tank Source Side EWT (RED), Source Side LWT (GREEN), the Building SWT-SP (BLUE), ASHP-1 Active Power (PURPLE), and ASHP-2 Active Power (BROWN)

5.6.2 Measure Description

Disable the ASHPs when the hydronic distribution pumps are off.

Implement a warmup sequence such that the heating plant is enabled prior to the start of the earliest AHU occupancy schedule. During the warmup period, the boilers shall be locked out, unless OAT is less than the ASHP OAT lockout setpoint.

Estimated savings assume that the measure described in section 5.4 has been implemented, and the hydronic distribution pumps are typically off during unoccupied hours unless operating in night setback mode.

If the ASHPs are enabled for night setback operation, sufficient time should be allowed for the buffer tank to warm up to the SWT-SP before the boilers are engaged for supplemental heating.

Estimated savings are based on a reduction in circulation pump run-time. Implementation of this measure will also result in a reduction in system heating losses, which are not quantified in the projected savings.

Estimated savings assume that the ASHPs will not be used for cooling purposes.

5.7 Measure 7: Reduce the HWST-SP During Low OAT Conditions and Implement Heating Optimum Start Programming

5.7.1 Description of Finding

The hot water supply temperature setpoint (HWST-SP) is reset based on OAT. When OAT is greater than 4°C, the maximum HWST-SP is 46°C or lower. When OAT is less than 4°C, the HWST-SP starts to increase up to a maximum setpoint of 80°C. The HWST-SP reset is shown graphically in Figure 9.

The condensing boilers are more efficient at lower hot water return temperatures, and propane savings can be achieved by lowering the HWST-SP during colder weather conditions (OAT less than 4°C). ASHP runtime can also be extended if the HWST-SP is reduced during colder weather conditions, as described in section 5.8.

If the HWST-SP is reduced when OAT is less than 4°C, it will take longer for the building to warm-up during colder weather conditions. To ensure the building is at a comfortable temperature when occupants arrive, optimum start (OS) programming can be implemented for AHUs and UVs. The heating OS programming would allow the AHUs and UVs to start before their occupancy schedules, if needed, to pre-heat zones to their occupied zone temperature setpoints.

The heating OS programing will also help limit spikes in electrical demand at 8:00 AM when most AHUs switch to occupied mode, and ASHP output increases to meet the high heating load.

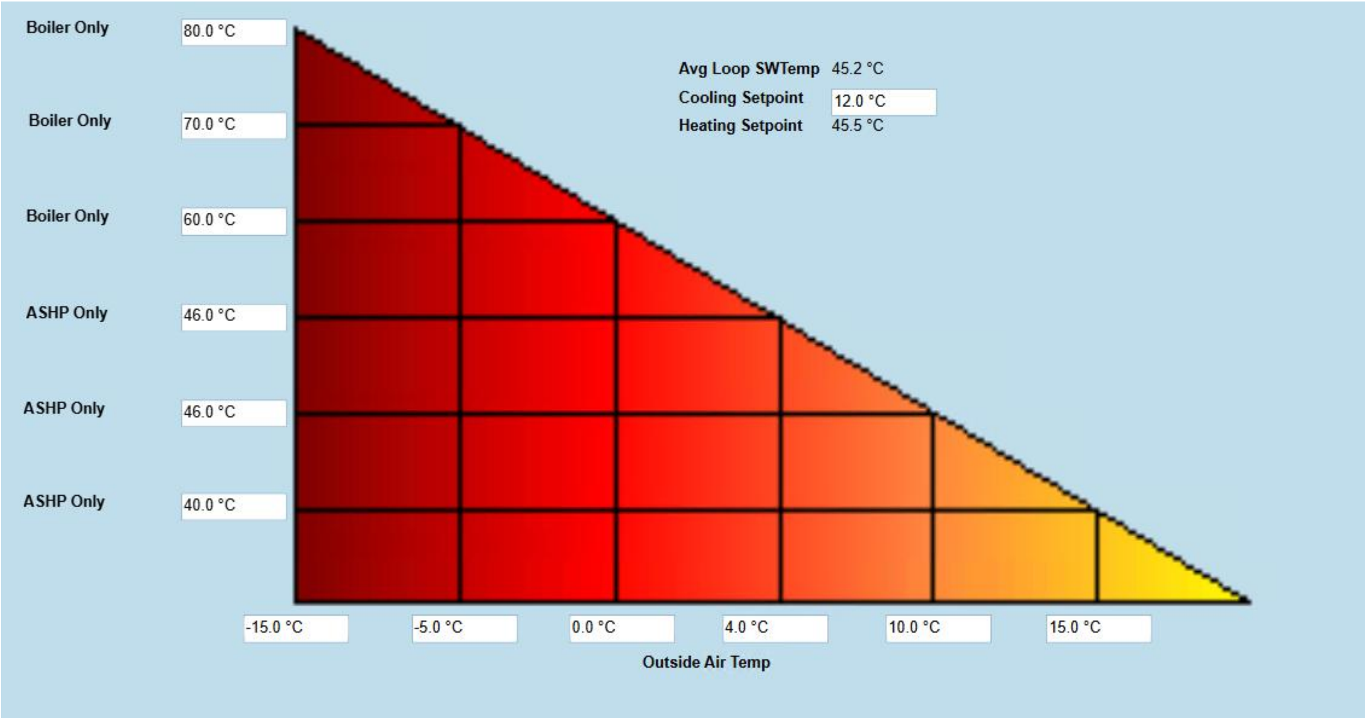

Figure 9: Diagram Showing the Existing Building Hot Water Supply Temperature Setpoint OAT Reset

5.7.2 Measure Description

Reduce the HWST-SP from 60°C to 46°C at 0°C OAT.

Implement heating OS programming for all AHUs and unit ventilators. During heating OS mode, the outdoor air dampers should be closed.

Lockout the natural boilers during heating OS mode, unless OAT is below the ASHP OAT lockout setpoint.

This measure will result in an increase in electricity use associated with AHU and hydronic distribution pump runtime, however, it is expected to improve tenant comfort and allow for extended ASHP runtime.

This measure is a pre-requisite to the measure described in section 5.8.

5.8 Measure 8: Extend ASHP Operation During Low OAT Conditions

5.8.1 Description of Finding

The ASHPs are currently disabled when OAT is less than 3.5°C. Assuming the measure described in section 5.7 has been implemented, the ASHP OAT lockout can be reduced, allowing the ASHPs to run during lower OAT conditions without risk of tripping off due to high inlet water temperatures.

Figure 10 shows a chart of the water temperatures produced by the Aermec NLC0675H heat pump at various outdoor air temperatures, as presented in the Aermec NLC 0280H-1250H installation manual. The chart shows that these units can produce water temperatures of 122°F (50°C) until OAT is below 32°F (0°C). Below 0°C, water temperatures start to drop.

Based on annual weather conditions in Ucluelet, B.C., significant propane savings can be achieved by extending ASHP operation to OAT > 0°C. Figure 11 shows a chart of OAT in Ucluelet from September 1, 2023, and August 31, 2024, sorted based on the number of hours within each 1°C OAT interval. OAT was between 0°C and 4°C for 8% of annual hours during this 1-year period.

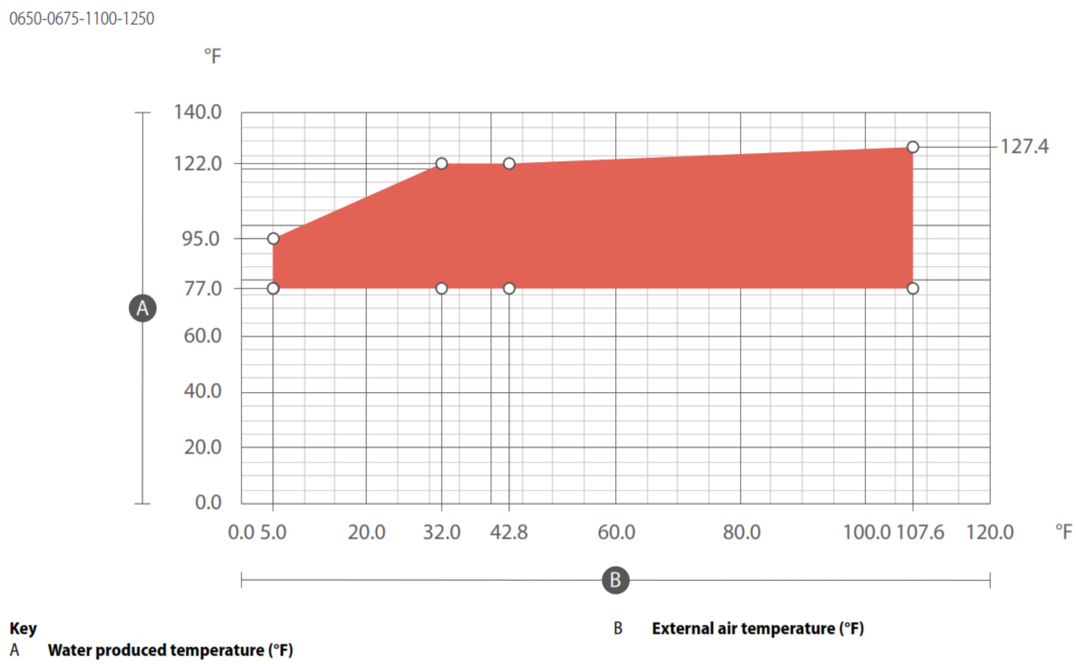

Figure 10: Chart of Aermec NLC0675H Operating Range at Various Outdoor Air Temperatures

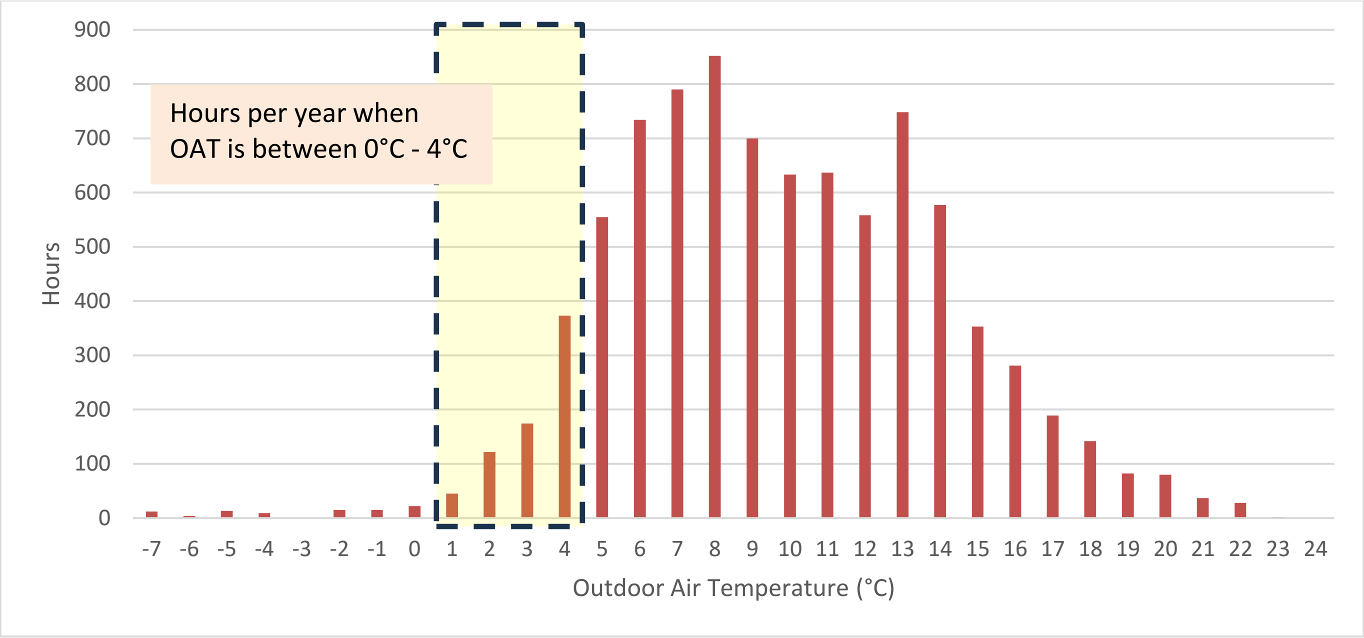

Figure 11: September 1, 2023 - August 31, 2024, Ucluelet Weather Station Data, Sorted Based on Number of Total Hours Within 1°C Outdoor Air Temperature Increments

5.8.2 Measure Description

Reduce the ASHP OAT lockout setpoint from 3.5°C to 0°C.

This measure assumes the measure described in section 5.7 has been implemented.

5.9 Measure 9: Lockout the Heating Plant During Summer Months

5.9.1 Description of Findings

Large spikes in electricity demand were recorded during summer months in 2025 when OAT drops below the OAT heating lockout setpoint, causing the ASHPs to cycle on to heat the buffer tank.

Figure 12 shows 5-minute electricity interval data from August 1 – 31, 2025, and OAT. A peak electricity demand of 137 kW was recorded during this period at 5:50 AM on August 7th when OAT was approximately 12°C. For most of this period, daily peak electricity demand was 40-50 kW.

During summer weather conditions, the building's overall heating load is negligible, and any heating provided on cool mornings is likely re-cooled later in the day. The heating plant can be locked out during summer months.

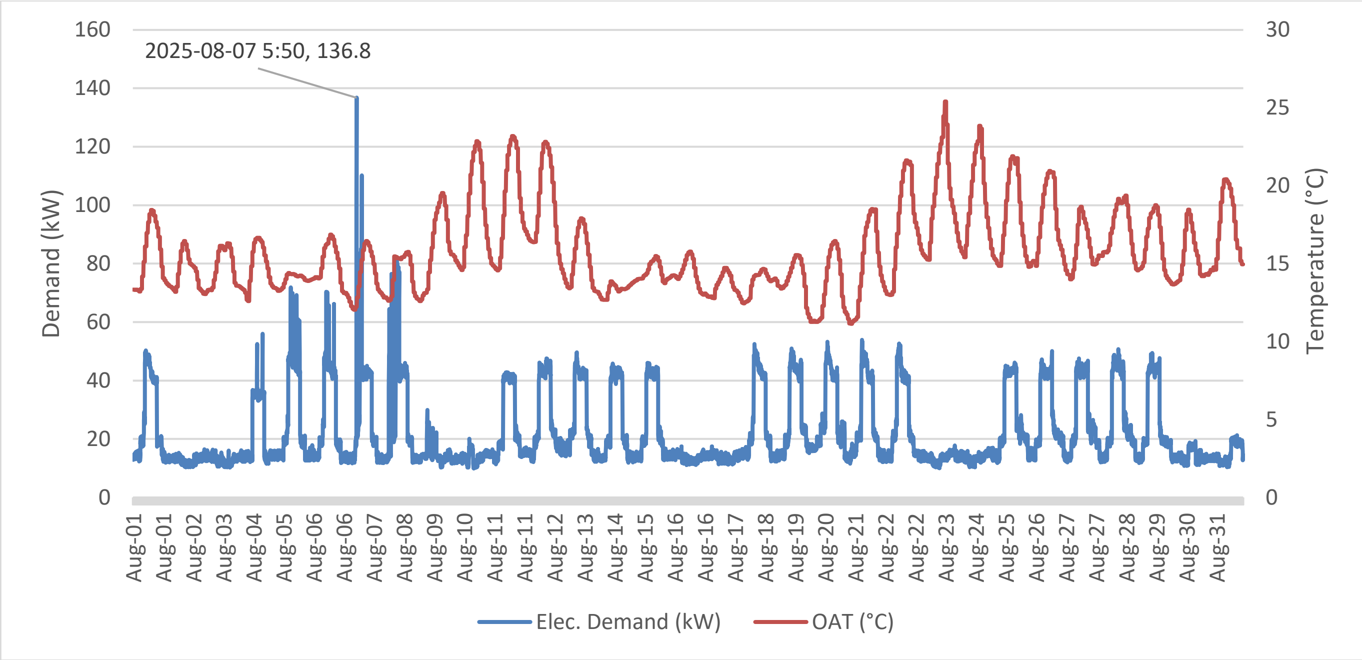

Figure 12: 5-minute Electricity Interval Data and Ucluelet Outdoor Air Temperature from August 1 - 31, 2025

5.9.2 Measure Description

Lockout the heating plant during summer weather periods.

Savings assume that the heating plant can be locked out for 3-months per year.

5.10 Measure 10: ASHP Demand Response

5.10.1 Description of Findings

A review of electricity interval data found large fluctuations in electricity demand during the heating season, corresponding to fluctuations in ASHP output.

Figure 13 shows electricity interval data recorded between November 1 – 12, 2025. During this review period, a peak demand of 158 kW was recorded. Figure 14 shows the same data, sorted from largest to smaller, and ranked based on percentile within the dataset. The peak electricity demand recorded over this period was 158 kW, while the 98th percentile was 135 kW.

Figure 15 shows trend log data of the ASHP-1 and ASHP-2 active power (%) on November 12, 2025, showing consistent large fluctuations in ASHP output.

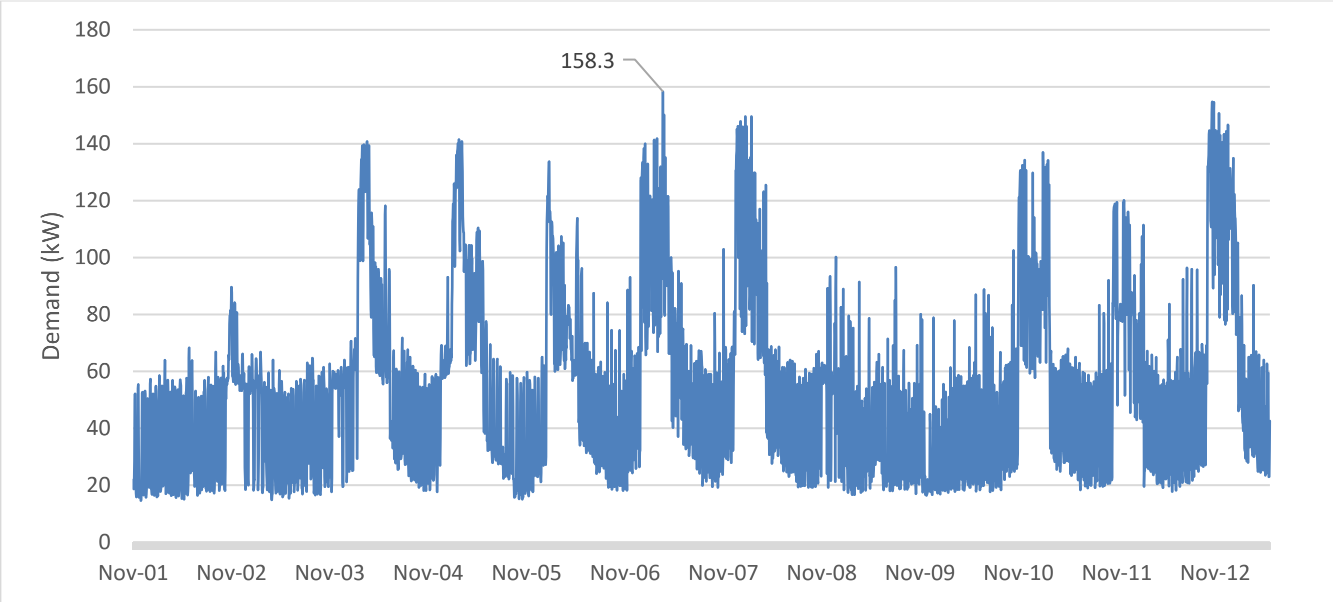

Figure 13: 5-minute Electricity Demand from November 1 - 12, 2025

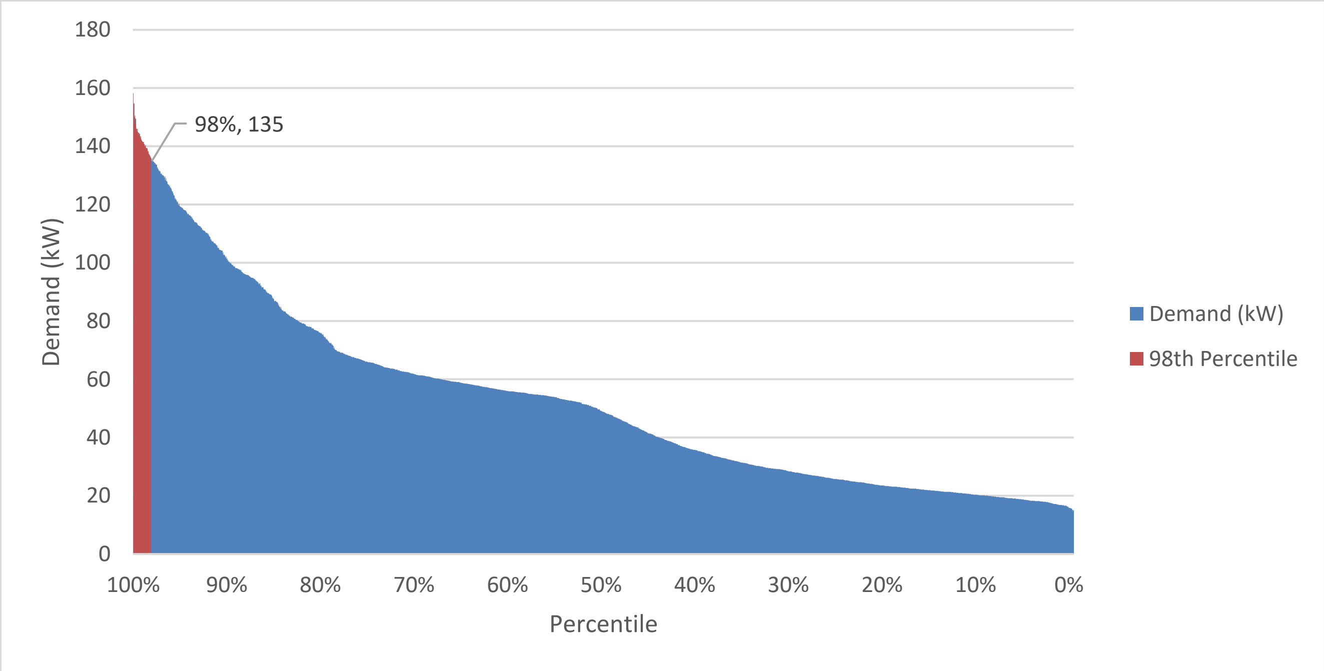

Figure 14: 5-minute Electricity Interval Data from November 1 – 12, 2025, Sorted Based on Percentile

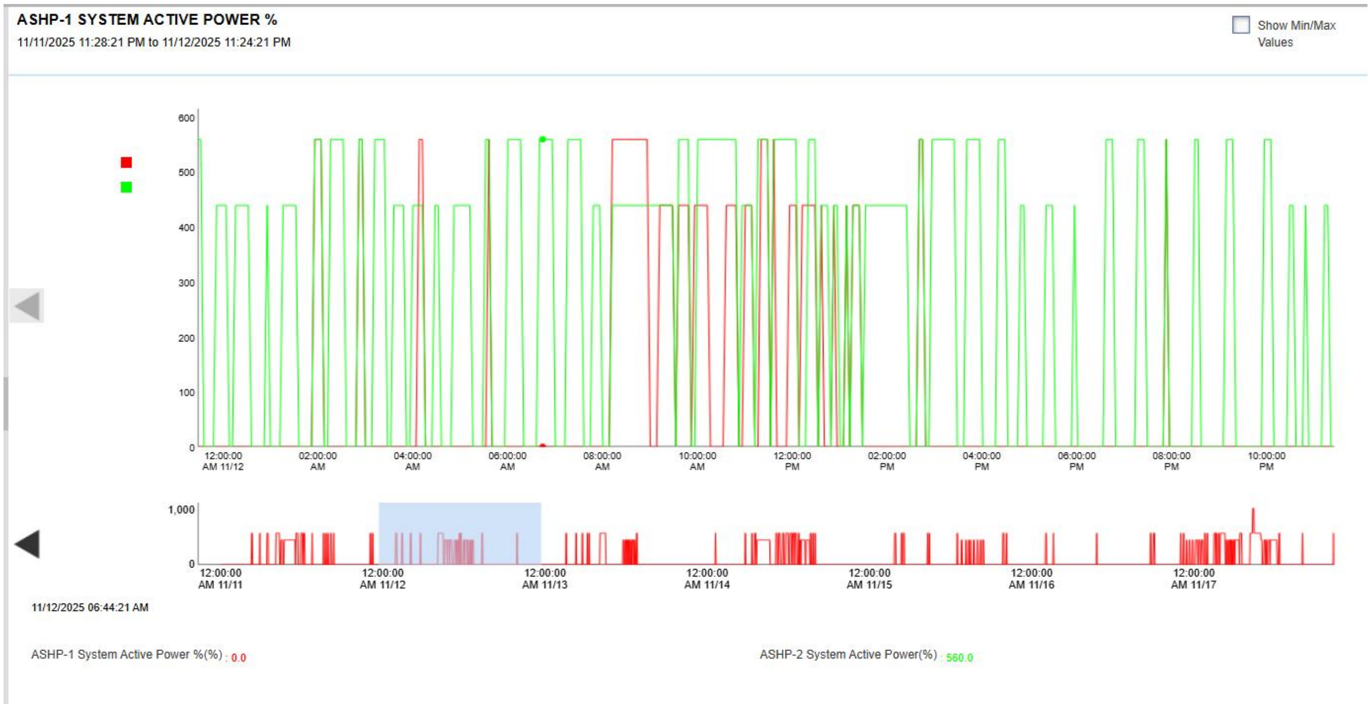

Figure 15: Trend Log Data of ASHP-1 and ASHP-2 Active Power (%) on November 12, 2025

5.10.2 Measure Description

Peak electrical demand during the heating season can be reduced by integrating electricity interval data with the DDC system and disabling ASHP compressor stages when real-time electricity demand exceeds a demand setpoint.

Install an electricity submeter to capture the building's real-time electricity demand and integrate the submeter with the DDC system. Program the ASHPs to disable compressor stages when demand exceeds a peak demand setpoint.

6.0 Measures to be considered for Future Implementation

This section provides an overview of each measure that was identified but **was not selected** as part of this C. Op. project. These measures either require further investigation or were determined to have lengthy payback periods. Energy savings and estimated retrofit costs were not quantified for the measures presented in this section.

6.1 Measure 1: Resolve ASHP Alarms

6.1.1 Description of Finding

In October 2025, ASHP-1 was observed to be in an active alarm state due to the AL28 – Fan1 CircBreaker alarm. The alarm was reset manually by the operations team on November 5, 2025, restoring ASHP-1 operation. Based on information provided by the operations team, this alarm has been activated several times in the last year. The exact cause of the alarm is unknown.

Maintenance records indicate that the ASHPs have tripped off in the past due to a high inlet water temperature alarm, when inlet water temperatures exceed 55°C. Based on the existing hot water supply temperature setpoint (HWST-SP) reset, the ASHP inlet water temperature should never exceed 55°C. It is suspected that the high inlet water temperature alarms were caused in the past by manual overrides to the HWST-SP. Maintenance records show that the last high inlet water temperature alarm was triggered on June 20, 2025.

When the ASHPs are in an active alarm state, they cannot run until the alarm has been reset, resulting in an increase in boiler operation to satisfy the building's heating demand. Given the high cost of propane, and the high efficiency of the ASHPs compared to the boilers, significant ASHP downtime in the winter will lead to an increase in utility costs. Figure 16 shows propane consumption data from December 2024 to October 2025, highlighting high propane consumption during a 4-month period from December 2024 to March 2025. It is expected that the high consumption was the result of the ASHPs being in an active alarm state and not operating.

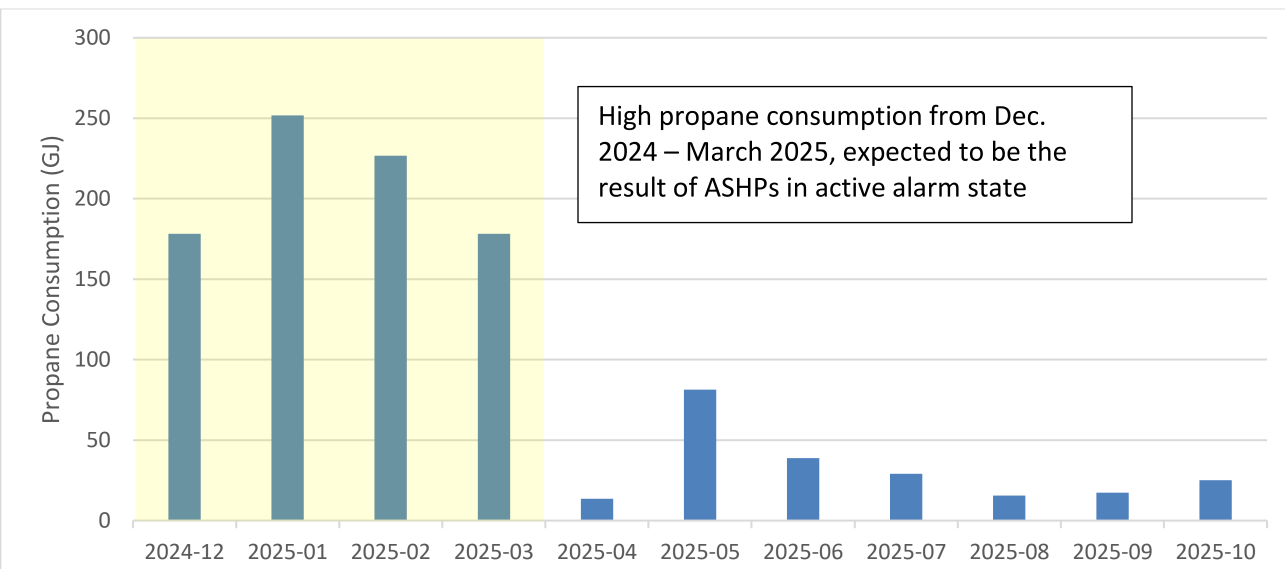

Figure 16: December 2024 - October 2025 Propane Consumption Data

6.1.2 Measure Description

It is recommended that the ASHPs be monitored for alarms during the 2025-2026 heating season. Alarms should be reset as soon as possible to maximize ASHP runtime during the heating season.

If ASHP-1 continues to trip off due to the Fan1 CircBreaker alarm, it is recommended that AERMEC be consulted to investigate further.

At the time of preparing this report, the high inlet water temperature alarms appear to be resolved, and both ASHPs have been running from November 3, 2025 – December 5, 2025. As such, this measure is presented without energy savings.

6.2 Measure 2: Re-Calibrate Differential Pressure Sensors Controlling Distribution Pumps

6.2.1 Description of Finding

The hydronic distribution pump speeds are each controlled by a differential pressure (DP) reading and setpoint.

The DP sensor controlling the hydronic distribution pumps for the academic wing, P-S1 and P-S2, was observed to be reading 23 psi when both pumps are off, as shown in Figure 17. This indicates that the DP sensor is mis-calibrated, as DP should be ~0 psi when the pumps are off. P-S1 and P-S2 control to maintain a DP setpoint of 18 psi when operating, and the pumps were observed to be always controlling to their minimum speed of 35%.

The DP sensor controlling the hydronic distribution pumps for the daycare building, P-S5 and P-S6, was observed to be reading 0.3 psi when both pumps are running at 100% speed, as shown in Figure 18. This indicates that the DP sensor is mis-calibrated, as it is not modulating during periods of higher and lower heating demand in the daycare. P-S5 and P-S6 were always observed to control to 100% speed when they are running.

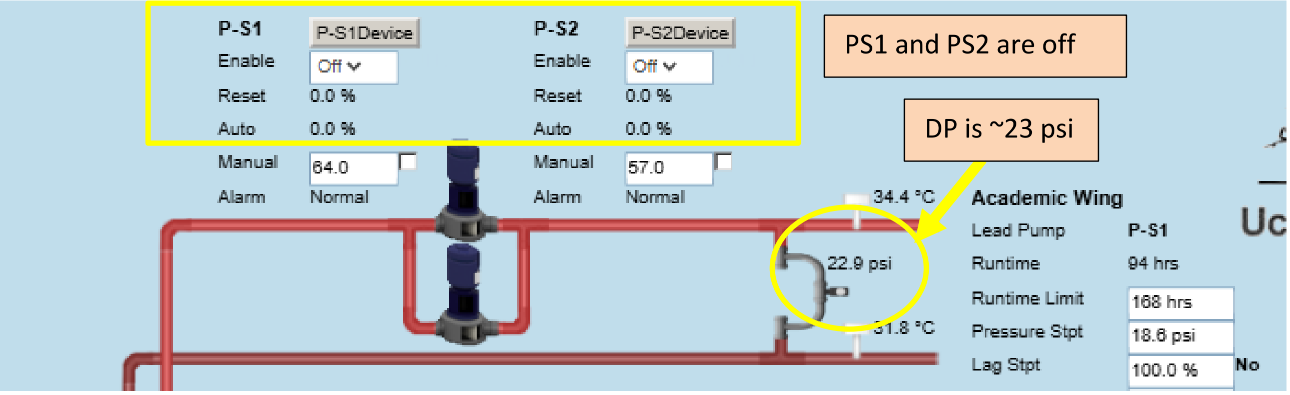

Figure 17: Screenshot of BAS Graphic for Academic Wing Hydronic Distribution Loop, Showing DP of 23psi when Distribution Pumps are Off

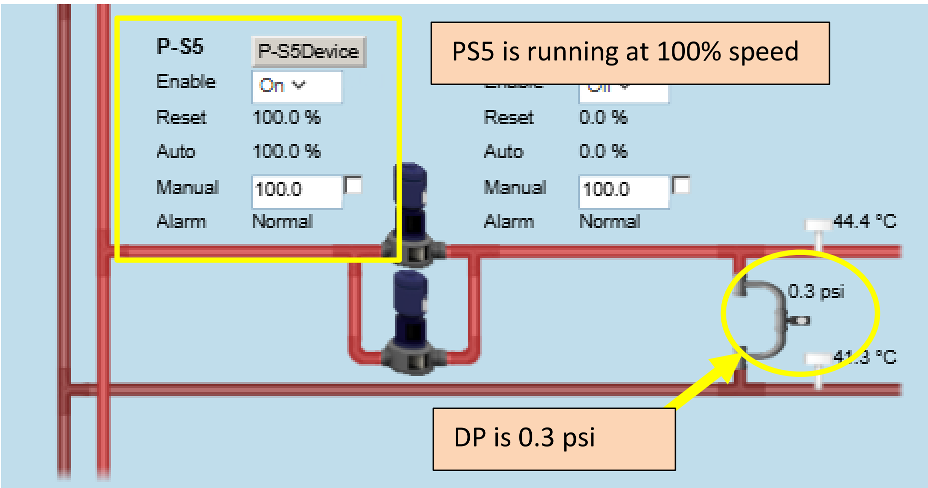

Figure 18: Screenshots of BAS Graphics for Hydronic Daycare Distribution Loop, Showing DP of Only 0.3 psi when Pump is Running at Full Speed

6.2.2 Measure Description

Re-calibrate the hot water distribution loop differential pressure sensors.

This measure is not expected to result in significant net energy savings; however, it may result in improved tenant comfort during cold weather periods, particularly in the academic wing of the school.

7.0 Next Steps – Implementation Phase and Completion Phase

7.1 Implementation Phase

To continue in the program, the owner is responsible for implementing the selected bundle of measures that pay back in two years or less. Using the *Recommissioning Report* for implementation allows flexibility in how the selected measures are implemented. Options include: utilize in-house building staff, hire the C.Op Provider to implement or provide technical assistance, contract with outside service contractors, or any combination of the above.

7.2 Completion Phase

C.Op Service provider will follow up after implementation of the selected measures and **update** this *Recommissioning report and Recommissioning Workbook*.

The updated report for the implemented measures includes but not limited to: date of completion of each measure, new or improved sequences of operation, the energy savings impact of the measures, the requirements for ongoing maintenance and monitoring of the measures, and contact information for the service provider, in house staff, and contractors responsible for the implementation. When feasible, verification data should include trends or functional test results, though other methods, such as copies of invoices, site visit reports, and before/after photos, may be acceptable.

The C.Op Service Provider will conduct an in-house (teleconference) session for the Applicant and the appropriate building operations personnel covering the new documentation, measures that were implemented, and requirements for ongoing maintenance and monitoring. Document the attendance of the building operations staff.

The *updated Recommissioning Workbook* and *updated Recommissioning Report* will be submitted to the owner and the program for review. See Appendix B: Completion Phase Summary Table for more details on implemented measures.

8.0 Appendix A: Investigation Phase Summary Table

Investigation Phase Summary				Investigation Phase							
				Energy Savings			Cost Savings	Financial		Est. GHG Reduction	
ECM #	Measure Title	Measure History	Include cost	Demand (kW)	Electrical (kWh/yr)	Fuel (GJ)	Total ($/yr)	Estimated Measure Cost ($)	Simple Payback (yrs)	tonnes CO2e/yr	Enter "x" if DESELECT for implementation
ECM-1	Implement a Holiday HVAC Schedule	New	1	0	9,487	8	$ 912	$ 1,900	2.1	0.7	
ECM-2	Update AHU-5 Re-heat Valve Control in Unoccupied Heating Mode	New	1	0	1,653	0	$ 107	$ 2,800	26.3	0.0	
ECM-3	Rectify RHC-129 Passing Heating Control Valve	New	1	1	4,081	0	$ 392	$ 1,900	4.8	0.0	
ECM-4	Update AHU-4 OAD and HCV Control	New	1	0	183	2	$ 71	$ 1,900	26.6	0.1	
ECM-5	Enable the Hydronic Distribution Pumps Based on Demand	New	1	0	15,019	0	$ 969	$ 3,700	3.8	0.2	
ECM-6	Disable the ASHPs when the Hydronic Distribution Pumps are Off	New	1	0	36,171	0	$ 2,333	$ 4,700	2.0	0.4	
ECM-7	Reduce the HWST-SP During Low OAT Conditions and Implement Heating Optimum Start Programming	New	1	0	-6,064	7	-$ 113	$ 7,400	- 65.3	0.4	
ECM-8	Extend ASHP Operation During Low OAT Conditions	New	1	-7	-22,337	208	$ 5,133	$ 500	0.1	14.2	
ECM-9	Lockout the Heating Plant During Summer Months	New	1	18	0	0	$ 2,906	$ 2,600	0.9	-	
ECM-10	ASHP Demand Response	New	1	17	0	0	$ 2,659	$ 16,700	6.3	-	
			TOTAL (Previous, still working):	-	-	-	$ -	n/a	n/a	-	
			TOTAL (All potential measures for Implementation):	29	38,191	225	$ 15,369	$ 44,100	2.9	16.1	
			TOTAL (Selected measures only):	**29**	**38,191**	**225**	**$ 15,369**	**$ 44,100**	**2.9**	**16.1**	
							Implementation cap @$0.25/ft2	$ 12,155			

9.0 Appendix B: Completion Phase Summary Table

To be completed during the completion phase.

10.0 Appendix C: Sample Training Outline

The Commissioning Provider (C.Op Provider) may customize the outline for the training and developing the training materials. Before preparing the training outline and materials, the C.Op Provider should assess the related level of knowledge of the building operators, to set up the training accordingly. For reference, the Program provides the following sample outline for the training:

- Background on the energy use of this particular building
  - Present Energy Utilization Index
  - Describe Operating Schedules and Owner's operating requirements
- RCx investigation process used in this building
  - Describe the methods used to identify problems and deficiencies
  - Review the RCx Workbook
- Implementation process in this building
  - Describe the measures that were implemented and by whom
  - Walk around the building to look at any physical changes or step through the new control sequences at the operator workstation
  - Provide as many details about implementation as necessary to describe what was done
  - Describe improved performance that these measures will create (show trends if available)
- O&M requirements
  - Describe the O&M requirements needed to keep these improvements working
  - Describe how the staff can be aware of energy efficiency opportunities and begin looking for additional savings potential

The C.Op Provider should follow the outline to prepare materials, as necessary, to hand out at the training session.

11.0 Appendix D: Training Completion Form

Project ID

Facility Information

Company Name	Building Name(s)	
Facility Address	City	Province

Training Details

Location	Date
Commissioning Provider/Trainer	

Materials Attached

☐ Agenda
☐ Materials used for training
☐ List of individuals who attended

COMMISSIONING PROVIDER SIGNATURE

By signing this Training Completion Form, I verify that this training took place with the listed attendees.	
Commissioning Provider (print name):	
Signature:	Date:

FACSIMILE/SCANNED SIGNATURES: Facsimile transmission of any signed original document, and the retransmission of any signed facsimile transmission, shall be the same as delivery of the original signed document. Scanned original documents transmitted to BC Hydro as an attachment via electronic mail shall be the same as delivery of the original signed document. At the request of BC Hydro, C.Op Provider shall confirm documents with a facsimile transmitted signature or a scanned signature by providing an original document.

Targeted Documentation

O & M Manual

O & M Manual updated ☐	Describe updates below and attach copies of new or amended portions
O & M Manual not updated ☐	Province reasons below
Building has no O & M Manual ☐	

Building Plans ("as-builts")

Building Plans updated ☐	Describe below
Wiring diagrams updated ☐	Describe below
No plans or diagrams updated ☐	Describe below

EMS Programming

New sequences of operation on file ☐	Specify location of file and attach copy
Printed screenshots on file ☐	Specify location of file and attach copy

Equipment Manuals

Manuals for new equipment are on file ☐	Describe below (attach copy if applicable)

Checklist of subjects discussed at training

Explain investigation process and how measures were identified	☐
Describe implemented measures, and how they are reducing energy usage	☐
Building walkthrough to show implemented measures	☐
Describe methods for monitoring and maintaining optimum system performance related to implemented measures	☐
Describe scenarios where system setting changes would be required, and how to maintain optimum energy efficiency, e.g., seasonal-based manual adjustments to setpoints.	☐

List of Individuals Who Attended

Name	**Title**	**Building (address or name)**	**Contact information (e-mail and/or phone number)**
