STATE OF WASHINGTON
DEPARTMENT OF CHILDREN, YOUTH, AND FAMILIES
OFFICE OF THE SECRETARY
1500 Jefferson Street, SE ● P.O. Box 40975 ● Olympia WA 98504-0975

September 13, 2023

TO: David Schumacher, Director
Office of Financial Management

FROM: Ross Hunter, Secretary
Department of Children, Youth, and Families

SUBJECT: DCYF 2024 SUPPLEMENTAL CAPITAL BUDGET SUBMITTAL

The Department of Children, Youth, and Families (DCYF) is pleased to put forward our 2024 Supplemental Capital Budget Request. DCYF's request is modest but includes critical project requests solely in support of the Juvenile Rehabilitation program.

State-owned Juvenile Rehabilitation facilities operated by DCYF include two institutions and eight community facilities. These facilities are a key investment in the health and safety of children, youth, and their families. They also serve the people of Washington by fulfilling the public's expectations for safe and secure communities.

DCYF's requests are critical for the safety, security, health and well-being of staff and residents at our Juvenile Rehabilitation institutions. Our requests include fully securing the Echo Glen Children's Center with resources to complete the fourth side of the perimeter fence, updating lighting and a covered walkway at Echo Glen, and replacing the HVAC systems at community facilities and the Green Hill School. DCYF's HVAC systems are outdated and replacement is vital for the health and well-being of our staff, youth, and young adults in our care, particularly as wildfires become increasingly more prominent in our state.

DCYF's capital requests will ensure that youth incarcerated within juvenile justice live in a well-maintained space that is both therapeutic and safe.

Should you have any questions or concerns, please contact Rene Newkirk, Chief Financial Officer by phone at (360) 480-3599 or via email at rene.newkirk@dcyf.wa.gov. You may also contact Michael Poier, Capital Programs Administrator at (360) 764-0253 or email michael.poier@dcyf.wa.gov

2024 Supplemental Capital Budget Request
Department of Children, Youth and Families

9/13/2023

New Appropriations		Total Cost
Major Projects		
Echo Glen Security Improvements		$5,564,000
Green Hill School HVAC Upgrades		$6,897,000
Statewide Community Facility HVAC Upgrades		$2,880,000
	Subtotal	*$15,341,000*
Minor Works Projects		
Echo Glen Academic School Walkway Roofing and Lighting		$500,000
	Subtotal	*$500,000*
	Total Request	**$15,841,000**

OFM

307 - Department of Children, Youth, and Families
Ten Year Capital Plan by Project Priority

2023-25 Biennium

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Version: A1 DCYF Supplemental Request

Report Number: CBS001
Date Run: 9/13/2023 7:26AM

Project by Agency Priority

Priority	Project by Account-EA Type	Estimated Total	Prior Expenditures	Current Expenditures	Reapprop 2023-25	New Approp 2023-25	Estimated 2025-27	Estimated 2027-29	Estimated 2029-31	Estimated 2031-33
1	**40000583 Echo Glen Security Upgrades**									
	057-1 State Bldg Constr-State	5,564,000				5,564,000				
2	**40000584 Green Hill School HVAC Upgrades**									
	057-1 State Bldg Constr-State	6,897,000				6,897,000				
3	**40000586 Echo Glen Academic School Walkway Roofing & Lighting**									
	057-1 State Bldg Constr-State	500,000				500,000				
4	**40000585 Community Facilities HVAC Upgrades**									
	057-1 State Bldg Constr-State	2,880,000				2,880,000				
	Total	**15,841,000**				**15,841,000**				

Total Account Summary

Account-Expenditure Authority Type	Estimated Total	Prior Expenditures	Current Expenditures	Reapprop 2023-25	New Approp 2023-25	Estimated 2025-27	Estimated 2027-29	Estimated 2029-31	Estimated 2031-33
057-1 State Bldg Constr-State	15,841,000				15,841,000				

OFM

Ten Year Capital Plan by Project Priority

2023-25 Biennium

*

Report Number: CBS001
Date Run: 9/13/2023 7:26AM

Parameter	Entered As	Interpreted As
Biennium	2023-25	2023-25
Functional Area	*	All Functional Areas
Agency	307	307
Version	A1-A	A1-A
Project Classification	*	All Project Classifications
Include Enacted	Yes	Yes
Sort Order	Project Priority	Priority
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

OFM

307 - Department of Children, Youth, and Families
Capital Project Request

2023-25 Biennium

*

Version: A1 DCYF Supplemental Request

Report Number: CBS002
Date Run: 9/13/2023 7:15AM

Project Number: **40000583**
Project Title: **Echo Glen Security Upgrades**

Description

Starting Fiscal Year: 2024
Project Class: Program
Agency Priority: 0

Project Summary

The Department of Children, Youth, and Families (DCYF) requests $5.565 million to complete the perimeter fence surrounding Echo Glen Children's Center in Snoqualmie. Echo Glen is a medium / maximum security facility that houses males up to age 17 and females up to age 25 committed to DCYF's Juvenile Rehabilitation (JR) program. At Echo Glen a variety of treatment services are provided and it is the only institution with females and gender specific programming. Educational and therapeutic services are also provided for a wide range of youth with varying needs. These include: Dialectical Behavior Therapy, Aggression Replacement Training, cultural programming, transformational mentoring, pre-vocation experiences, sex offense specific treatment, chemical dependency treatment specialized mental health services and education in partnership with the Issaquah School District and Renton Technical College. The campus is also known for its Canine Connection program which allows youth to train future service animals.

Project Description

Due to a changing and complex population and recent escapes, there is an immediate need to ensure staff safety, community safety, and the safety of the youth and young adults at that facility. The Echo Glen campus is not currently fenced, part is bordered by natural wetlands and forests.

While the existing capital funds provided in the 2023-25 Biennial Capital Budget for securing Echo Glen addresses three sides of the facility with a secure fence, the fourth side which borders Lake Kittyprince, was not previously planned to be fenced. However, given the need for a more secure campus, DCYF requests funding to complete the perimeter fence on the fourth side so that there is a continuous fence running all four sides of the campus to prevent escapes and/or intrusions onto campus. In addition, the agency requests to reconfigure and consolidate parking off campus to further secure and prevent youth's access to staff's personal vehicles. Further, a security entrance is proposed to be added by repurposing an existing space in the Administration Building into a secure control room, which will be the single point of entry for the facility staff and visitors.

Location

City: Snoqualmie **County:** King **Legislative District:** 005

Project Type

Infrastructure (Major Projects)

Growth Management impacts

There are no known GMA impacts

New Facility: No

Funding

Acct Code	Account Title	Estimated Total	Expenditures: Prior Biennium	Expenditures: Current Biennium	2023-25 Fiscal Period: Reapprops	2023-25 Fiscal Period: New Approps
057-1	State Bldg Constr-State	5,564,000				5,564,000
	Total	**5,564,000**	**0**	**0**	**0**	**5,564,000**

307 - Department of Children, Youth, and Families
Capital Project Request

2023-25 Biennium

*

Version: A1 DCYF Supplemental Request

Report Number: CBS002
Date Run: 9/13/2023 7:15AM

Project Number: 40000583
Project Title: Echo Glen Security Upgrades

Funding

		Future Fiscal Periods			
		2025-27	2027-29	2029-31	2031-33
057-1	State Bldg Constr-State				
	Total	**0**	**0**	**0**	**0**

Operating Impacts

No Operating Impact

Narrative

This project adds infrastructure fencing and parking along with light remodeling of existing building space and does not drive the need for additional FTE

Capital Project Request

2023-25 Biennium

*

Parameter	Entered As	Interpreted As
Biennium	2023-25	2023-25
Agency	307	307
Version	A1-A	A1-A
Project Classification	*	All Project Classifications
Capital Project Number	40000583	40000583
Sort Order	Project Priority	Priority
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

State of Washington
AGENCY / INSTITUTION PROJECT COST SUMMARY
Updated June 2022

Agency	Department Children Youth Family
Project Name	Echo Glen Security Upgrades
OFM Project Number	40000583

Contact Information

Name	Trent Phillips
Phone Number	(360) 764-0177
Email	trent.phillips@dcyf.wa.gov

Statistics

Gross Square Feet		MACC per Gross Square Foot	
Usable Square Feet		Escalated MACC per Gross Square Foot	
Alt Gross Unit of Measure			
Space Efficiency		A/E Fee Class	A
Construction Type	Detention/correctional f	A/E Fee Percentage	10.57%
Remodel	No	Projected Life of Asset (Years)	10

Additional Project Details

Procurement Approach	DBB	Art Requirement Applies	No
Inflation Rate	4.90%	Higher Ed Institution	No
Sales Tax Rate %	8.70%	Location Used for Tax Rate	Snoqualmie
Contingency Rate	5%		
Base Month (Estimate Date)	January-24	OFM UFI# (from FPMT, if available)	
Project Administered By	DES		

Schedule

Predesign Start	NA	Predesign End	
Design Start	July-24	Design End	September-24
Construction Start	October-24	Construction End	May-25
Construction Duration	6 Months		

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Project Cost Estimate

Total Project	**$5,353,055**	Total Project Escalated	**$5,563,525**
		Rounded Escalated Total	**$5,564,000**

Cost Estimate Summary

Acquisition

Acquisition Subtotal	**$0**	**Acquisition Subtotal Escalated**	**$0**

Consultant Services			
Predesign Services	$50,000		
Design Phase Services	$581,010		
Extra Services	$20,000		
Other Services	$584,570		
Design Services Contingency	$61,779		
Consultant Services Subtotal	**$1,297,359**	**Consultant Services Subtotal Escalated**	**$1,351,012**

Construction			
Maximum Allowable Construction Cost (MACC)	$3,330,000	Maximum Allowable Construction Cost (MACC) Escalated	$3,464,865
DBB Risk Contingencies	$0		
DBB Management	$0		
Owner Construction Contingency	$166,500		$175,342
Non-Taxable Items	$0		$0
Sales Tax	$304,196	Sales Tax Escalated	$316,698
Construction Subtotal	**$3,800,696**	**Construction Subtotal Escalated**	**$3,956,905**

Equipment			
Equipment	$0		
Sales Tax	$0		
Non-Taxable Items	$0		
Equipment Subtotal	**$0**	**Equipment Subtotal Escalated**	**$0**

Artwork			
Artwork Subtotal	**$240,000**	**Artwork Subtotal Escalated**	**$240,000**

Agency Project Administration			
Agency Project Administration Subtotal	$0		
DES Additional Services Subtotal	$0		
Other Project Admin Costs	$0		
Project Administration Subtotal	**$0**	**Project Administration Subtotal Escalated**	**$0**

Other Costs			
Other Costs Subtotal	**$15,000**	**Other Costs Subtotal Escalated**	**$15,608**

Project Cost Estimate

Total Project	**$5,353,055**	Total Project Escalated	**$5,563,525**
		Rounded Escalated Total	**$5,564,000**

Funding Summary

	Project Cost (Escalated)	Funded in Prior Biennia	New Approp Request 2023-2025	2025-2027	Out Years
Acquisition					
Acquisition Subtotal	$0				**$0**
Consultant Services					
Consultant Services Subtotal	$1,351,012		$1,351,012		**$0**
Construction					
Construction Subtotal	$3,956,905		$3,956,905		**$0**
Equipment					
Equipment Subtotal	$0				**$0**
Artwork					
Artwork Subtotal	$240,000		$240,000		**$0**
Agency Project Administration					
Project Administration Subtotal	$0				**$0**
Other Costs					
Other Costs Subtotal	$15,608				**$15,608**

Project Cost Estimate

Total Project	**$5,563,525**	**$0**	**$5,547,917**	**$0**	**$15,608**
	$5,564,000	**$0**	**$5,548,000**	**$0**	**$16,000**
	Percentage requested as a new appropriation		**100%**		

What is planned for the requested new appropriation? (*Ex. Acquisition and design, phase 1 construction, etc.*)

This project completes the fourth side of campus with a full 16ft secure permiter fence along with associated site lighting, security infrastruture for camera

What has been completed or is underway with a previous appropriation?

This is a new request

Insert Row Here

What is planned with a future appropriation?

Insert Row Here

Cost Estimate Details

Acquisition Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Purchase/Lease					
Appraisal and Closing					
Right of Way					
Demolition					
Pre-Site Development					
Other					
Insert Row Here					
ACQUISITION TOTAL	**$0**		**NA**	**$0**	

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Cost Estimate Details

Item	Base Amount		Escalation Factor	Escalated Cost	Notes
Consultant Services					
1) Pre-Schematic Design Services					
Programming/Site Analysis					
Environmental Analysis	$50,000				
Predesign Study					
Other					
Insert Row Here					
Sub TOTAL	**$50,000**		**1.0272**	**$51,360**	Escalated to Design Start
2) Construction Documents					
A/E Basic Design Services	$255,010				69% of A/E Basic Services
Design	$326,000				
Sub TOTAL	**$581,010**		**1.0299**	**$598,383**	Escalated to Mid-Design
3) Extra Services					
Civil Design (Above Basic Svcs)					
Geotechnical Investigation	$20,000				
Commissioning					
Site Survey					
Testing					
LEED Services					
Voice/Data Consultant					
Value Engineering					
Constructability Review					
Environmental Mitigation (EIS)					
Landscape Consultant					
Other					
Insert Row Here					
Sub TOTAL	**$20,000**		**1.0299**	**$20,598**	Escalated to Mid-Design
4) Other Services					
Bid/Construction/Closeout	$114,570				31% of A/E Basic Services
HVAC Balancing					
Staffing					
Construction Management	$470,000				
Insert Row Here					
Sub TOTAL	**$584,570**		**1.0531**	**$615,611**	Escalated to Mid-Const.
5) Design Services Contingency					
Design Services Contingency	$61,779				
Other					
Insert Row Here					
Sub TOTAL	**$61,779**		**1.0531**	**$65,060**	Escalated to Mid-Const.

CONSULTANT SERVICES TOTAL	**$1,297,359**		**$1,351,012**	

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Cost Estimate Details

Construction Contracts					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Site Work					
G10 - Site Preparation	$300,000				
G20 - Site Improvements	$500,000				
G30 - Site Mechanical Utilities	$700,000				
G40 - Site Electrical Utilities	$1,400,000				
G60 - Other Site Construction					
Other					
Insert Row Here					
Sub TOTAL	**$2,900,000**		**1.0405**	**$3,017,450**	
2) Related Project Costs					
Offsite Improvements	$0				
City Utilities Relocation	$100,000				
Parking Mitigation	$0				
Stormwater Retention/Detention	$330,000				
Other					
Insert Row Here					
Sub TOTAL	**$430,000**		**1.0405**	**$447,415**	
3) Facility Construction					
A10 - Foundations					
A20 - Basement Construction					
B10 - Superstructure					
B20 - Exterior Closure					
B30 - Roofing					
C10 - Interior Construction					
C20 - Stairs					
C30 - Interior Finishes					
D10 - Conveying					
D20 - Plumbing Systems					
D30 - HVAC Systems					
D40 - Fire Protection Systems					
D50 - Electrical Systems					
F10 - Special Construction					
F20 - Selective Demolition					
General Conditions					
Other Direct Cost					
Insert Row Here					
Sub TOTAL	**$0**		**1.0531**	**$0**	
4) Maximum Allowable Construction Cost					
MACC Sub TOTAL	**$3,330,000**			**$3,464,865**	
	NA			*NA per 0*	

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7) Owner Construction Contingency				
Allowance for Change Orders	$166,500			
Other				
Insert Row Here				
Sub TOTAL	**$166,500**	**1.0531**	**$175,342**	
8) Non-Taxable Items				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0531**	**$0**	
9) Sales Tax				
Sub TOTAL	**$304,196**		**$316,698**	
CONSTRUCTION CONTRACTS TOTAL	**$3,800,696**		**$3,956,905**	

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Cost Estimate Details

Equipment					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
1) Equipment					
E10 - Equipment					
E20 - Furnishings					
F10 - Special Construction					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0531**	**$0**	
2) Non Taxable Items					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0531**	**$0**	
3) Sales Tax					
Sub TOTAL	**$0**			**$0**	
EQUIPMENT TOTAL	**$0**			**$0**	

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Cost Estimate Details

Artwork					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Artwork					
Project Artwork	$0				0.5% of total project cost for new construction
Higher Ed Artwork	$0				0.5% of total project cost for new and renewal construction
Calculated Art Budget	$240,000				
Insert Row Here					
ARTWORK TOTAL	**$240,000**		**NA**	**$240,000**	

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Cost Estimate Details

Project Management					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Agency Project Management					
Agency Project Management	$0				
Additional Services					
Other					
Insert Row Here					
Subtotal of Other	*$0*				
PROJECT MANAGEMENT TOTAL	**$0**		**1.0531**	**$0**	

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Cost Estimate Details

Other Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Mitigation Costs					
Hazardous Material Remediation/Removal					
Historic and Archeological Mitigation	$15,000				
Other					
Insert Row Here					
OTHER COSTS TOTAL	**$15,000**		**1.0405**	**$15,608**	

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C-100(2022)
Additional Notes

Tab A. Acquisition
Insert Row Here

Tab B. Consultant Services
Insert Row Here

Tab C. Construction Contracts
Insert Row Here

Tab D. Equipment
Insert Row Here

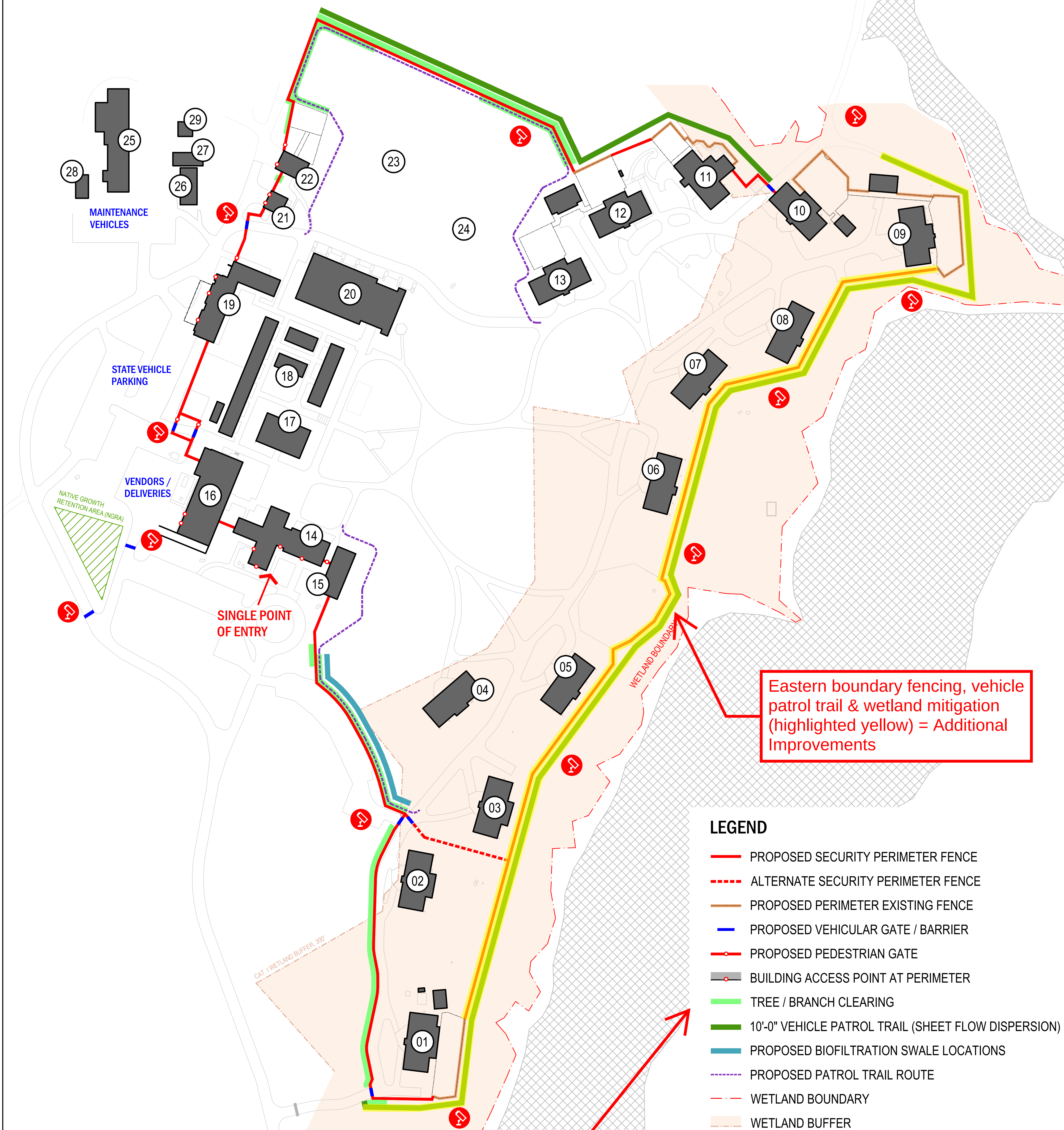
Tab E. Artwork
Insert Row Here

Tab F. Project Management
Insert Row Here

Tab G. Other Costs
Insert Row Here

BUILDING KEY

01	COTTAGE #1 CHINOOK (MALE, MAX)	11	COTTAGE #11 (FEMALE MHU)	21	GENERATOR BUILDING
02	COTTAGE #2 NISQUALLY	12	COTTAGE #12 COPALIS (FEMALE)	22	CANINE PROGRAM
03	COTTAGE #3 KALAMA	13	COTTAGE #13 YAKIMA (FEMALE)	23	OUTDOOR RECREATION
04	COTTAGE #4 (UNOCCUPIED)	14	ADMINISTRATION / HEALTH SERVICES	24	ROPES COURSE
05	COTTAGE #5 SKAGIT	15	SOCIAL SERVICES	25	MAINTENANCE
06	COTTAGE #6 WILAPA	16	COMMISSARY, KITCHEN, & DINING	26	WOOD SHOP
07	COTTAGE #7	17	LIBRARY	27	COMPUTER CLASSROOM
08	COTTAGE #8	18	CLASSROOMS	28	PAINT STORAGE
09	COTTAGE #9 TOUTLE (MALE, MAX)	19	VOCATIONAL EDUCATION	29	VEHICLE STORAGE
10	COTTAGE #10 KLICKITAT (MALE, MAX)	20	CHAPEL / INDOOR RECREATION	30	SEWAGE PUMP STATION



NORTH

ECHO GLEN CHILDREN'S CENTER CAMPUS PERIMETER MAP

SCALE: 1" = 200'-0"

0 200' 400'

All scopes of work besides Eastern boundary elements are in Base

001B rev

SHEET NO.

SCOPING & FEASIBILITY STUDY

DATE: 08-01-2023

REVISIONS:

HALF SIZE REDUCTIONS = 11 x 17

ECHO GLEN CHILDREN'S CENTER SECURITY IMPROVEMENTS

DEPARTMENT OF CHILDREN, YOUTH, AND FAMILIES

33010 SE 99TH STREET SNOQUALMIE, WA 98065

PROJECT NO. 2022-558

KMB Project # 22019

KMB architects

906 Columbia Street SW, Suite 400
Olympia, Washington 98501
360.352.8883

OFM

307 - Department of Children, Youth, and Families
Capital Project Request

2023-25 Biennium

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Version: A1 DCYF Supplemental Request

Report Number: CBS002
Date Run: 9/13/2023 7:17AM

Project Number: **40000584**
Project Title: **Green Hill School HVAC Upgrades**

Description

Starting Fiscal Year: 2024
Project Class: Preservation
Agency Priority: 0

Project Summary

The Department of Children, Youth, and Families (DCYF) requests $6.6 million to upgrade the Juvenile Rehabilitation (JR) program's Green Hill School HVAC systems. The Green Hill School provides residential care, treatment, education, and vocational training to juvenile offenders. The HVAC systems in the living units on campus, which house the Green Hill residents, have been in operation for 30+ years and have reached their end- of-life. Currently, there are frequent equipment failures and the needed parts are no longer available to keep the HVAC systems running properly. DCYF requests funding to upgrade these systems to modern controls and equipment to avoid future catastrophic failure of the systems

Project Description

Considering the living units and support service buildings at the Green Hill School campus were built in the 1990s, the HVAC systems are 30+ years old and have reached their end-of-life. The Hawthorne and Maple living units, vocational dining, laundry buildings, Human Resources, and the staff training building are all experiencing more frequent system failures, particularly during the hot and cold weather months of the year. In attempting to repair the HVAC systems, DCYF has become aware that parts for these systems are no longer available. These buildings are critical to housing, feeding, and educating the residents who are confined at Green Hill School and the buildings must be equipped to ensure the safety, health, and well-being of the residents and staff

Location

City: Chehalis **County:** Lewis **Legislative District:** 020

Project Type

Infrastructure (Major Projects)

Growth Management impacts

There are no known GMA impacts from this project

Funding

Acct Code	Account Title	Estimated Total	Expenditures: Prior Biennium	Expenditures: Current Biennium	2023-25 Fiscal Period: Reapprops	2023-25 Fiscal Period: New Approps
057-1	State Bldg Constr-State	6,897,000				6,897,000
	Total	**6,897,000**	**0**	**0**	**0**	**6,897,000**

Acct Code	Account Title	Future Fiscal Periods: 2025-27	2027-29	2029-31	2031-33
057-1	State Bldg Constr-State				
	Total	**0**	**0**	**0**	**0**

Operating Impacts

No Operating Impact

Project Number: **40000584**
Project Title: **Green Hill School HVAC Upgrades**

Operating Impacts

Narrative

This project upgrades existing HVAC equipment and controllers for specific buildings on campus and does not drive additional FTE need

OFM

Capital Project Request

2023-25 Biennium

*

Parameter	Entered As	Interpreted As
Biennium	2023-25	2023-25
Agency	307	307
Version	A1-A	A1-A
Project Classification	*	All Project Classifications
Capital Project Number	40000584	40000584
Sort Order	Project Priority	Priority
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

STATE OF WASHINGTON
AGENCY / INSTITUTION PROJECT COST SUMMARY
Updated June 2022

Agency	Department of Children, Youth and Families
Project Name	Green Hill School - HVAC Upgrades Buildings HMVDLF
OFM Project Number	40000584

Contact Information	
Name	Mike Poier
Phone Number	360-764-0253
Email	michael.poier@dcyf.wa.gov

Statistics			
Gross Square Feet		MACC per Gross Square Foot	
Usable Square Feet		Escalated MACC per Gross Square Foot	
Alt Gross Unit of Measure			
Space Efficiency		A/E Fee Class	A
Construction Type	Detention/correctional f	A/E Fee Percentage	13.18%
Remodel	Yes	Projected Life of Asset (Years)	30
Additional Project Details			
Procurement Approach	DBB	Art Requirement Applies	No
Inflation Rate	4.90%	Higher Ed Institution	No
Sales Tax Rate %	8.20%	Location Used for Tax Rate	Chehalis
Contingency Rate	10%		
Base Month (Estimate Date)	January-24	OFM UFI# (from FPMT, if available)	
Project Administered By	DES		

Schedule			
Predesign Start		Predesign End	
Design Start	July-24	Design End	October-24
Construction Start	November-24	Construction End	May-25
Construction Duration	6 Months		

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Project Cost Estimate			
Total Project	**$6,580,290**	Total Project Escalated	**$6,897,162**
		Rounded Escalated Total	**$6,897,000**

Cost Estimate Summary

Acquisition

Acquisition Subtotal	**$0**	**Acquisition Subtotal Escalated**	**$0**

Consultant Services			
Predesign Services	$250,000		
Design Phase Services	$453,664		
Extra Services	$0		
Other Services	$348,820		
Design Services Contingency	$105,248		
Consultant Services Subtotal	**$1,157,733**	**Consultant Services Subtotal Escalated**	**$1,201,662**

Construction			
Maximum Allowable Construction Cost (MACC)	$4,535,000	Maximum Allowable Construction Cost (MACC) Escalated	$4,762,188
DBB Risk Contingencies	$0		
DBB Management	$0		
Owner Construction Contingency	$453,500		$477,627
Non-Taxable Items	$0		$0
Sales Tax	$409,057	Sales Tax Escalated	$429,665
Construction Subtotal	**$5,397,557**	**Construction Subtotal Escalated**	**$5,669,480**

Equipment			
Equipment	$0		
Sales Tax	$0		
Non-Taxable Items	$0		
Equipment Subtotal	**$0**	**Equipment Subtotal Escalated**	**$0**

Artwork			
Artwork Subtotal	**$0**	**Artwork Subtotal Escalated**	**$0**

Agency Project Administration			
Agency Project Administration Subtotal	$0		
DES Additional Services Subtotal	$0		
Other Project Admin Costs	$0		
Project Administration Subtotal	**$0**	**Project Administration Subtotal Escalated**	**$0**

Other Costs			
Other Costs Subtotal	**$25,000**	**Other Costs Subtotal Escalated**	**$26,020**

Project Cost Estimate

Total Project	**$6,580,290**	Total Project Escalated	**$6,897,162**
		Rounded Escalated Total	**$6,897,000**

Funding Summary

	Project Cost (Escalated)	Funded in Prior Biennia	New Approp Request 2023-2025	2025-2027	Out Years
Acquisition					
Acquisition Subtotal	$0				**$0**
Consultant Services					
Consultant Services Subtotal	$1,201,662		$1,201,662		**$0**
Construction					
Construction Subtotal	$5,669,480		$5,669,480		**$0**
Equipment					
Equipment Subtotal	$0				**$0**
Artwork					
Artwork Subtotal	$0				**$0**
Agency Project Administration					
Project Administration Subtotal	$0				**$0**
Other Costs					
Other Costs Subtotal	$26,020				**$26,020**

Project Cost Estimate

Total Project	**$6,897,162**	**$0**	**$6,871,142**	**$0**	**$26,020**
	$6,897,000	**$0**	**$6,871,000**	**$0**	**$26,000**
	Percentage requested as a new appropriation		**100%**		

What is planned for the requested new appropriation? (*Ex. Acquisition and design, phase 1 construction, etc.*)

Insert Row Here

What has been completed or is underway with a previous appropriation?

Insert Row Here

What is planned with a future appropriation?

Insert Row Here

Cost Estimate Details

Acquisition Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Purchase/Lease					
Appraisal and Closing					
Right of Way					
Demolition					
Pre-Site Development					
Other					
Insert Row Here					
ACQUISITION TOTAL	**$0**		**NA**	**$0**	

Green cells must be filled in by user

Cost Estimate Details

Item	Base Amount		Escalation Factor	Escalated Cost	Notes
Consultant Services					
1) Pre-Schematic Design Services					
Programming/Site Analysis	$225,000				
Environmental Analysis	$25,000				
Predesign Study					
Other					
Insert Row Here					
Sub TOTAL	**$250,000**		**1.0241**	**$256,025**	Escalated to Design Start
2) Construction Documents					
A/E Basic Design Services	$453,664				69% of A/E Basic Services
Other					
Insert Row Here					
Sub TOTAL	**$453,664**		**1.0303**	**$467,411**	Escalated to Mid-Design
3) Extra Services					
Civil Design (Above Basic Svcs)					
Geotechnical Investigation					
Commissioning					
Site Survey					
Testing					
LEED Services					
Voice/Data Consultant					
Value Engineering					
Constructability Review					
Environmental Mitigation (EIS)					
Landscape Consultant					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0303**	**$0**	Escalated to Mid-Design
4) Other Services					
Bid/Construction/Closeout	$203,820				31% of A/E Basic Services
HVAC Balancing	$145,000				
Staffing					
Other					
Insert Row Here					
Sub TOTAL	**$348,820**		**1.0532**	**$367,378**	Escalated to Mid-Const.
5) Design Services Contingency					
Design Services Contingency	$105,248				
Other					
Insert Row Here					
Sub TOTAL	**$105,248**		**1.0532**	**$110,848**	Escalated to Mid-Const.

CONSULTANT SERVICES TOTAL	**$1,157,733**		**$1,201,662**	

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Cost Estimate Details

Construction Contracts					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Site Work					
G10 - Site Preparation	$15,000				
G20 - Site Improvements					
G30 - Site Mechanical Utilities	$880,000				
G40 - Site Electrical Utilities	$240,000				
G60 - Other Site Construction					
Other					
Insert Row Here					
Sub TOTAL	**$1,135,000**		**1.0408**	**$1,181,308**	
2) Related Project Costs					
Offsite Improvements					
City Utilities Relocation					
Parking Mitigation					
Stormwater Retention/Detention					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0408**	**$0**	
3) Facility Construction					
A10 - Foundations					
A20 - Basement Construction					
B10 - Superstructure					
B20 - Exterior Closure					
B30 - Roofing					
C10 - Interior Construction					
C20 - Stairs					
C30 - Interior Finishes					
D10 - Conveying					
D20 - Plumbing Systems					
D30 - HVAC Systems	$2,500,000				
D40 - Fire Protection Systems					
D50 - Electrical Systems	$900,000				
F10 - Special Construction					
F20 - Selective Demolition					
General Conditions					
Other Direct Cost					
Insert Row Here					
Sub TOTAL	**$3,400,000**		**1.0532**	**$3,580,880**	
4) Maximum Allowable Construction Cost					
MACC Sub TOTAL	**$4,535,000**			**$4,762,188**	
	NA			*NA per 0*	

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7) Owner Construction Contingency				
Allowance for Change Orders	$453,500			
Other				
Insert Row Here				
Sub TOTAL	**$453,500**	**1.0532**	**$477,627**	
8) Non-Taxable Items				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0532**	**$0**	
9) Sales Tax				
Sub TOTAL	**$409,057**		**$429,665**	
CONSTRUCTION CONTRACTS TOTAL	**$5,397,557**		**$5,669,480**	

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Cost Estimate Details

Equipment					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Equipment					
E10 - Equipment					
E20 - Furnishings					
F10 - Special Construction					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0532**	**$0**	
2) Non Taxable Items					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0532**	**$0**	
3) Sales Tax					
Sub TOTAL	**$0**			**$0**	
EQUIPMENT TOTAL	**$0**			**$0**	

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Cost Estimate Details

Artwork					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Artwork					
Project Artwork	$0				0.5% of total project cost for new construction
Higher Ed Artwork	$0				0.5% of total project cost for new and renewal construction
Other					
Insert Row Here					
ARTWORK TOTAL	**$0**		**NA**	**$0**	

Green cells must be filled in by user

Cost Estimate Details

Project Management					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Agency Project Management					
Agency Project Management	$0				
Additional Services					
Other					
DES/DCYF					
Subtotal of Other	*$0*				
PROJECT MANAGEMENT TOTAL	**$0**		**1.0532**	**$0**	

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Cost Estimate Details

Other Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Mitigation Costs					
Hazardous Material Remediation/Removal					
Historic and Archeological Mitigation	$25,000				
Other					
Insert Row Here					
OTHER COSTS TOTAL	**$25,000**		**1.0408**	**$26,020**	

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C-100(2022)
Additional Notes

Tab A. Acquisition
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Tab B. Consultant Services
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Tab C. Construction Contracts
Insert Row Here

Tab D. Equipment
Insert Row Here

Tab E. Artwork
Insert Row Here

Tab F. Project Management
Insert Row Here

Tab G. Other Costs
Insert Row Here

OFM

307 - Department of Children, Youth, and Families
Capital Project Request

2023-25 Biennium

*

Version: A1 DCYF Supplemental Request

Report Number: CBS002
Date Run: 9/13/2023 7:19AM

Project Number: **40000585**
Project Title: **Community Facilities HVAC Upgrades**

Description

Starting Fiscal Year: 2024
Project Class: Preservation
Agency Priority: 0

Project Summary

The Department of Children, Youth, and Families (DCYF) requests $1.9 million for the preservation of the HVAC systems in the Juvenile Rehabilitation's (JR) eight community facilities across Washington state. These facilities house youth and young adults who have served the majority of their court-ordered commitment and are transitioning back into the community. These Community Facilities are located in Chelan, Pierce, Kittitas, Grant, Thurston, Benton, and King County. Each facility houses between 12-16 minimum security residents who attend school and/or work in the local community during the day, while sleeping and eating at the community facility at night and on the weekends. Five of the eight facilities are located on the east side of the state and therefore, have experienced severe heat stress and fire smoke inundation over the last few years, which impacts the air quality indoors. The existing residential HVAC systems have been in operation between 20 to 28 years, dependent on the community facility.

Project Description

Due to the age and condition of the existing HVAC systems at the JR Community Facilities, the systems need to be updated to ensure ongoing viability of their heating and cooling capacity. In addition, smoke from recent wildfires over the past five years has required indoor air scrubbers to be rented each season to ensure the air quality indoors remains safe for the residents and staff. An outside engineering firm, Engineering Economics, Inc., was brought in during FY 2021 and FY 2022 to evaluate the systems and the air quality capacity. The findings of the assessment are documented in the "Facility Ventilation Assessment Report." It was found that the HVAC systems were inadequate, when compared to the national standard for these systems. DCYF received funding to update the HVAC system for one community facility in the 2023-25 Biennial Budget. Therefore, this project proposes to implement the recommendations outlined in the Facility Ventilation Assessment Report, updating the remaining seven community facility sites with modern air handling and filtering systems to ensure the safety, health, and well-being of the residents and staff.

Location

City: Richland **County:** Benton **Legislative District:** 008

Project Type

Infrastructure (Major Projects)

Growth Management impacts

There are no known GMA impacts from this project

Funding

			Expenditures		2023-25 Fiscal Period	
Acct Code	**Account Title**	**Estimated Total**	**Prior Biennium**	**Current Biennium**	**Reapprops**	**New Approps**
057-1	State Bldg Constr-State	2,880,000				2,880,000
	Total	**2,880,000**	**0**	**0**	**0**	**2,880,000**

		Future Fiscal Periods			
		2025-27	**2027-29**	**2029-31**	**2031-33**
057-1	State Bldg Constr-State				

OFM

307 - Department of Children, Youth, and Families
Capital Project Request

2023-25 Biennium

*

Version: A1 DCYF Supplemental Request

Report Number: CBS002
Date Run: 9/13/2023 7:19AM

Project Number: **40000585**
Project Title: **Community Facilities HVAC Upgrades**

Funding

Total	**0**	**0**	**0**	**0**

Operating Impacts

No Operating Impact

Narrative

This project updates and replaces existing HVAC systems and does not drive additional FTE needs

Capital Project Request

2023-25 Biennium

*

Parameter	Entered As	Interpreted As
Biennium	2023-25	2023-25
Agency	307	307
Version	A1-A	A1-A
Project Classification	*	All Project Classifications
Capital Project Number	40000585	40000585
Sort Order	Project Priority	Priority
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

State of Washington
AGENCY / INSTITUTION PROJECT COST SUMMARY
Updated June 2022

Agency	Department of Children, Youth and Families
Project Name	Statewide Community Facilities HVAC Upgrades
OFM Project Number	40000585

Contact Information	
Name	Mike Poier
Phone Number	360-764-0253
Email	michael.poier@dcyf.wa.gov

Statistics			
Gross Square Feet		MACC per Gross Square Foot	
Usable Square Feet		Escalated MACC per Gross Square Foot	
Alt Gross Unit of Measure			
Space Efficiency		A/E Fee Class	A
Construction Type	Detention/correctional f	A/E Fee Percentage	14.14%
Remodel	Yes	Projected Life of Asset (Years)	30
Additional Project Details			
Procurement Approach	DBB	Art Requirement Applies	No
Inflation Rate	4.90%	Higher Ed Institution	No
Sales Tax Rate %	8.20%	Location Used for Tax Rate	Chehalis
Contingency Rate	10%		
Base Month (Estimate Date)	January-24	OFM UFI# (from FPMT, if available)	
Project Administered By	DES		

Schedule			
Predesign Start		Predesign End	
Design Start	July-24	Design End	October-24
Construction Start	November-24	Construction End	May-25
Construction Duration	6 Months		

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Project Cost Estimate			
Total Project	**$2,745,749**	Total Project Escalated	**$2,879,887**
		Rounded Escalated Total	**$2,880,000**

Cost Estimate Summary

Acquisition

Acquisition Subtotal	**$0**	**Acquisition Subtotal Escalated**	**$0**

Consultant Services			
Predesign Services	$250,000		
Design Phase Services	$194,791		
Extra Services	$0		
Other Services	$87,515		
Design Services Contingency	$53,231		
Consultant Services Subtotal	**$585,536**	**Consultant Services Subtotal Escalated**	**$604,952**

Construction			
Maximum Allowable Construction Cost (MACC)	$1,815,000	Maximum Allowable Construction Cost (MACC) Escalated	$1,911,372
DBB Risk Contingencies	$0		
DBB Management	$0		
Owner Construction Contingency	$181,500		$191,156
Non-Taxable Items	$0		$0
Sales Tax	$163,713	Sales Tax Escalated	$172,407
Construction Subtotal	**$2,160,213**	**Construction Subtotal Escalated**	**$2,274,935**

Equipment			
Equipment	$0		
Sales Tax	$0		
Non-Taxable Items	$0		
Equipment Subtotal	**$0**	**Equipment Subtotal Escalated**	**$0**

Artwork			
Artwork Subtotal	**$0**	**Artwork Subtotal Escalated**	**$0**

Agency Project Administration			
Agency Project Administration Subtotal	$0		
DES Additional Services Subtotal	$0		
Other Project Admin Costs	$0		
Project Administration Subtotal	**$0**	**Project Administration Subtotal Escalated**	**$0**

Other Costs			
Other Costs Subtotal	**$0**	**Other Costs Subtotal Escalated**	**$0**

Project Cost Estimate

Total Project	**$2,745,749**	Total Project Escalated	**$2,879,887**
		Rounded Escalated Total	**$2,880,000**

Funding Summary

	Project Cost (Escalated)	Funded in Prior Biennia	New Approp Request 2023-2025	2025-2027	Out Years
Acquisition					
Acquisition Subtotal	$0				**$0**
Consultant Services					
Consultant Services Subtotal	$604,952		$604,952		**$0**
Construction					
Construction Subtotal	$2,274,935		$2,274,935		**$0**
Equipment					
Equipment Subtotal	$0				**$0**
Artwork					
Artwork Subtotal	$0				**$0**
Agency Project Administration					
Project Administration Subtotal	$0				**$0**
Other Costs					
Other Costs Subtotal	$0				**$0**

Project Cost Estimate

Total Project	**$2,879,887**	**$0**	**$2,879,887**	**$0**	**$0**
	$2,880,000	**$0**	**$2,880,000**	**$0**	**$0**
	Percentage requested as a new appropriation		**100%**		

What is planned for the requested new appropriation? (*Ex. Acquisition and design, phase 1 construction, etc.*)

Insert Row Here

What has been completed or is underway with a previous appropriation?

Insert Row Here

What is planned with a future appropriation?

Insert Row Here

Cost Estimate Details

Acquisition Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Purchase/Lease					
Appraisal and Closing					
Right of Way					
Demolition					
Pre-Site Development					
Other					
Insert Row Here					
ACQUISITION TOTAL	**$0**		**NA**	**$0**	

Green cells must be filled in by user

Cost Estimate Details

Consultant Services					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
1) Pre-Schematic Design Services					
Programming/Site Analysis	$225,000				
Environmental Analysis	$25,000				
Predesign Study					
Other					
Insert Row Here					
Sub TOTAL	**$250,000**		**1.0241**	**$256,025**	Escalated to Design Start
2) Construction Documents					
A/E Basic Design Services	$194,791				69% of A/E Basic Services
Other					
Insert Row Here					
Sub TOTAL	**$194,791**		**1.0303**	**$200,693**	Escalated to Mid-Design
3) Extra Services					
Civil Design (Above Basic Svcs)					
Geotechnical Investigation					
Commissioning					
Site Survey					
Testing					
LEED Services					
Voice/Data Consultant					
Value Engineering					
Constructability Review					
Environmental Mitigation (EIS)					
Landscape Consultant					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0303**	**$0**	Escalated to Mid-Design
4) Other Services					
Bid/Construction/Closeout	$87,515				31% of A/E Basic Services
HVAC Balancing					
Staffing					
Other					
Insert Row Here					
Sub TOTAL	**$87,515**		**1.0532**	**$92,171**	Escalated to Mid-Const.
5) Design Services Contingency					
Design Services Contingency	$53,231				
Other					
Insert Row Here					
Sub TOTAL	**$53,231**		**1.0532**	**$56,063**	Escalated to Mid-Const.

CONSULTANT SERVICES TOTAL	$585,536		$604,952	

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Cost Estimate Details

Construction Contracts					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Site Work					
G10 - Site Preparation	$15,000				
G20 - Site Improvements					
G30 - Site Mechanical Utilities					
G40 - Site Electrical Utilities					
G60 - Other Site Construction					
Other					
Insert Row Here					
Sub TOTAL	**$15,000**		**1.0408**	**$15,612**	
2) Related Project Costs					
Offsite Improvements					
City Utilities Relocation					
Parking Mitigation					
Stormwater Retention/Detention					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.0408**	**$0**	
3) Facility Construction					
A10 - Foundations					
A20 - Basement Construction					
B10 - Superstructure					
B20 - Exterior Closure					
B30 - Roofing					
C10 - Interior Construction					
C20 - Stairs					
C30 - Interior Finishes					
D10 - Conveying					
D20 - Plumbing Systems					
D30 - HVAC Systems	$1,200,000				
D40 - Fire Protection Systems					
D50 - Electrical Systems	$600,000				
F10 - Special Construction					
F20 - Selective Demolition					
General Conditions					
Other Direct Cost					
Insert Row Here					
Sub TOTAL	**$1,800,000**		**1.0532**	**$1,895,760**	
4) Maximum Allowable Construction Cost					
MACC Sub TOTAL	**$1,815,000**			**$1,911,372**	
	NA			*NA per 0*	

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7) Owner Construction Contingency				
Allowance for Change Orders	$181,500			
Other				
Insert Row Here				
Sub TOTAL	**$181,500**	**1.0532**	**$191,156**	
8) Non-Taxable Items				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0532**	**$0**	
9) Sales Tax				
Sub TOTAL	**$163,713**		**$172,407**	
CONSTRUCTION CONTRACTS TOTAL	**$2,160,213**		**$2,274,935**	

Green cells must be filled in by user

Cost Estimate Details

Equipment					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
1) Equipment					
E10 - Equipment					
E20 - Furnishings					
F10 - Special Construction					
Other					
Insert Row Here					
Sub TOTAL	$0		1.0532	$0	
2) Non Taxable Items					
Other					
Insert Row Here					
Sub TOTAL	$0		1.0532	$0	
3) Sales Tax					
Sub TOTAL	$0			$0	
EQUIPMENT TOTAL	$0			$0	

Green cells must be filled in by user

Cost Estimate Details

Artwork					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Artwork					
Project Artwork	$0				0.5% of total project cost for new construction
Higher Ed Artwork	$0				0.5% of total project cost for new and renewal construction
Other					
Insert Row Here					
ARTWORK TOTAL	**$0**		**NA**	**$0**	

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Cost Estimate Details

Project Management					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Agency Project Management					
Agency Project Management	$0				
Additional Services					
Other					
DES/DCYF					
Subtotal of Other	*$0*				
PROJECT MANAGEMENT TOTAL	**$0**		**1.0532**	**$0**	

Green cells must be filled in by user

Cost Estimate Details

Other Costs					
Item	Base Amount		Escalation Factor	Escalated Cost	Notes
Mitigation Costs					
Hazardous Material Remediation/Removal					
Historic and Archeological Mitigation					
Other					
Insert Row Here					
OTHER COSTS TOTAL	**$0**		**1.0408**	**$0**	

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C-100(2022)
Additional Notes

Tab A. Acquisition
Insert Row Here

Tab B. Consultant Services
Insert Row Here

Tab C. Construction Contracts
Insert Row Here

Tab D. Equipment
Insert Row Here

Tab E. Artwork
Insert Row Here

Tab F. Project Management
Insert Row Here

Tab G. Other Costs
Insert Row Here

OFM

307 - Department of Children, Youth, and Families
Capital Project Request

2023-25 Biennium

*

Version: A1 DCYF Supplemental Request

Report Number: CBS002
Date Run: 9/13/2023 7:21AM

Project Number: **40000586**
Project Title: **Echo Glen Academic School Walkway Roofing & Lighting**

Description

Starting Fiscal Year: 2024
Project Class: Preservation
Agency Priority: 0

Project Summary

The Department of Children, Youth, and Families (DCYF) requests $500,000 for a covered walkway and lighting at Echo Glen Children's Center in Snoqualmie. Echo Glen is a medium / maximum security facility that houses males up to age 17 and females up to age 25 committed to DCYF's Juvenile Rehabilitation (JR) program. At Echo Glen a variety of treatment services are provided and it is the only institution with females and gender specific programming. Educational and therapeutic services are also provided for a wide range of youth with varying needs. These include: Dialectical Behavior Therapy, Aggression Replacement Training, cultural programming, transformational mentoring, pre-vocation experiences, sex offense specific treatment, chemical dependency treatment specialized mental health services and education in partnership with the Issaquah School District and Renton Technical College. The campus is also known for its Canine Connection program which allows youth to train future service animals.

Project Description

The Echo Glen campus includes an Academic School, which consists of multiple classroom buildings joined together via an outdoor covered walkway system. This covered walkway is estimated to be 25 years or older and over time has experienced multiple leaks and failures allowing water to penetrate the canopy and short out the electrical lights which illuminate the pathways. A recent assessment of the walkway roof, lighting, and downspout gutter system revealed it has rusted and deteriorated to the point it can no longer be repaired. The covered walkways and lighting are essential for residents to walk to and from classrooms. Rather than tear down the structure, DCYF proposes to re-cover the existing roof with a newer rubber membrane material that is waterproof and will form fit to the old structure by means of a glue and heat application process. This project applies the roofing membrane to the covered walkway and replaces, where appropriate, old and outdated incandescent lighting with energy efficient LED lighting for the walkways.

Location

City: Snoqualmie **County:** King **Legislative District:** 005

Project Type

Infrastructure Preservation (Minor Works)

Growth Management impacts

There are no known GMA impacts from this project

Funding

Acct Code	Account Title	Estimated Total	Expenditures Prior Biennium	Expenditures Current Biennium	2023-25 Fiscal Period Reapprops	2023-25 Fiscal Period New Approps
057-1	State Bldg Constr-State	500,000				500,000
	Total	**500,000**	**0**	**0**	**0**	**500,000**

Acct Code	Account Title	Future Fiscal Periods 2025-27	2027-29	2029-31	2031-33
057-1	State Bldg Constr-State				
	Total	**0**	**0**	**0**	**0**

Version: A1 DCYF Supplemental Request

Report Number: CBS002
Date Run: 9/13/2023 7:21AM

Project Number: 40000586
Project Title: Echo Glen Academic School Walkway Roofing & Lighting

Operating Impacts

No Operating Impact

Narrative

This project replaces roofing over covered walkways and does not drive additional FTE

Capital Project Request

2023-25 Biennium

*

Parameter	Entered As	Interpreted As
Biennium	2023-25	2023-25
Agency	307	307
Version	A1-A	A1-A
Project Classification	*	All Project Classifications
Capital Project Number	40000586	40000586
Sort Order	Project Priority	Priority
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

FACILITY VENTILATION ASSESSMENT REPORT

YOUR FACILITY | YOUR GOALS | OUR COMMITMENT

Juvenile Rehabilitation Facilities

Ventilation and HVAC Assessment

Prepared for: Washington State Department of Children Youth and Families

EEI Project #03-22238

July 14, 2023

MAKING BUILDINGS BETTER SINCE 1984

ENGINEERING ECONOMICS, INC.

ENGINEERING ECONOMICS, INC.

Engineering Economics, Inc.
1536 Cole Blvd., Suite 240
Lakewood, Colorado 80401
(303) 239-8700

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

A/E	Architect/Engineer
AFMS	Air Flow Measuring Station
AHU	Air Handling Unit
BAS	Building Automation System
BHP	Boiler Horsepower
BMS	Building Management System
BoD	Basis of Design
Cx	Commissioning
CH	Chiller
CHW	Chilled Water
CW	Condenser Water
CFM	Cubic Feet per Minute
CT	Cooling Tower
CUH	Cabinet Unit Heater
DAT	Discharge Air Temperature
DCYF	Department of Children, Youth and Families
°F	Degrees Fahrenheit
DHW	Domestic Hot Water
dP	Differential Pressure
EEI	Engineering Economics, Inc.
EF	Exhaust Fan
ECAi	Equivalent Clean Air for Infection risk mitigation
ERV	Energy Recovery Ventilator
FCU	Fan Coil Unit
GPM	Gallons per Minute
HVAC	Heating, Ventilating and Air Conditioning
HW	Hot Water
HHW	Heating Hot Water
LEED	Leadership in Energy and Environmental Design
MAT	Mixed Air Temperature
MAU	Make-up Air Unit
MEP	Mechanical, Electrical and Plumbing
MERV	Minimum Efficiency Reporting Value (for filters)
O&M	Operations and Maintenance
OA	Outside Air
OAT	Outside Air Temperature
OPR	Owner’s Project Requirements
PSI	Pounds per Square Inch
RAT	Return Air Temperature
RFP	Request for Proposal
RHC	Reheat Coil
RH	Relative Humidity
RF	Return Fan
SF	Supply Fan
SF	Square Foot
TAB	Test, Adjust and Balance
UH	Unit Heater
UV	Unit Ventilator

I. EXECUTIVE SUMMARY

At the request of Department of Children, Youth and Families (DCYF) nurses Taylor Pitts and Troy Wasmundt, Engineering Economics, Inc. (EEI) has performed an assessment of DCYF's Juvenile Rehabilitation Facilities throughout Washington State. This assessment focuses foremost on the issue of ventilation performance for mitigating airborne illnesses such as COVID-19. Additional issues addressed are the general condition of Heating Ventilation and Air Conditioning (HVAC) systems, heating and cooling capacity, and mitigation of wildfire smoke.

Overall, the HVAC systems in most buildings are not working well. Of the 46 buildings evaluated:

- 11 Buildings have no filtered mechanical ventilation.
- Most other buildings have equipment capacity to deliver acceptable ventilation rates, but systems are not delivering it consistently to spaces.
- Only two buildings assessed are already set up for appropriate levels of filtration to mitigate infectious airborne aerosols (MERV-13A). Only one other building included MERV-13 level filtration recommended throughout the COVID-19 Pandemic. All three have other problems with their systems preventing delivery of appropriate ventilation.

Common reasons for deficiency include equipment operating beyond useful life, air registers damaged or adjusted improperly by occupants, unintended consequences of system modifications, and incomplete work by contractors.

Tailored improvements are proposed for each building and budget estimates for these recommendations are provided. Overall, $48,600,000 estimated over the next 12 years, with almost half in the next year to address severe deficiencies and imminent equipment failures.

In parallel with the physical improvements recommended for systems, we recommend that DCYF dedicate more resources toward facility operations, including overarching leadership and coordination. We were consistently impressed by the ingenuity and dedication of DCYF facility staff, but it is clear they face an uphill battle. Many sites, including the Institutions, are overwhelmed by problems with their systems, leaving little opportunity for proactive activities to prevent future problems. Each Juvenile Rehabilitation site is currently operating in its own "silo" independently trying to figure out what is important for their operations with limited technical expertise in HVAC systems. Staff are burning out and turnover is high leading to valuable knowledge being lost. Without strong facility operations, new and improved systems will not perform adequately over time.

II. INTRODUCTION

This report documents finding of an assessment of Washington State DCYF Juvenile rehabilitation facilities' Heating, Ventilating and Air Conditioning (HVAC) systems with a focus on the condition of these systems in providing good dilution of indoor infectious aerosols. This assessment also addresses the general condition of HVAC systems including their ability to control space temperature and maintaining good indoor air quality beyond disease transmission.

Facilities including the Echo Glen Children's Center in Snoqualmie, the Green Hill School in Chehalis, and 8 Community Facilities spread throughout the State were observed between December 2022 and April 2023. We found that most buildings are not providing adequate airflows to consistently achieve healthy indoor environments. Three main factors contribute to the ventilation deficiencies:

- Systems are beyond their useful life and important components are failing. Many facilities have systems that are simply too old and outdated.
- Some systems are working as intended but were not originally designed and constructed to provide the airflows we now know are needed.
- Many systems have been compromised by incremental modifications by maintenance staff and servicing contractors. These appear to be temporary fixes to component failures or extreme weather conditions that were left in place indefinitely and prevent the correct automatic functioning of the system.

Following these visits, we evaluated the options for facility improvements to achieve good indoor air quality and temperature control. We are recommending options that provide the best long-term value in terms of ventilation performance, practical maintainability, cost, and efficiency. Our team then developed budget estimates for the recommended interventions.

Site observation findings and facility recommendations are included in the body of this report. Budget estimates for recommendations are presented in Appendices B and C. Specific recommendations for each building are tailored to have good performance, streamlined operations & maintenance, and align the campus with State policy trajectory while avoiding unnecessary costs.

Health and HVAC Operation

Heating Ventilation and Air Conditioning (HVAC) systems support the health of occupants by limiting the concentration of airborne contaminants and maintaining indoor temperatures and humidities in a range that support occupant health. HVAC systems also maintain appropriate air pressures to minimize the unwanted transport of moisture, germs, and other pollutants from their sources.

Without properly functioning HVAC Systems, known health impacts include:

- Increased disease transmission due to higher concentration of airborne pathogens
- Increased disease transmission due to reduced immune response and increased pathogen survival time in the indoor environment.
- Increased allergic responses.
- Fuzzy headedness, Headaches, eye nose and throat irritation collectively referred to as "Sick Building Syndrome".
- Reduced cognitive performance.

The focus of this report is on the effect of building systems to mitigate disease transmission of airborne pathogens. The term ‘airborne pathogens’ refers to viruses and bacteria suspended very fine water droplets 1 to 3 micrometers in diameter emitted while breathing, speaking, sneezing, coughing, and toilet flushing. These fine droplets called aerosols stay suspended in the air for hours days and have been tied to many ‘superspreader’ events in the COVID-19 pandemic.

HVAC equipment provides the critical function of diluting contaminants in the indoor air with cleaner air. We are using two standards to evaluate HVAC systems:

- ASHRAE Standard 62.1 is the long-established engineering standard and Mechanical Code basis for ventilation rates and systems, however it is primarily focused on perception of odors and sick building syndrome symptoms, not infectious aerosols.
- ASHRAE Standard 241: *Control of Infectious Aerosols* was released this month (July 2023). This standard focuses specifically on mitigating risk from airborne infectious aerosols. This standard accounts for the benefits of both outside air and filtration to reduce aerosol concentrations in a factor called the “*Equivalent Clean Airflow for infection risk mitigation*” (*ECAi*). The *ECAi* varies per space type, but is 40 CFM/person for most Juvenile Rehabilitation facility spaces. This can typically be achieved by providing minimum outdoor air flow of 20 CFM/person (at or slightly above code requirements) and implementing MERV 13 filters.

Our recommendations also consider mitigating the growing issue of wildfire smoke. Wildfire smoke particulate is very small, so we recommend more effective MERV 14 filters during fire season. For Echo Glen and Community facilities East of the Cascades, we recommend provisions to use gas phase filters in addition to MERV 14 filters for fires taking place within 20 miles.

For more explanation of ventilation issues and criteria, refer to *Appendix A: Background Information*.

Improving Maintenance and Operations

While emerging research is pointing to new criteria for ventilation rates and filtration, a larger body or research shows that many, if not most existing buildings fail to even provide minimum ventilation rates required by code. Our assessment of DCYF facilities confirms that this is the case. In general, we see intelligent and committed staff doing their best to keep facilities running adequately with limited resources and knowledge about how the facilities should operate.

- Many facilities are understaffed, some have no maintenance staff at all.
- Maintenance staff typically have experience in various construction or mechanic trades. They have interest, but no dedicated training on HVAC systems.
- Each facility is largely operating in isolation with maintenance staff turning over every three to six years, taking institutional knowledge with them and leaving very little records behind for their successors.
- Without operational plans, full understanding of systems, or knowledgeable leadership, the culture and approach for facility maintenance has gravitated to being reactive to problems, rather than proactively ensuring that systems are working as they should. Systems are incrementally modified when issues arise, but never brought into correct permanent operation. The cumulative effect over time is that many undocumented layers of system deficiencies prevent proper ventilation and sometimes temperature control as well. In some facilities staff are taking initial steps to develop a proactive approach, but this is a minority.

Communication and Oversight

Visiting these facilities and interviewing administrators and maintenance staff, we see that each facility is largely reinventing the wheel about how to structure their maintenance program. Creating a regular forum for maintenance staff to discuss their issues, experiences, and best practices will help get the most out of the diverse experience base of the maintenance staff, improve morale and reduce time spent dealing with similar issues. **Recommendation: monthly online meetings and quarterly in-person meetings for maintenance staff.**

It would be valuable to have a centralized leadership role covering operations for all DCYF facilities. A central leader is needed to develop consistent maintenance standards, provide accountability that facility performance expectations are being met, ensure important records are being maintained, and coordinate the sharing of information between facilities. Perhaps most importantly, a central leader would be able to shift expectations from ‘doing the best I can with what I’m given’ to ‘knowing what is needed and getting it done”. Central leadership can also help with researching the best products and negotiating bulk purchases of equipment and materials at preferred rates. **Recommendation: Establish a permanent position coordinating facility standards department wide.**

Building Performance Certifications are a good way to both motivate and track building performance. *Energy Star*® Certification includes an annual independent “checkup” evaluation of both energy performance and building ventilation as well as monthly logging of energy performance. *LEED for Existing buildings* includes ongoing tracking of energy as well as an initial survey of ventilation and other issues affecting occupant health. Historically, it has been common for consultants providing these services to focus on energy and largely ignore ventilation, so it is important to advocate that comprehensive ventilation reviews are adequately funded and completed. **Recommendation: Pursue building certifications as an operational benchmark.**

Information

Operations and Maintenance Staff typically do not have the information that they need to fully understand how their facilities work and best practices to keep them functioning properly. **Recommendation: each unique building have the following**:

1. As-Built drawings in electronic PDF format indicating the layout of the building architecture, HVAC equipment, pipes & ducts, and schedules of equipment performance. These can be sketches on top of existing floor plans done in house or can be created by an HVAC Engineer or Contractor.

2. O&M Plans for each facility. These living documents serve as a go-to for the important information building operators need and spell out what successful operations look like:

- System Description in plain English, explaining all major MEP systems and equipment in the building. This should include an overview of HVAC operation in all operating modes (cooling, heating, unoccupied, etc.).
- Performance objectives, including comfort, air quality, and energy efficiency.
- Ventilation and airflow tables indicate the minimum amount of outdoor and total airflow that should be flowing to each room and through each piece of equipment. Additionally, how airflows are measured at each location.
- Preventative maintenance schedule, and list of disposable products to use, such as filters and belts.
- Maintenance Checks, including monthly, quarterly, and annual tasks
- Vendors to contact and their strengths and weaknesses

- This information is extremely valuable for system operation, and we recommend that it be kept locally as well as on a central server that is backed up.
- Note the Washington Clean Buildings Standard requires O&M plans be created and used for regulated buildings, however these plans are a good reference for smaller buildings as well.

Standards & Guidelines

Standards and Guidelines establish a department wide set of best practices that can be pursued to improve the DCYF portfolio over time and streamline operations. These documents act as a living brain bank for the collective wisdom of DCYF facilities staff. Procuring equipment per standards increases compatibility and familiarity for equipment at different buildings, making it easier for staff to support other facilities when staffing issues arise. By proactively identifying current best practices, you can avoid missing out on technologies that offer the best value as well as avoid "snake oil" solutions that are marketed to individual properties.

Standards also provide guidance for operators facing new technical issues.

1. Equipment- Including preferred products for routine maintenance and major equipment replacements. In general, we recommend equipment standards avoid proprietary equipment that cannot replace or interface with other brands, include preferred and alternate brand products to ensure future replacement will be competitive, and establish clear performance standards rather than relying on model numbers which quickly become outdated.

2. Generally, be clear on what is a standard (required) and what is a guideline (recommended).

3. Example O&M Plan

4. Building Performance Targets

    - Ventilation
    - Temperature Control
    - Energy Use
    - Water Use

Training

Many maintenance staff indicated interest in training on HVAC systems. We recommend that training in HVAC systems be an expectation for maintenance staff. Training is available from multiple sources, including the Smart Buildings Center.

Capital Planning

HVAC systems are hardworking machines and components predictably wear out over time, typically around 15 and 20 years. HVAC equipment is also increasingly digitally controlled, providing many benefits, but also more components to upgrade. Financial planning should anticipate keeping HVAC systems working well.

We have been impressed by staff in DCYF committed to the work being done, improving facilities, and learning about how to make them better. We anticipate that building on that culture to provide a bit more collaboration, structure and resources will pay dividends in achieving consistent comfort and healthy indoor air quality.

Energy and Greenhouse Gas Emissions

While the focus of this study is not energy conservation there are important emerging developments in State policy and regulations for energy use in existing buildings that should be considered as a part of assessing the DCYF building stock and operations:

1. The Washington State Clean Buildings Performance Standard (Law signed in 2019) creates new requirements for non-residential buildings 50,000 SF and larger.

    - Sets energy consumption limits and requires reporting energy use for each building.
    - Provides a tailored alternative compliance approach if achieving the energy target is not financially feasible.
    - Imposes fines for buildings out of compliance.
    - Sets minimum operational requirements, such as O&M Plans, Energy Management Plans, and coordinating with capital planning.
    - Establishes a compliance timeline with largest buildings submitting in 2026.

2. The Clean Buildings Expansion Bill (Law signed March 2022) extends some requirements to smaller buildings 20 to 50,000 SF:

    - Requires O&M Plans and Energy Management Plans
    - Requires Benchmarking (reporting) energy consumption, by July 2027
    - The final rules will be published in December 2023
    - After an initial benchmarking phase, expect energy consumption or emissions targets to follow.

3. The 2021 Washington State Energy Code, going into effect July 1, 2023, requires all new buildings and major renovations to use heat pumps as the main source of heating rather than natural gas or electric resistance heat.

These policies create a framework that will continue raising the bar with more stringent targets for existing, renovated, and new buildings in the future. Washington State is near the forefront of these policy developments along with California, New York, Colorado, and Washington DC with momentum from an increasing number of other jurisdictions. These policies are game changers in terms of aligning the building industry with magnitude of decarbonization necessary in coming years.

Major take-aways for DCYF facilities are:

- Requirements are aligned with DCYF needs to improve facilities planning and operations. Generally, the same proactive practices that ensure consistently good air quality in buildings will also minimize energy consumption and emissions.

- Plan to shift away from natural gas use and toward electric heat-pump based systems.

- Don’t expect to continue ‘making do’ with out-of-date equipment. Plan to replace out-of-date equipment with modern systems that offer dramatic improvements in efficiency, ventilation, comfort, and operations.

- Look for opportunities to maximize both energy efficiency and air quality whenever facility modifications are planned. Considering either in isolation will likely result in additional rounds of costly renovation.

- Following final rulemaking for the Clean Buildings Expansion Law in December, we recommend evaluating compliance requirements. Preparing for compliance will be a multi-year process so don't delay in understanding the specific requirements for each facility.
- Expect energy/emissions limits to follow approximately 5 years after benchmarking for at least the larger institutional facilities.

It is worth noting that there is a lingering myth in the building industry that higher ventilation rates significantly reduce building energy performance. With modern HVAC systems including energy recovery and heat pumps, generous ventilation is provided with little additional energy.

Resilience

Ideally, HVAC systems for institutional facilities include provisions for resilience so that the failure of a single equipment component does not take a whole system down. Depending on the use of the space, either full redundancy (n+1) or partial redundancy may be appropriate. DCYF Juvenile Rehabilitation facility HVAC systems generally lack robust redundancy provisions.

Lack of redundancy turns inevitable component failures into emergency situations requiring immediate response and improvised solutions. Improvised solutions often create additional problems.

Another consideration for resilient systems is that facilities staff get the appropriate notifications when there has been a failure. This requires that 1) equipment is monitored by a Building Management System, 2) The Building Management System is functioning properly to notify operators without generating an overwhelming number of false alarms. Though it is current best practice, ventilation rates have historically not been directly controlled or monitored in HVAC systems.

- At Community facilities, the residential style HVAC equipment has no Building Management System to provide alarms.
- Only a couple of the buildings at Green Hill School include outdoor airflow monitoring.

As systems are updated, consideration should be given to ensuring that the new systems installed can continue operation with reasonable capacity. We also recommend that airflows are measured, recorded and low levels are alarmed for each ventilation system.

Overview of Technical Recommendations

The following are brief descriptions of common recommendations for improvements of Juvenile Rehabilitation facilities.

Test and Balance: Is a systematic measurement adjustment of system airflows by a dedicated technician. This is how you get the right amount of air to the right places.

Commissioning: Commissioning is a comprehensive process of testing building systems and coordinating resolution of issues so that buildings operate correctly in all expected conditions. This is performed by certified professionals working on the owner's behalf.

Filtration: Filtration is a critical issue for indoor air quality and health. Please see Appendix A Background information for important information about filters.

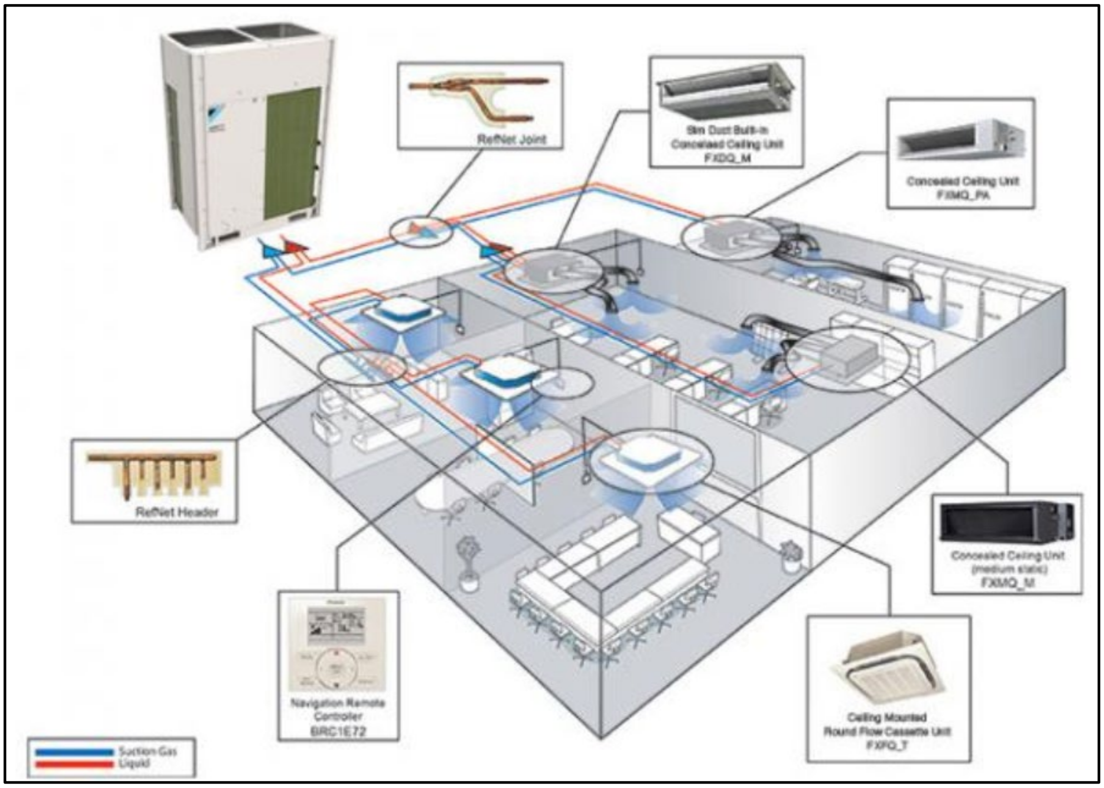
- MERV-14A filters are recommended for mitigating wildfire smoke as well as infectious aerosols. The "A" rating reflects certification that good performance lasts throughout the filter's life.
- V-Bank style fiberglass filters are the best style to achieve MERV-13A and 14A. These are deeper than the 2 and 4-inch-thick filters currently in most DCYF buildings, and generally require some system modification to accommodate.

Outdoor Airflow Monitoring: Special sensors can be installed to permanently measure ventilation airflow. Outdoor airflow monitoring is the best way for operators to confirm the building is ventilated properly. It is already installed on some institutional properties.

Energy Recovery Ventilators: Energy recovery ventilators combine a fan for outdoor air, a fan for exhaust and a heat exchanger to transfer heat (and sometime moisture) from the exhaust air before it is discharged. This type of energy recovery is common in current HVAC systems and required by the Washington State Energy Code in many cases.

Heat Pumps: Heat pumps are a broad group of equipment that uses a refrigeration cycle to provide heat where it is needed. Heat pumps can condition air like a residential heat pump or be used to heat water.

Variable Refrigerant Flow (VRF) Systems: VRF systems are a special class of heat pump. These systems are like the split air conditioning units typical for DCYF server rooms, however, these systems can connect a single larger outdoor unit to multiple indoor units conditioning different rooms. These systems are particularly well suited to small to medium sized office areas, however the current refrigerant used will be phased out in the next few years, so current equipment will not be compatible with future systems.



Efficient Direct Drive Fans

Before the advent of variable frequency drives, belts were required to translate between the operating speed of the motor and fan, like the 'gears' on a bicycle. With the advent of Variable frequency drives (VFD's) and Electrically Commutated (ECM) motors, modern HVAC equipment incorporates electronics to adjust motor speed. This allows a direct connection between the motor and the fan without a belt.

Many organizations now have a policy to require direct drive fans in their facility standards, and we recommend this for DCYF facilities.

Eliminating belts eliminates a key recurring maintenance requirement as belts wear down and break. Belt failures are inevitable and, in many cases, go unnoticed for long periods. Transitioning to direct drive fans would be a game-changer for maintenance at DCYF Institutional campuses.

Community Facility Makeup Air and Hood Upgrades

In many community facilities, we found that kitchen exhaust hoods are not being used because the associated makeup air is unconditioned creating unacceptably cold temperatures in the kitchen. This is a significant IAQ issue as cooking fumes, including combustion biproducts, are significant indoor pollutants. We recommend each kitchen be reviewed for both acoustics and makeup air preheat so that staff are not forced to choose between air quality and acceptable comfort conditions.

III. COMMUNITY FACILITY ASSESSMENTS AND RECOMMENDATIONS

Canyon View

Overview

Address: 260 North Georgia Avenue, East Wenatchee, WA 98802

Residents: 14 Beds

Built: 1968

Site: Location has potential to be in close proximity to wildfires.

Envelope

Windows: Single pane with aluminum frames

Main HVAC Systems

Two large furnaces operate together to provide heating and cooling to the main building outside the kitchen via both floor grilles and ceiling grilles in two rooms.

The system is generally working well and has good capacity, but the outdoor airflow is slightly low, and the air balance to some rooms is off, resulting in about half of the rooms receiving inadequate airflow (below code) for ventilation. 2" MERV 13 synthetic filters are installed which likely only provide MERV 10 performance after a few weeks of use (See Appendix A filtration discussion).

1. The classroom was built as a modular building with wall mounted Bard HVAC unit. The ventilation rate and overall airflow and capacity appear good.

2. The kitchen is relatively new and in good condition, however the makeup air is unheated and causes discomfort. Transfer Air Grilles and ducts connect the kitchen and dining, presumably to prevent under pressurizing the kitchen.

3. A detached 500 SF weight room shed located behind the main building has no HVAC system. Two walls are predominantly glazed roll-up doors. The other two walls contain large, fixed windows. The space is well suited for good natural ventilation when the rolling doors are at least partially opened. Presumably it would be desirable to extend the seasons that this weight room can be used, however providing heating to the space as currently constructed would violate the Washington Energy Code.

Additional HVAC Systems

Split AC units serve the server room, pantry, and kitchen.

Electric wall heaters serve restrooms.

Health and IAQ performance

The overall dilution of airborne infectious aerosols is good for most spaces, with the exception of duty office and Admin Assistant rooms which are considerably low. The outdoor air to dilute gaseous air contaminants (odors, CO_2, VOCs) is low, particularly in bedrooms, which are getting about half the code outdoor air requirement. It appears that the system can provide good outdoor airflow rates with system adjustments.

The MERV-13 (estimated MERV-10A) filters provide a small benefit for wildfire smoke, but most particulate will pass through. This is the best filter that the system can accommodate without modifying ductwork.

For the kitchen system, we measured the supply air to the kitchen slightly higher than exhaust. Exhaust should be greater than supply to keep the kitchen negatively pressurized and minimize migration of kitchen fumes to other areas.

Heating and Cooling Capacity

Apart from the unheated kitchen, the building appears to have adequate heating and cooling capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Fan Coil 1 & 2	Manuf:	Maytag	Appx. Age:	10	Fair	Main Furnaces
	Model:	B6EMMX60K-C	Est. Remaining Useful Life:	10		
HP-1&2	Manuf:	Lennox	Appx. Age:	10	Fair	5 Ton Condensing Unit
	Model:	MSH1BE41SP6 0K	Est. Remaining Useful Life:	10		
Server room AC	Manuf:	Mitsubishi	Appx. Age:	6	Good	
	Model:	PKA-A12HA7/PUZ-12KA7	Est. Remaining Useful Life:	14		
Kitchen AC	Manuf:	Daikin	Appx. Age:	7	Good	
	Model:	FXAQ18PVJU/ RXTQ36TAVJU	Est. Remaining Useful Life:	13		
Pantry AC	Manuf:	Mitsubishi	Appx. Age:	7	Good	
	Model:	PUY-A12NHA6	Est. Remaining Useful Life:	13		

Recommendations

Short Term

1. Replace floor grilles with heavy duty commercial grade bar grilles throughout the main building. Install balance dampers in ductwork where needed.
2. Modify ductwork entering furnaces to accommodate 2” prefilters and 12” V-bank MERV 14 filters for wildfire conditions.
3. Rebalance furnace system.
4. Do acoustical evaluation of classroom system.

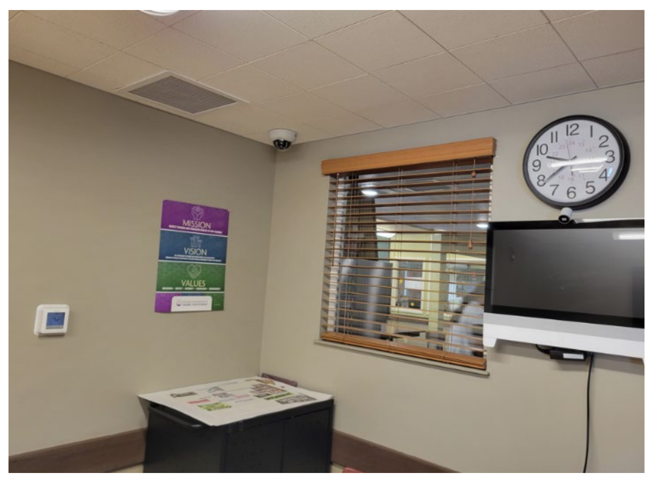
Mid Term (5 years)

1. Replace main furnace equipment: Indoor and exterior portions. Recommend providing separate heat pump units for bedroom wing, common spaces, office area, conference room, and control room. Provide dedicated systems for the conference room and control room, which will frequently require cooling while the rest of the building needs heating. Include 2" prefilters and 12" V-Bank MERV-14A filters. Provide at least 20 CFM outdoor air and *ECAi* per ASHRAE Std 241.

2. Perform engineering review and redesign of kitchen. Provide new makeup air unit with capacity for tempering makeup air. Rebalance System.

3. Replace Classroom BARD wall mounted AC unit with new high efficiency wall mounted heat pump including MERV-13 (MERV-10A) filtration. Provide ERV with capacity for 30 CFM/occupant and MERV 14 filtration for operation during wildfires.

PICTURES

 *Canyon View*	 *Living/Common Area*
 *Dining/Common Area*	 *Classroom*

Typical Bedroom

Restroom

Staff Restroom

Kitchen

Kitchen Dish Area
No Exhaust

Pantry Area with Food Service Office

Rooftop Makeup Air Unit

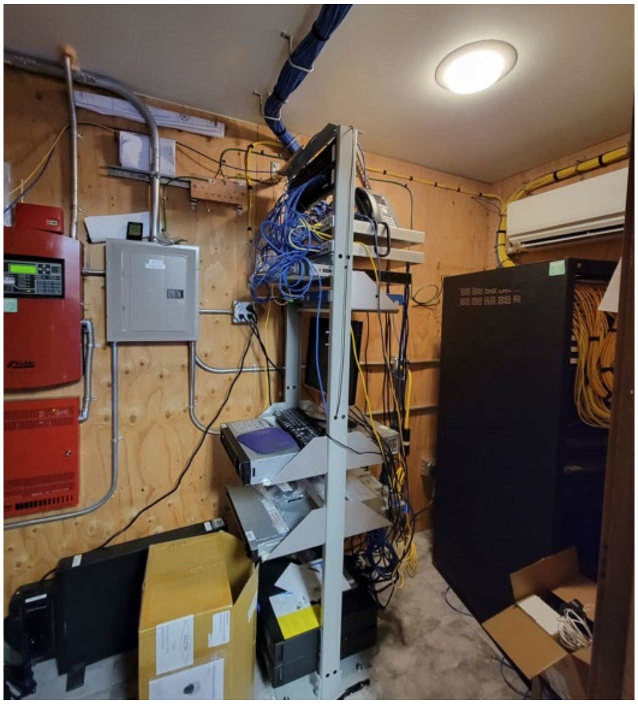
Pantry Outdoor Unit and Refrigeration

Kitchen AC Unit

Transfer Grille Between Kitchen and Dining. Note this is not working because it includes a barometric damper that is not adjusted properly (no weight).

Hallway

Hallway



Server Room

Server Room Outdoor Unit.

Note: Eves have been extended to protect unit from falling ice and snow

Typical Filter

Mech Room with Furnace

Duct branches appeared to previously have reheat coils controlling temperature separately to different areas.

Condenser Units for Furnace

Classroom Wall Mounted AC Unit

Detached Weight Room


Weight Room

Oakridge

Overview

Address: 8701 Steilacoom Boulevard SW, Lakewood, WA 98498

Residents: 22 Beds

Built: 1969

Site: Suburban, on a very busy street, but set back behind trees.

Envelope

Wood Framed, double pane vinyl framed windows.

Main HVAC Systems

Four gas fired furnaces with DX cooling

Furnace 1: Installed in 1994, serves common spaces and office. This is a gas fired unit with 140,000 BTU/h gas input capacity and the phased out R22 refrigerant. The unit appears to have no OA intake and total supply airflow is very low at only 553 CFM (should be 2,000-3,000 CFM). Ducts are likely pinched off in the attic. The unit is well past its useful life.

Furnace 2: Installed in 1994, serves the two Bedroom Wings (“Long” and “Short”). This is a gas fired unit with 140,000 BTU/h gas input and the phased out R22 refrigerant. Thermostat controlling the entire system is in the hall of the long Bedroom Wing, and as a result the short wing bedrooms are ‘always hot’. The unit appears to have no OA intake and total supply airflow is low at only 1,100 CFM, (roughly half the expected airflow). Supply air is delivered by residential style adjustable registers and ductwork in the attic appears crushed. The unit is well past its useful life.

Unit 1A: Serves the large classroom/multifunction space - 1750 CFM

Unit 2A: Serves the Recreation Room - 580 CFM

1. Old thermostats for Units 1A and 2A lose time and schedule regularly.

2. Outdoor airflow at the combined building intake for both unit 1A and 2A was 428 CFM and should be closer to 600 CFM per Mechanical Code given likely peak occupancy levels. This outdoor intake is small and is likely a ‘bottleneck’ for outside air to these systems.

All four furnaces were originally installed with electrostatic filters, which have been gutted and replaced with standard MERV 11 filters slotted into the casing. These filters do not fit snugly in the casing for the electrostatic filters, so there is substantial bypass- rendering the effective filtration level much lower.

Flexible ductwork serving Furnace 1 and 2 is in poor condition- very crushed and bent in the attic.

Kitchen exhaust appears to be operating via bypass switches with an appropriate airflow. The controller LCD display is damaged and not currently useable. Makeup is via an inline fan in the attic with an electric duct heater. We were not able to measure airflow at the makeup air diffusers, likely because of the controller. An additional diffuser provided a small amount of air (43 CFM), likely from the Furnace 1 system.

Additional HVAC Systems

A window mounted AC unit is installed in the kitchen.

Bathrooms are exhausted with small local fans and receive supply air from the furnace systems for heating and cooling. The two large restrooms in the “Long” residential wing appear to have adequate airflow, though one has only half the airflow of the other. The restroom in the short wing has only 57 CFM which is below the mechanical code requirement of 70 CFM for the room; the supply air for this room is much higher, so contaminated air from the restroom is being pushed out into the adjacent hallway. The exhaust airflow in the staff bathroom opening into the common area is also below code requirements with only 42 CFM.

Split System Air Conditioners are provided for pantry, and server room.

Health and IAQ performance

Furnace 1 and 2 systems are not providing any significant benefit to air quality in the building. They provide no outside air, the filtration is likely removing only some dust, not aerosols or fine particulate. Operable windows are currently the only means of ventilation for bedrooms, office, and central common space. If pollen related allergies or airborne illness issues arise, recirculating HEPA air cleaners are an effective temporary measure.

The AHU-1A system serving the classroom appears to be getting approximately 320 CFM of outside air, which is slightly below the 345 CFM that would be required in this space for code required ventilation for 20 occupants. The AHU-1B system is only providing enough outdoor airflow to meet code requirements for one person in the recreation room.

Heating and Cooling Capacity

Airflow restrictions affecting the AHU-1 and 2 systems are significantly preventing these units from delivering the heating and cooling capacity needed.

The AHU-1A and AHU-2A systems appear to have adequate heating and capacity. If necessary, this capacity could be increased by adjusting the fan speed setting and system air balance.

Equipment Table

LEGEND	MARK	EQUIPMENT		YEARS		CONDITION	NOTES
	Furnace 1 & 2	Manuf:	Trane	Appx. Age:	29	Poor	
		Model:	TZC061C5HPB2	Est. Remaining Useful Life:	0		
	Condensing Unit 1 & 2	Manuf:	Trane	Appx. Age:	29	Poor	
		Model:	TTN060C100A1	Est. Remaining Useful Life:	0		
	HVAC-1A	Manuf:	Trane	Appx. Age:	19	Fair	
		Model:	TXC061C5CHPO	Est. Remaining Useful Life:			
		Manuf:	Trane	Appx. Age:	19	Fair	

LEGEND	MARK	EQUIPMENT		YEARS		CONDITION	NOTES
	HVAC-1B	Model:	2TTA2060A3000 AB	Est. Remaining Useful Life:	5		
	HVAC-2A	Manuf:	Trane	Appx. Age:	19	Fair	
		Model:	TXC036C4HPCO	Est. Remaining Useful Life:	5		
	HVAC-2B	Manuf:	Trane	Appx. Age:	19	Fair	
		Model:	2TTA2036A3000 AA Trane	Est. Remaining Useful Life:	5		
	Kitchen fan	Manuf:	CapitveAire	Appx. Age:	7	Fair	
		Model:	NCA14FA	Est. Remaining Useful Life:			
	Kitchen Makeup Fan	Manuf:		Appx. Age:	7	Fair	
		Model:		Est. Remaining Useful Life:			
	Kitchen Duct Heater	Manuf:	Neptronic	Appx. Age:	7	Fair	
		Model:	DF CI00H	Est. Remaining Useful Life:			
	Server Room AC	Manuf:	Mitsubishi	Appx. Age:		Fair	
		Model:	PKA-A12HA7	Est. Remaining Useful Life:			

Recommendations

Short Term

1. Replace Furnace 1 (beyond useful life) with a new heat pump system and Energy Recovery Ventilator (ERV). Provide a separate thermal zone for the common area and office. Provide dedicated systems for the conference room and control room, which will frequently require cooling while the rest of the building needs heating.

2. Replace Furnace 2 (beyond useful life) with two new systems:

   a. 1000 CFM heat pump furnace and 500 CFM ERV for long wing.

   b. 500 CFM heat pump and 250 CFM ERV for short wing.

3. For Furnace 1 and 2 replacements

   a. Replace all attic ductwork with sheet metal ducts supported from roof NOT lying on ceiling.

   b. Replace floor grilles with heavy duty commercial grade bar grilles.

c. Install duct mounted dampers with remote operators so the air balance of the building will not be easily disrupted. No dampers should be accessible from grilles.

d. Provide split system AC unit for kitchen in lieu of window unit and connection to Furnace 1.

e. Balance system airflows.

4. For AHU-1A and 2A

   a. Add gasketing materials to filter section for close fit and minimal bypass leakage. Use MERV-13 filters.

   b. Provide new thermostats.

   c. Tune up and rebalance equipment for appropriate outdoor and total airflows. Provide at least 20 CFM of outside air for each occupant expected in the space.

Mid Term

1. Fix display on grease exhaust fan controller, provide MERV-14 filter on makeup air.

2. Provide energy recovery ventilators for AHU-1A and AHU-2A, including MERV-14A filters and controlled based on room occupancy. Provide separate outdoor air intake for the AHU-2A system so these two systems are not 'fighting' for the outside air. Modify ductwork for the recirculating furnaces to accommodate MERV-13A V-bank filters.

Long Term

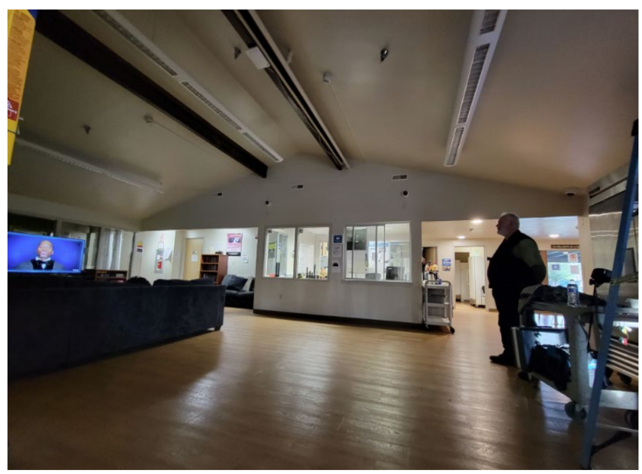
1. Replace kitchen exhaust and makeup equipment at the end of life.

PICTURES

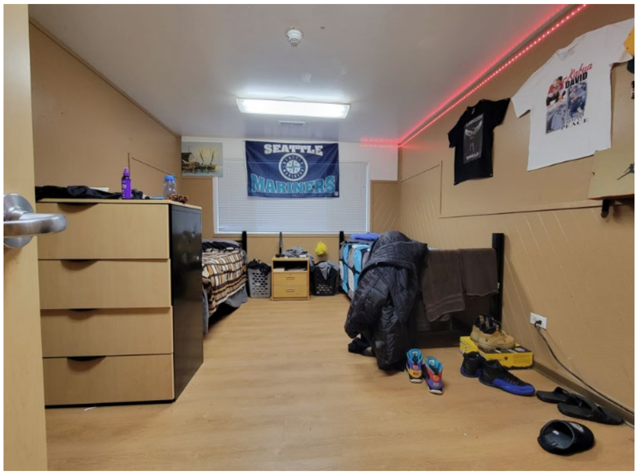
Oakridge Community Facility

Classroom/Multipurpose Space

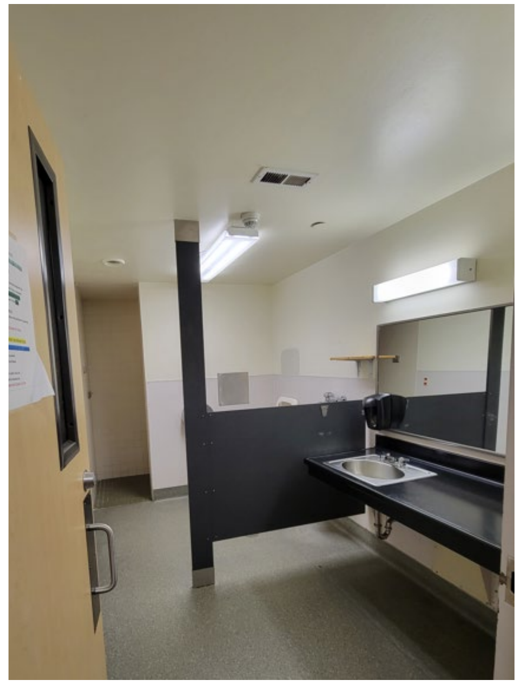
Common Space/Living Room



Common Space/Living Room



Typical Bedroom
Note: Residential supply register at ceiling.


Resident Bathroom


Kitchen
Note: Two square makeup supply diffuser and rectangular residential style supply register (heating/cooling) in ceiling

Kitchen
Note window AC unit

Kitchen Window AC Unit

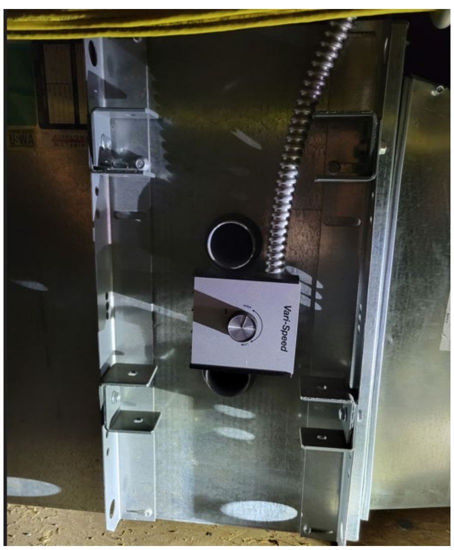
Exhaust and Makeup Air Control Box.
Note display is damage and unusable

Pantry

Kitchen from Exterior


Kitchen Exhaust Fan


Kitchen Makeup Air Intake in Attic



Kitchen Makeup Fan in Attic


Kitchen Makeup Electric Heater

AHU Serving Recreation Room

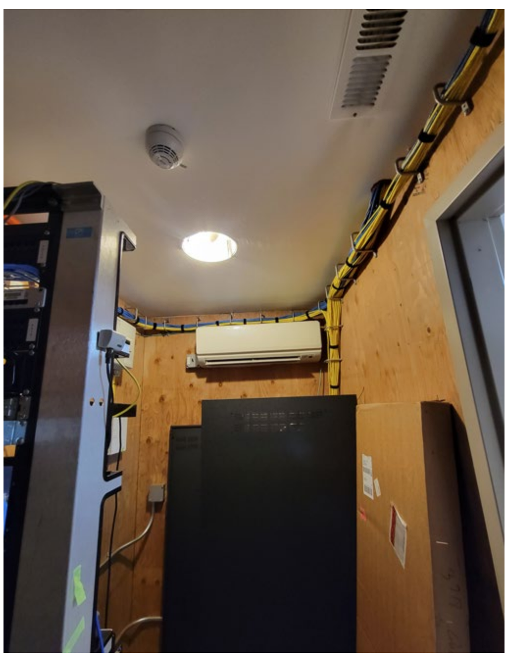

Mechanical Room for Units 2A and 2B
Note common outdoor air duct to exterior

AHU-2A Filter Section

AHU-2A Filter Section

AHU-2A and AHU-2B condensing Units

Server Room



Server Room AC Unit Indoor Section

Server Room AC Unit Outdoor Section

Server Room AC Unit Refrigerant Lines Appear well protected

Abandoned Outdoor AC Unit

Furnaces (1 &2) and Water Heater in Electrical Room

Condenser Units Serving Furnace 1 & 2

 *Attic Space*	 *Attic Space*

Parke Creek

Overview

Address: 11042 Parke Creek Road, Ellensburg, WA 98926

Residents: 14 Beds

Built: 1981

T-Shaped main building. Detached school building includes a classroom and a weight room.

Site: Open fields Grassland, consistently in close proximity to wildfires, less than a mile away. Significant solar exposure to the West.

Envelope

Wood framed with standing seam metal roof over wood decking and heavily weathered wood panel wall siding. Floor insulation approximately 8” Batt. Attic insulation approximately 6” batt, but highly disturbed by during installation of various services. Kitchen windows are double pane vinyl-framed. Entry windows are double-pane, but most windows in the buildings are single-pane with aluminum frames.

Classroom building has CMU walls with furred out insulated gyp board walls and insulation between.

Main HVAC Systems

Three Residential style heat pumps

1. Residential Wing Furnace nominal 3-ton
2. Unit #2 Common Area & Kitchen nominal 5-ton
3. Office area DX heat pump in ceiling, nominal 3-ton

Ductwork in attic is a combination of flexible and hard ductwork laid on top of the ceiling. These ducts are smashed and kinked: generally, in terrible shape. Airflows are low for all systems, particularly the residential wing system. These systems provide little to no outside air.

An electric resistance furnace provides makeup air to the kitchen. It appears to date from the original construction. Five electric heating stages are controlled by wall mounted dials.

5-ton heat pump serves classroom building.

2” MERV-7 filters are installed on all these furnaces.

Flex ducts are insulated, but generally have no vapor barriers, which can lead to condensation in warm weather.

Additional HVAC Systems

1. Server room split system has outdoor unit directly under eaves and are getting damaged by snow and ice sheeting off the roof.

2. A split system conditions pantry. This seems to have a way-oversized indoor cassette unit that is very squeaky in operation, likely to fail soon.

3. Electric Baseboard Heaters in some offices

Health and IAQ Performance

Apart from the kitchen makeup air system, the building HVAC systems are not ventilating the building. Until this is resolved, operable windows are the only means of ventilation for bedrooms, office, and central common space. If pollen related allergies or airborne illness issues arise, recirculating HEPA air cleaners are an effective temporary measure.

Heating and Cooling Capacity

We measured very low airflows in the space likely due to crushed, pinched and leaky broken ductwork in the attic. Despite adequate capacity in the equipment, the distribution ductwork is preventing systems from adequately heating and cooling the building.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Residential Wing Unit	Manuf:	Carrier	Appx. Age:	11	Fair	
	Model:	FB4CNF036	Est. Remaining Useful Life:	9		
Unit #2	Manuf:	Carrier	Appx. Age:	11	Fair	Common Area Furnace
	Model:	FB4CNF060	Est. Remaining Useful Life:	9		
Office Wing Unit	Manuf:	Carrier	Appx. Age:	11	Fair	In Attic
	Model:	FB4CNF036	Est. Remaining Useful Life:	9		
Kitchen Makeup	Manuf:	Sears	Appx. Age:	42	Fair	1126 BTU/hr (33 kW @ 240 V)
	Model:	867.687550	Est. Remaining Useful Life:	2		
Classroom Heat Pump (Indoor)	Manuf:	Maytag	Appx. Age:	15	Fair	With 60 Amp electric heat kit
	Model:	B6VMMX60K-C	Est. Remaining Useful Life:	4		
Classroom Outdoor Unit	Manuf:	Maytag	Appx. Age:	15	Fair	5 Ton
	Model:	MSH4BE060KA	Est. Remaining Useful Life:	4		
Pantry Split System	Manuf:	Mitsubishi	Appx. Age:	20	Poor	R-22. Old, bearings making a squeaking sound.
	Model:	PLH18KI//PHU18EK	Est. Remaining Useful Life:	0		
Server Rm AC	Manuf:	Mitsubishi	Appx. Age:	6	Fair	Should be protected from snowfall checked for previous damage
	Model:	PKA-A12HA7/PUZ-A12NKA7	Est. Remaining Useful Life:	14		

Recommendations

Short Term

1. Ductwork has been severely damaged due to ‘snowballing’ poor installations within the attic and cannot serve the building. While solving these issues, it is a cost-effective time to provide important elements for maintaining good air quality and improving efficiency.

2. Clean up services in the Attic. Remove all existing ductwork for the three main heat pump systems. Support wiring (IT, Security) tight to building structure so it does not hamper access within this service space. Retest IT and Security systems to ensure they are working correctly after writing configuration.

3. Repair attic batt insulation, bring up to current code level. Use Batt insulation NOT loose fill insulation.

4. Provide a new Energy Recovery Ventilator (ERV) and tie into the inlet of the Residential Wing heat pump system. Provide a 2” prefilter and 12” V-Bank MERV-14A on the mixed air intake of the heat pump. Provide new sheet metal ductwork for this system.

5. Provide a separate heat pump in the office area for East facing offices. Provide energy recovery ventilator(s) for the office area. Provide a 2” prefilter and 12” V-Bank MERV-14A filter on the mixed air intakes to the heat pump system. Provide new sheet metal ductwork for this system.

6. Provide a new Energy Recovery Ventilator (ERV) and tie into the inlet of the Common area (Unit 2) heat pump system. Provide a 2” prefilter and 12” V-Bank MERV-14A filter on the mixed air intake of the heat pump. Provide new sheet metal ductwork for this system.

7. Configure unit controls to operate consistently at an appropriate level for minimum ventilation.

8. Relocated restroom supply grilles to interior walls rather than floors.

9. Provide heavy duty commercial security bar grilles at all resident bedrooms and restrooms.

10. Install duct mounted dampers so the air balance of the building will not be easily disrupted. No dampers should be accessible from grilles.

11. Support all attic ductwork tight to the roof structure, professionally installed and sealed maintaining access clearances throughout the attic.

<u>Mid Term (4 Years)</u>

1. Replace heat pump serving classroom building. If still applicable, provide one system for the classroom, and one for the weight room.

2. Replace electric resistance makeup system serving kitchen with heat pump.

3. Decommission Pantry AC split system by qualified refrigeration technician.

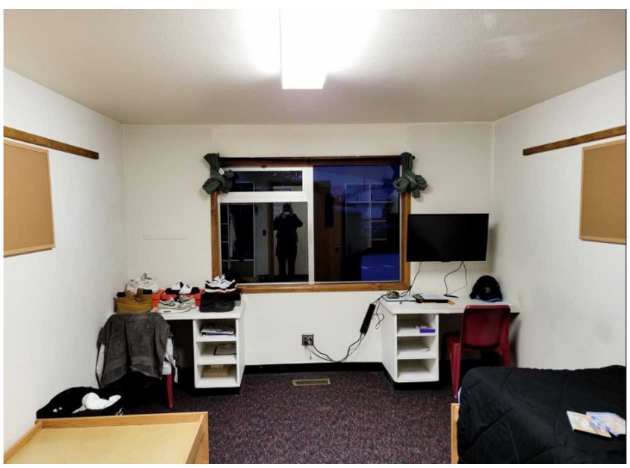
4. Provide split system to serve conference room.

PICTURES

Parke Creek Community Facility

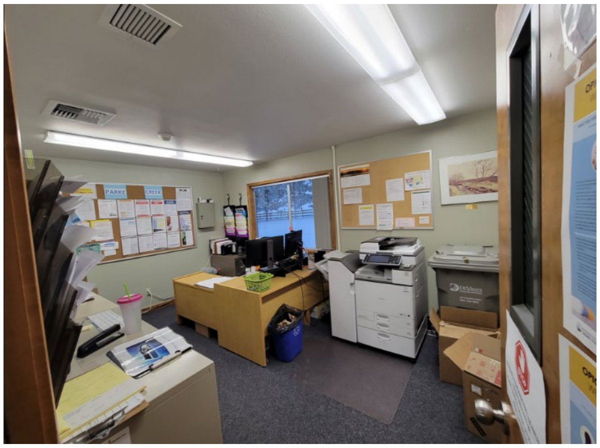
West Facing Façade
Is extremely weathered.

Plumbing Vent at roof has been bent by sheeting snow



Typical Bedroom with Floor Register

Office


Office


Typical Floor Register


Office


Hall

Typical Restroom

Restroom Floor Register

Pantry/Food Service Office
Note furnaces in Corner

Older AC Unit in Dry Storage Pantry Area


Outdoor Condensing Units for Main Building Furnaces. Refrigerant insulation is unjacketed and degraded

Classroom Condensing Unit


Classroom Refrigerant Piping with Degraded Insulation


Dry Storage Outdoor Unit

Server Room with AC Unit

Server Room Outdoor Unit
Note: Damage from Snowfall

Server Outdoor Unit Located Directly Below Roof Edge

Residential Wing Furnace

Typical MERV 7 Filter

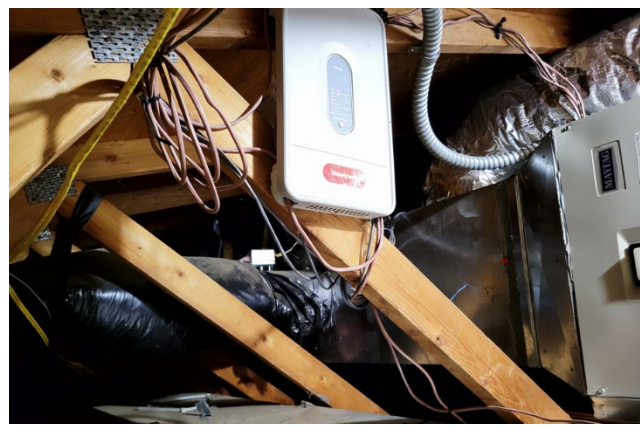

Attic Ductwork


Attic Ductwork

Office Unit

Office Unit Filter Section

Classroom Unit



Controller for Classroom Unit

Appears to include ventilation control functions based on CO_2 levels, but these are not currently functioning

Ridgeview

Overview

Address: 1726 Jerome Avenue Yakima, WA 98902

Residents: 14

Built: 1981

Site: Located in the middle of a block in a mixed residential/light commercial portion neighborhood in Yakima. Ridgeview is adjacent to and shares a parking lot with the Yakima County Juvenile Court. A moving company across the street to the West likely introduces particulate from Diesel Exhaust. This location is susceptible to nearby wildfires.

Envelope

Wood Frame Construction. Insulation is ~8" Batt at ceiling, no floor insulation, walls likely insulated to 1981 code. Double pane vinyl windows in bedrooms, double pane aluminum framed windows central areas.

Ridgeview is the community facility serving female residents. Maintenance of staffing has been particularly difficult and inconsistent here.

Main HVAC Systems

Two large ground-mounted packaged air handlers with gas heat and integral cooling (gaspacks) serve the building:

1. Residential Wing unit: 93,000 BTU gas heating output, 70,000 BTU cooling output. Door transfer grilles to hallway. Floor grilles are generally heavy-duty bar grilles. Total supply airflows are good and well balanced. The total outdoor air coming into the is less than half the appropriate amount.

2. Common area unit: 103,000 BTU gas heating output, 83,000 BTU Cooling capacity unit is enclosed within a fence causing recirculation of condenser, outdoor air, and relief air. Offices are 'sub zoned' with a damper that responds to a thermostat in the room. The offices facing the back yard are often "freezing" or "boiling" because the sub zoning control is not working effectively.

3. Both Systems are using MERV 8 filters.

4. Duct system appears in good condition.

The kitchen includes a 54" grease hood. The exhaust fan for this system was not functioning, so there is no exhaust for this commercial range.

Additional HVAC Systems

1. 1-ton Split system heat pump in pantry

2. Through-wall Packaged Terminal Air Conditioner (PTAC) in kitchen office to garage

Health and IAQ performance

1. Total supply airflows for these systems look good, and well balanced, but outdoor airflows draw in into the systems are low: slightly less than half the appropriate ventilation rates. These systems do not currently provide adequate ventilation but have the capability to do so. Additionally, the unit serving the common spaces is heavily enclosed on all sides leading to significant re-entrainment of relief air, combustion fumes, and hot air discharged by the condensing section.

2. These units are not configured to hold true MERV-13A or MERV-14A filters. This means these systems are not capable of providing adequate removal of infectious aerosols or any significant protection from outdoor particulate.

Heating and Cooling Capacity

1. The air current air handling units have good heating capacity, but according to Administrator Michelle Ragland they have had significant cooling problems, have been leaking refrigerant and requiring refills.

Other Issues

1. The common space unit combustion flue location is causing problems. With the flue discharge directly below the building eves, the plume of warm, moist, acidic combustion gases appears to be damaging the building. The flue is also located directly above the gas pipe serving the unit, and condensed acidic flue vapors are dripping down onto the pipe union.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Main AHU	Manuf:	Carrier	Appx. Age:	11	Poor	Gas Output 103,000 BTUH Rated Cooling 83,000 BTU/h
	Model:	48CTDD08A2A5-0A0A0	Est. Remaining Useful Life:	0		
Bedrm AHU	Manuf:	Carrier	Appx. Age:	11	Poor	Gas Output 93,000 BTUH Rated Cooling 70,000 BTU/h
	Model:	48CTCEA07A2A5A0A0A0	Est. Remaining Useful Life:	0		
Pantry AC	Manuf:	Mitsubishi	Appx. Age:	5	Good	Covered up, no significant cooling need.
	Model:	PKA-A12HA7	Est. Remaining Useful Life:	15		
Kitchen Office AC	Manuf:	-	Appx. Age:	5	Fair	Through Wall Style Unit
	Model:	-	Est. Remaining Useful Life:	10		

Recommendations

Short Term

1. Provide new kitchen exhaust equipment including a new kitchen exhaust fan and makeup air unit.

2. Replace existing gaspack units for residential wing with all electric heat pump for heating and cooling. Provide an energy recovery ventilator (ERV) to deliver consistent minimum ventilation to the building tied to this system.

3. Provide separate small air conditioning systems for offices: one system for interior offices and one system for offices facing the backyard. Provide an ERV serving offices.

4. Replace existing gaspack unit serving common areas with all electric heat pump for heating and cooling. Provide an energy recovery ventilator. Provide an ERV to deliver consistent minimum ventilation to the building tied to this system.

5. Provide a 2” prefilter and 12” V-Bank MERV-14A filter on all systems. Clean existing ductwork. Perform minor repairs to locations of sagging ductwork.

PICTURES

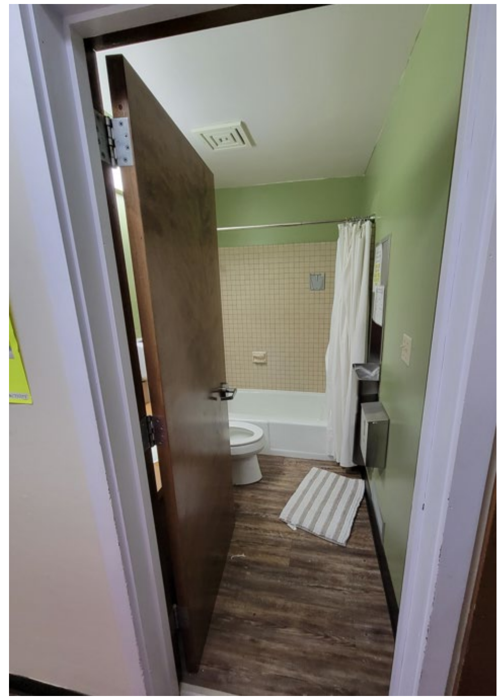
Ridgeview Community Facility

Living Room

Office Between Living Room and Back Yard

Zone Thermostat in Office

Typical Bedroom



Typical Bathroom

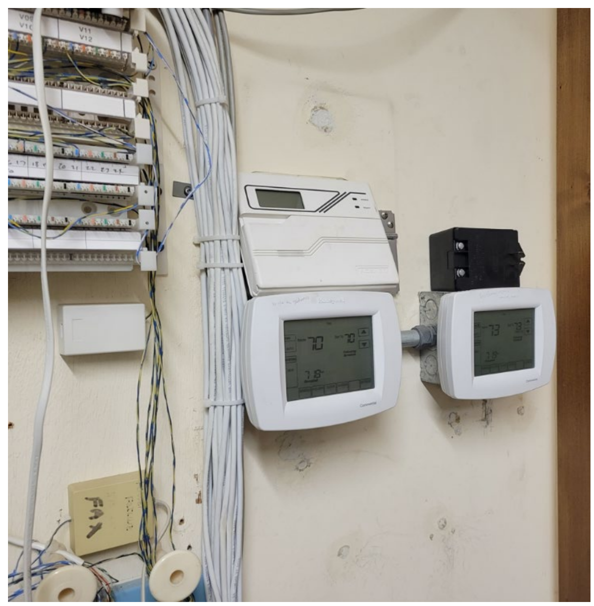
Typical Bathroom

Kitchen Office with Through-wall Packaged AC

Pantry AC Unit Hidden Behind Stored Items

Workshop

Mechanical/Electrical Room

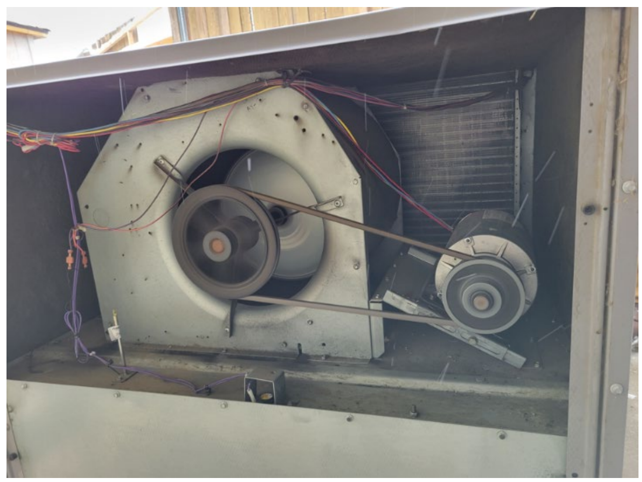


Master HVAC Controllers in Mechanical/Electrical Room


Gas Fired Packaged AC Unit Serving Bedroom Wing

Condenser Coils Are Loaded with Dirt and Need Cleaning


Common Area Gas Packaged AC Unit


Interior of Unit

Interior of Unit, Filters

Flue Gases Rising to roof edge appear to be damaging structure

Condensed Flue Gases Freezing onto Gas Piping

Ducts Entering Building Crawlspace

Duct Distribution in Crawlspace

Typical Connection to Floor Grille

Attic Return Duct

Attic Return Duct

Sunrise

Overview

Address: 1421 Division Avenue E., Ephrata, WA 98823

Residents: 14

Built: 1968

Site: Open on edge of town surrounded by open high desert on Northeast and South. Municipal airport to the SE.

Envelope

Wood Framed Construction, Shingled Roof. Blown in Cellulose attic insulation. Vinyl framed double pane windows.

Main HVAC Systems

A single large Variable Volume and Temperature (VVT) system with CO_2 based controls serves most of the building. This system offers some adjustments to airflow in different spaces based on multiple thermostats, but all zones are heating or cooling at the same time. This dated system was somewhat popular for a short period, but nearly all installations have been removed due to its complexity. The system has a 24”x36” rooftop air intake gooseneck, however controls set to no outside air and 100% recirculation. Total airflow is good. The unit has electric heat, which is regularly tripping off on an emergency safety.

Carrier 15-ton heat pump in attic serving East side of building including kitchen, conference room, and councilor offices. Access is very difficult. Good overall airflow.

Kitchen Rooftop exhaust fan 1240 CFM. Makeup air appears effective.

Additional HVAC Systems

1. 1-ton Mitsubishi split AC unit for server room
2. Through wall AC Unit installed in kitchen wall.

Health and IAQ performance

The main system is currently providing no outside air to the building. This can be readily corrected by a technician versed in these systems.

The current 2” MERV 8 filters are doing little to capture infectious aerosols or particulate. The current filter slots in mixed air ducts will not accommodate true MERV-13A or MERV-14A filters, however, it appears that there is space to modify mechanical room ductwork for these higher performance filters.

Heating and Cooling Capacity

The system has very substantial heating and cooling capacity. There appears to be some hardware issue with internal safety causing the electric heating to trip out, but this can likely be resolved with minor troubleshooting.

Other Issues

The main problem is that the main HVAC system is complicated and unfamiliar to HVAC service contractors as well as maintenance staff. The system can be tuned up, but it is inevitable that the system will be adjusted improperly in the future because this is so easy to do. The few people left who know these systems will be retiring soon.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-1	Manuf:	Carrier	Appx. Age:	11	Poor	VVT System is antiquated and difficult to operate properly.
	Model:	40RMQ016—B511YC	Est. Remaining Useful Life:	None		
CU-1	Manuf:	Carrier	Appx. Age:	11	Poor	Outdoor unit serving AHU-1 R-22 Refrigerant
	Model:	38CKO08570	Est. Remaining Useful Life:	None		
East Side Air Handler	Manuf:	Carrier	Appx. Age:	11	Choose an item.	Serves East side rooms. Unit not accessible in attic.
	Model:		Est. Remaining Useful Life:	3		
East Side Condensing Unit	Manuf:	Carrier	Appx. Age:	11	Choose an item.	R-22 Refrigerant
	Model:	38AQS016	Est. Remaining Useful Life:	3		
Server Room AC	Manuf:	Mitsubishi	Appx. Age:	5 (2018)	Good	R410A Refrigerant
	Model:	PKA-A12HA7/ PUZ-A12NKA7	Est. Remaining Useful Life:	15		

Recommendations

Short Term

1. Reconfigure ducts in the Mechanical Room to provide MERV-14A filters and 2” prefilters. Commission and check balance on existing systems. Note this requires specialized knowledge of this legacy VVT system and electric controls.

Mid Term

Replace VVT system with:

1. Two separate heat pumps serving residential wing east and west sides. Control to temps in return from rooms. East and west facing rooms have significantly different thermal loads and should not be on the same thermal zone.

2. One heat pump serving the Living and Dining areas.
3. Two heat pumps serve the office wing (North side and South side).
4. Provide ERV(s) for outside air and exhaust control on all new systems.
5. Provide a 2” prefilter and 12” V-Bank MERV-14A filter on all systems. Clean existing ductwork. Perform minor repairs to locations of sagging ductwork.
6. Retrofit East side heat pump to accommodate a 2” prefilter and 12” V-Bank MERV-14A

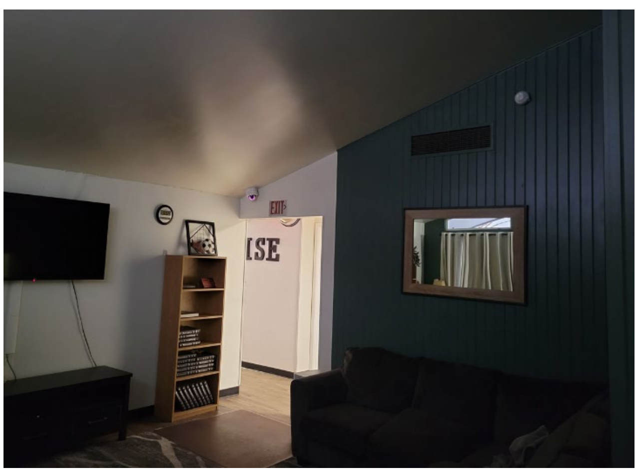
<u>Long Term</u>

1. Replace East side heat pump system (end of life) and add an ERV or integral heat recovery.

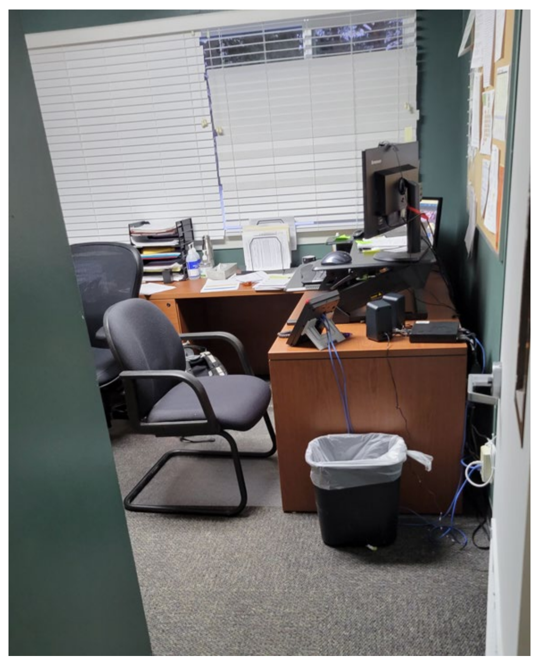
PICTURES

Sunrise Community Facility
Note: Air Intake and Kitchen Exhaust Fan

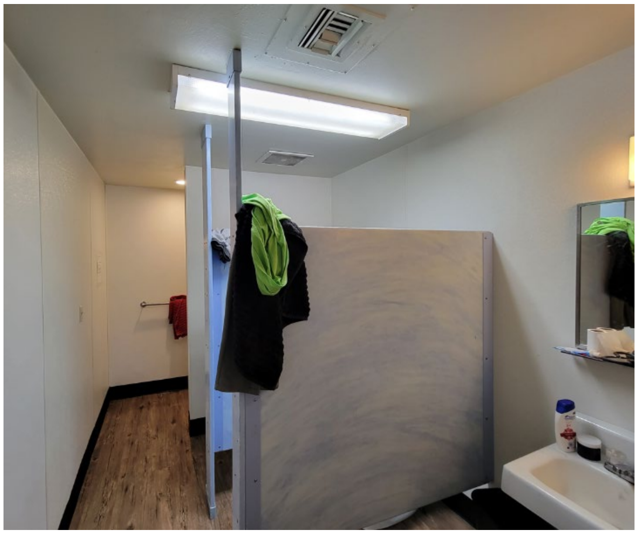
Dining Area



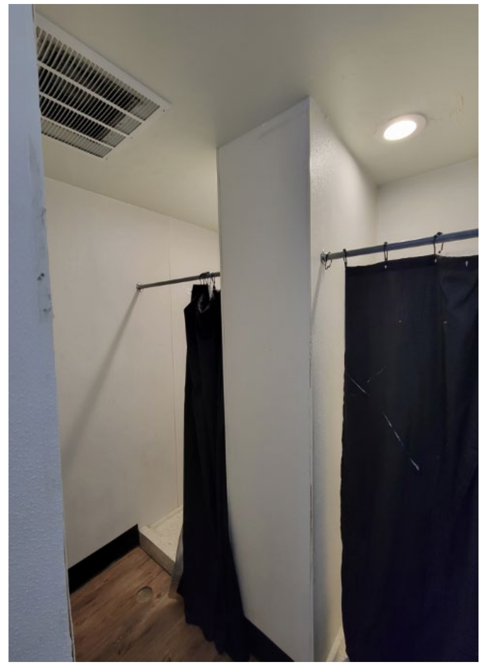
Living Room



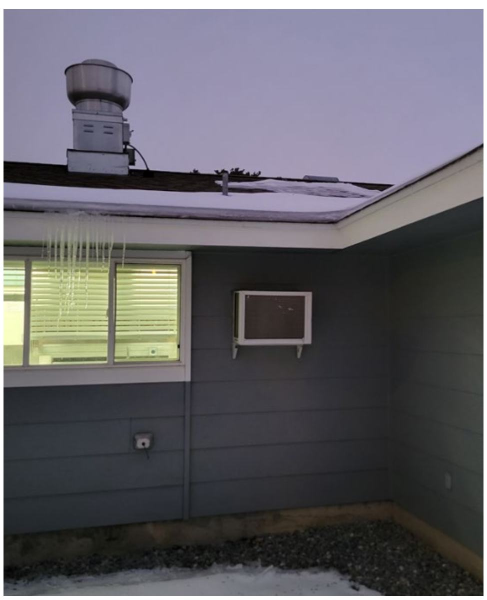
Office



Restroom



Restroom Shower Area with Exhaust Grille



Exterior of Kitchen with Thru-wall AC and Fan.

Note: Icicles, likely from water condensed and drained from fan

Kitchen Exhaust and Makeup Air Controller

Server Room

Mechanical Room with AHU-1

East Side AHU

East Side Condenser Unit

Server Condenser Unit

Touchstone

Overview

Address: 2010 Puget St. N.E. Olympia, WA 98506

Residents: 16 (8 bedrooms)

Built: 1971

Site: NE Olympia neighborhood with many trees creating shade particularly to the South and West.

Envelope

Wood Framed Construction, Wood panel siding. Shingled Roof. Blown in Cellulose attic insulation. Vinyl framed double pane windows.

Facility includes a 5,600 SF main building (2 story) plus 1,200 SF detached classroom building. The property was recently purchased by DCYF. Significant renovations are under consideration. The first floor of the main building includes common dining and living areas as well as staff offices and laundry. The second floor includes bedrooms and resident restrooms. The classroom building includes a variety of spaces including a computer room, fitness room, audio recording studio, and pantry.

Main HVAC Systems

1. Condensing gas heating-only furnace serves the first floor of main building. This system has no outside air connection and only a coarse washable filter. All ventilation is via operable windows.
2. Heat pump in attic serves the upper floor of main building (bedrooms) providing heating and cooling. Outdoor air damper actuator is broken and was closed.
3. Kitchen exhaust is 1,460 CFM, makeup air is through backdraft damper mounted in window.
4. A condensing furnace serves the classroom building. This system has no outside air connection and only a coarse washable filter. All ventilation is via operable windows.

Additional HVAC Systems

1. Split system heat pump server the in pantry (in classroom building)- This is permanently turned off because it consistently trips breakers.
2. Split system heat pump in server room.
3. Classroom area exhaust fan not working. This appears to be a remnant from previous space use and may not be important.

Health and IAQ performance

The first floor and classroom building furnaces provide heating only, are not ventilating the building. Until this is resolved, operable windows are the only means of ventilation for these spaces. If pollen related allergies or airborne illness issues arise, recirculating HEPA air cleaners are an effective temporary measure to reduce risks.

The second-floor air handling unit appears to have good airflow capacity, but some rooms have the registers shut and low airflow. The system currently does not have outdoor air or effective filtration, but these should be simple to retrofit.

Heating and Cooling Capacity

Heating and cooling capacity appear adequate where provided, however there is no temperature control in the kitchen area, no cooling on the first floor or classroom area.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
First Floor Furnace	Manuf:	American Standard	Appx. Age:	2013	Poor	
	Model:	AUH1B080A9421BA	Est. Remaining Useful Life:			
2nd Floor Air Handling Unit	Manuf:	American Standard	Appx. Age:	8	Poor	Broken Outdoor Air Damper
	Model:	-	Est. Remaining Useful Life:			
2nd Floor Condensing Unit	Manuf:	American Standard	Appx. Age:	8	Good	
	Model:	4A6H4042D1000AA	Est. Remaining Useful Life:			
2nd Floor Condensing Unit	Manuf:	American Standard	Appx. Age:	8	Good	
	Model:	4A6H4042D1000AA	Est. Remaining Useful Life:			
Kitchen Exhaust Fan	Manuf:	-	Appx. Age:	5	Fair	
	Model:	-	Est. Remaining Useful Life:	15		
Server AC	Manuf:	Mitsubishi	Appx. Age:	5	Good	
	Model:	PKA-A12HA7	Est. Remaining Useful Life:			
Pantry AC	Manuf:	Mitsubishi	Appx. Age:	5	Poor	Issues with electrical power
	Model:	MSZ-GL12NA/ MUZ-GL12NA	Est. Remaining Useful Life:			

Recommendations

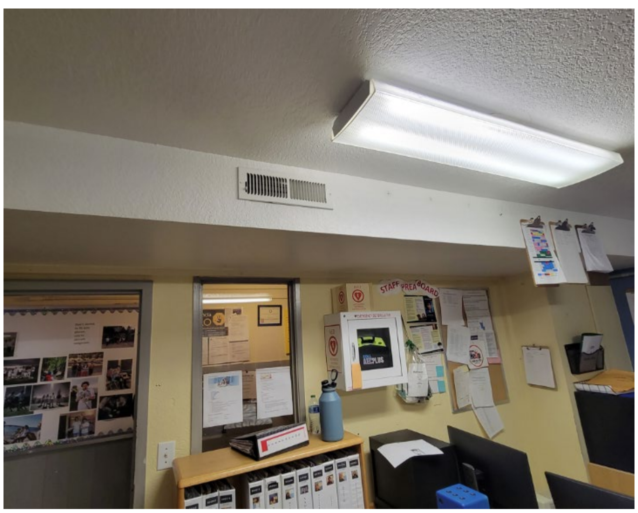
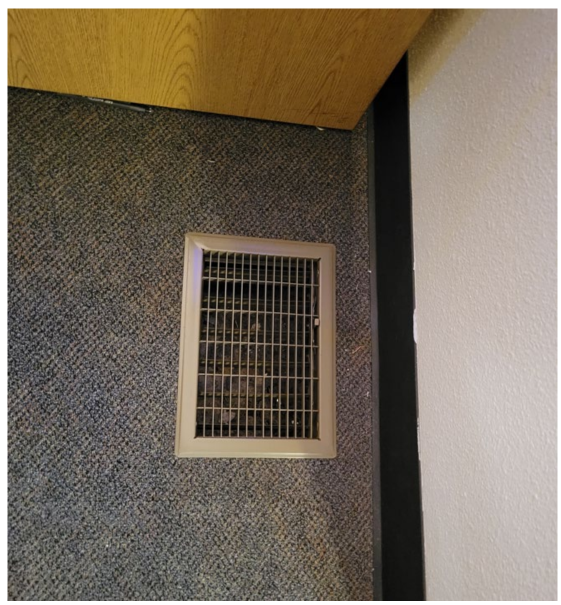
Immediate

1. Electrical engineering review of building service and desired renovations.
2. Fix outdoor air damper on attic heat pump unit. Provide MERV-13 (MERV-10A) filters.
3. Rebalance airflow to rooms.
4. Fix laundry exhaust system.

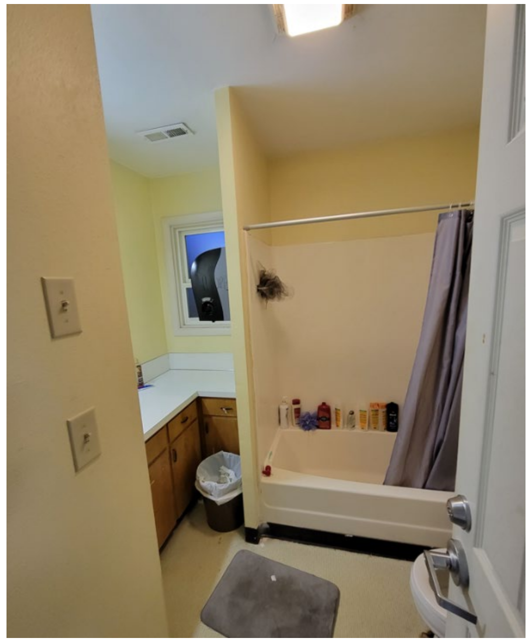
Short Term

1. Coordinate HVAC upgrade with facility renovation:
    a. Provide heat pump and ERV systems serving bedrooms, offices, and common areas. Spaces with different heating and cooling needs need to be on separate systems.
    b. Provide heat pump and ERV systems serving the classroom building. Provide separate ERV for weight room. Provide occupancy controls to disable ventilation and setback space temperature when unoccupied.
    c. Provide tempered makeup air to kitchen with a heat pump system.
    d. Provide a 2” prefilter and 12” V-Bank MERV-14A filter on all systems. Clean existing ductwork. Perform minor repairs to locations of sagging ductwork.
    e. Provide heavy duty commercial security bar grilles at all rooms.
    f. Install duct mounted dampers so the air balance of the building will not be easily disrupted. No dampers should be accessible from grilles.

PICTURES

 *Touchstone Community Facility*	 *Office*
 *Typical Sidewall Register in Soffit*	 *Typical Floor Grille*

Typical Bedroom



Typical Bathroom

Kitchen

Note: Intake damper in window

Exterior of kitchen intake is a residential interior grille

Utility Area with Kitchen Office, Water Heater, and Electrical Gear.

Note: Round high and low combustion openings.

Exterior of Water Heater Combustion Opening

Opening is completely clogged with dust and dirt.

First Floor Furnace

Flue Connection Leaking

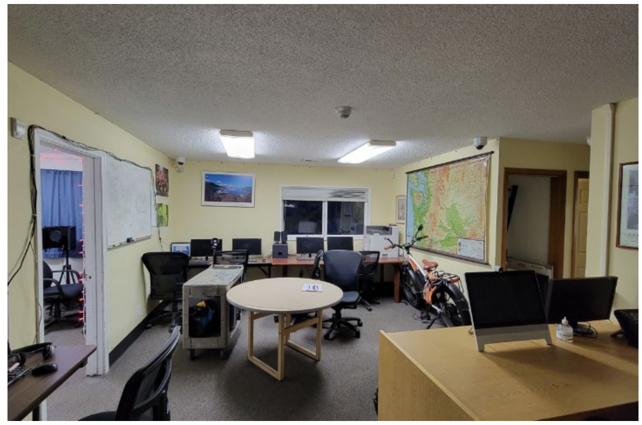
Second Floor Air Handling Unit

Outdoor Air Damper and Broken Actuator

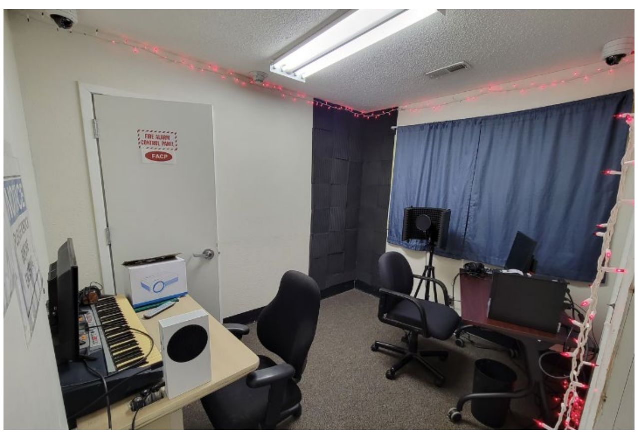
Second Floor System Supply Ductwork in Attic

Second Floor System Return Ductwork

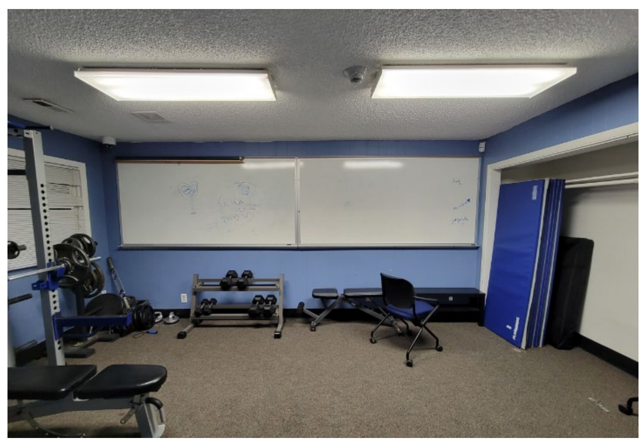
Condenser Unit Serving Upper Floor



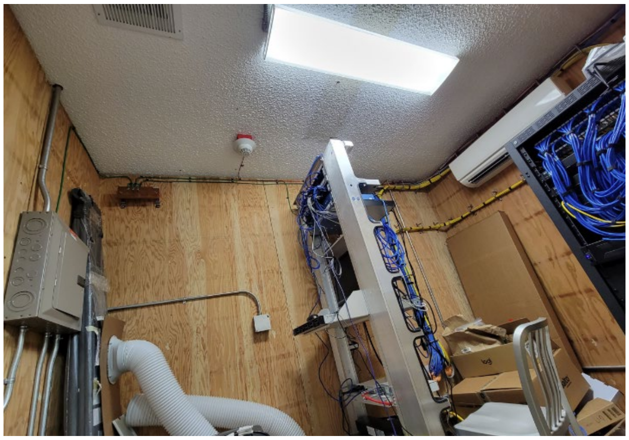
Classroom Building Computer Room



Classroom Building Recording Studio



Fitness Room



Server Room

Pantry

Pantry Condensing Unit

Workshop with Classroom Building Furnace

Classroom Building Furnace

Twins Rivers

Overview

Address: 605 McMurray, Richland, WA 99354

Residents: 16

Built: 1974

Site: Suburban, heavily shaded to South and West

Envelope: Wood Framed Construction and Concrete Masonry Units. Shingled Roof. Batt and blown in fiberglass attic insulation. Vinyl framed double pane windows.

Main HVAC Systems

The Twin Rivers facility includes multiple systems which overlap. There are negative interactions disrupting system performance.

1. Ground mounted gas packs located in front of building
    a. HVAC Unit #1: Serves Office and Common Spaces supply is via floor registers. Return is via a 54x24 grille in high level soffit facing the entry. Crosstalk between counseling and admin office is an issue with the system.
    b. HVAC Unit #2: Serves Bedroom Wing. Thermostat is in hallway. Return air directly ducted in ceiling to rooms. Return seems to be blocked at main four rooms at far end of the line causing the return ducts to act as transfer air between rooms. Outdoor air damper was closed. The actuator was unplugged. There are frequent problems with temperature control in these rooms.
2. A rooftop unit provides additional conditioning for the living/dining areas. This unit appears to be 1990s vintage but was recently serviced including replacement of refrigerant R407C for R22. This system overlaps with Unit #1 and it is likely that these units frequently work against each other.
3. Kitchen rooftop exhaust fan and makeup fan are in good condition and makeup air fan, but makeup air to the kitchen is not heated or cooled. There are also problems with the controls for the kitchen ventilation equipment. The controller is mounted too high to use and it appears to be mis-wired. Two Daikin 1.5-ton split systems condition the space. Additional general exhaust is provided in the dishwashing area.
4. Classroom includes a VRF split system with two cassette type fan coils hung in open ceiling space, connected to ~130 CFM ERV. This system also includes fan coils in the adjacent office (FC-3) and kitchen (FC-4 & FC-5). The outdoor unit was very frosted up when observed. Note the ERV discharges relief air into main lobby area, not outside as it should.
5. All filters are MERV-8.

Additional HVAC Systems

1. 1 split system unit in server room.
2. Two roof top downblast exhaust fans serve restrooms.
3. The laundry exhaust fan was not working.
4. Electric radiant heat panels in restroom ceiling.

Health and IAQ performance

System outdoor airflow is currently below code levels, apart from the classroom. Rebalancing the system and removing blockages in attic ducts should be able to improve the airflows to the building in the short term, however the current level of filtration will not achieve recommended levels of aerosol or particulate removal.

The existing equipment will not accommodate true MERV-13A and MERV-14A filters.

Heating and Cooling Capacity

Equipment installed has enough cooling and heating capacity for the building, however, the interactions of overlapping systems and unbalanced air distribution are causing erratic comfort problems. We recommend these overlapping systems be consolidated for reliable operation.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
HVAC Unit 1	Manuf:	Lennox	Appx. Age:	13	Fair	
	Model:	KGA060S4DH3Y	Est. Remaining Useful Life:	2		
HVAC Unit 2	Manuf:	Lennox	Appx. Age:	13	Fair	
	Model:	KGA060S4DH3Y	Est. Remaining Useful Life:	2		
Rooftop Unit	Manuf:	Lennox	Appx. Age:	25	Poor	
	Model:	GCS20RV-261-50-1P	Est. Remaining Useful Life:	2		
FC-1 thru FC-3	Manuf:	Daikin	Appx. Age:	7	Good	
	Model:	FXZQ18MVJU9	Est. Remaining Useful Life:	12		
FC-4 and FC-5	Manuf:	Daikin	Appx. Age:	7	Good	
	Model:	FXAQ18PVJU	Est. Remaining Useful Life:	12		
ERV-1	Manuf:	RenewAire	Appx. Age:	7	Good	Serving Classroom. Discharges to interior entryway.
	Model:	EV130	Est. Remaining Useful Life:	12		

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
EF-1	Manuf:	Greenheck	Appx. Age:	7	Good	
	Model:	CUE-180-V6-10-6	Est. Remaining Useful Life:	12		
MAU-1	Manuf:	Greenheck	Appx. Age:	7	Good	
	Model:	KSF-110-H10-DB	Est. Remaining Useful Life:	12		
Server Rm AC	Manuf:	Mitsubishi	Appx. Age:	7	Good	
	Model:	PUZ-A12NKA7	Est. Remaining Useful Life:	12		
Restrm Exhaust	Manuf:	Dayton	Appx. Age:	20	Fair	
	Model:	4YC676	Est. Remaining Useful Life:			

Recommendations

Immediate

1. Resolve the blocked return duct in attic on HVAC Unit #2 system. This is likely a closed fire damper at firewall in attic, or crushed flex duct.

2. Remove all blockages from floor grilles and rebalance HVAC Unit #2 serving dorms for appropriate total and outdoor airflow.

3. Close off (blank off with sheet metal and caulk+ gyp board) floor grilles in councilor office.

4. Replace exhaust fans serving staff restroom, laundry room, Administrator office restroom, and isolation bathroom.

5. Resolve apparent control issues with kitchen makeup and exhaust.

Short Term

1. Replace Rooftop Unit and ground mounted HVAC #1 with new heat pump rooftop unit including full capacity for the living and dining areas. Provide unit with heat recovery or separate ERV.

2. Replace HVAC Unit #2 with heating and cooling heat pump and ERV. Replace flex duct in attic with insulated hard duct suspended from structure. Provide temperature sensors in return duct of two different rooms.

3. Adjust classroom ERV relief air to discharge outside rather than into hallway.

4. Provide a 2” prefilter and 12” V-Bank MERV-14A filter on all systems. Clean existing ductwork. Perform minor repairs to locations of sagging ductwork.

Long Term

1. Plan to replace Classroom VRF System at end of life approximately 2035.

PICTURES

Twin Rivers Community Facility

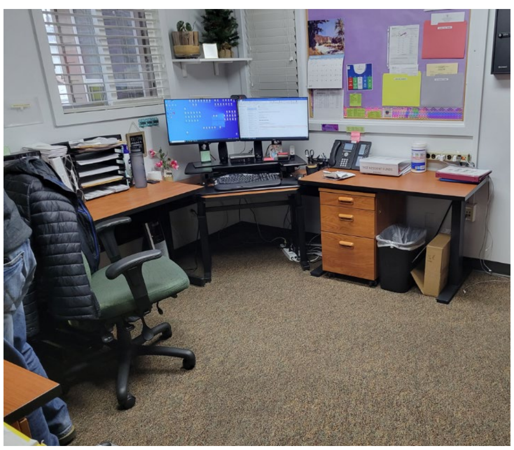
Entry and Dining

Toe Kick Outlet to Unit #1 with no Grille
120 CFM

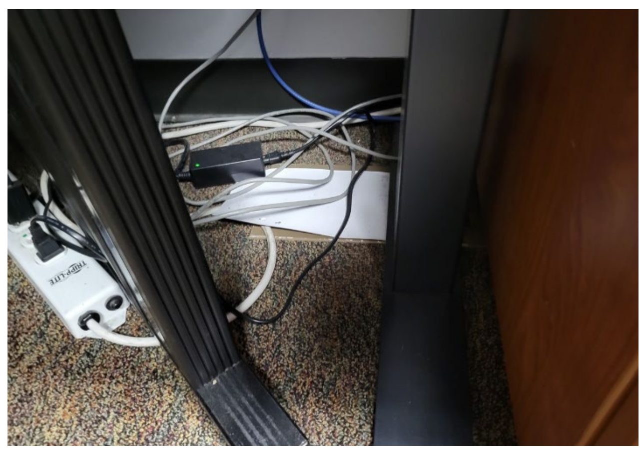
Living Room

TV Room

Office



Office



Floor Grille Covered

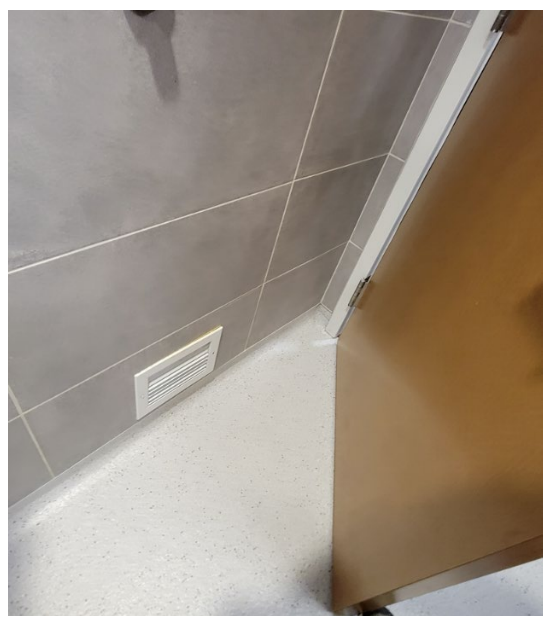
Typical Bedroom

Note: Bed was covering floor grille

Bedroom Floor Grille

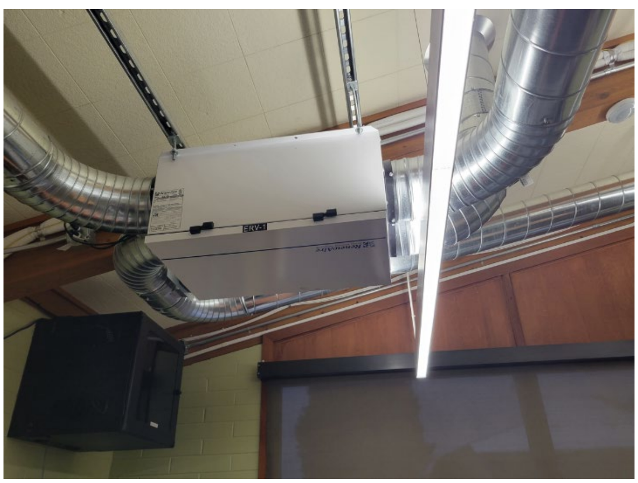
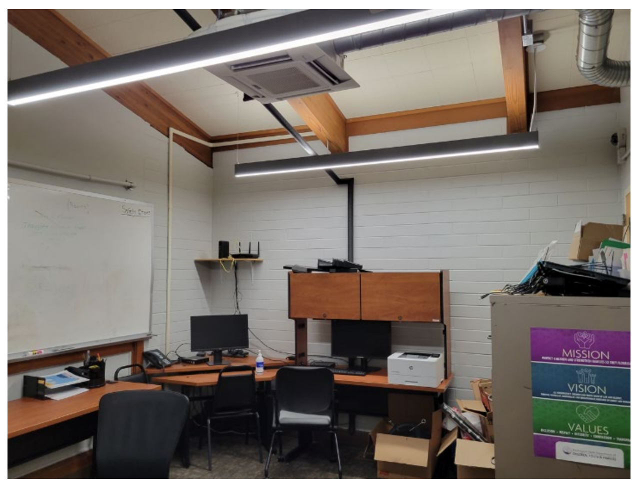
Typical Bathroom

Exhaust fan, heating panel, and transfer air grille in ceiling



Typical Bathroom

Heating/cooling air supply behind door

 *Hallway Thermostat*	 *Classroom*
 *Classroom ERV*	 *Office on VRF System and Unit #1*

 *Classroom VRF Outdoor Unit*	 *Classroom VRF Outdoor Unit*
 *Kitchen*	 *Kitchen Hood and Makeup Air Controller* *Note: Switches in lower left bypassing controller.*

VRF In Kitchen

Laundry Room

Classroom ERV Relief Air Discharge in Entryway

Outdoor Workout Area

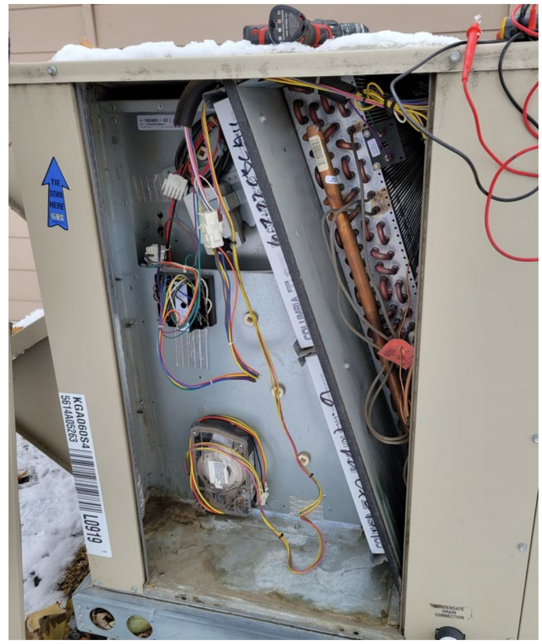
Attic Ductwork Covered with Insulation

Attic Ductwork Covered with Insulation

Server Room Outdoor Unit

Kitchen Exhaust and Makeup Air

Air Handler Intake and Relief



Air Handler Dampers Filter and Cooling Coil

Rooftop Unit

Exhaust Fan

Woodinville

Overview

Address: 14521 124th Avenue NE, Kirkland, WA, 98034

Resident Capacity: 14

Built: 1964

Site: Suburban heavily wooded surroundings

Construction

Main Building 5,000 SF wood framed with, double pane windows, aluminum framed. Walls appear insulated, but R-value is unknown.

Classroom building 730 SF (detached) is wood framed with R-19 wall insulation, R-38 attic insulation, and R-21 floor insulation. Windows are double pane aluminum framed.

Main HVAC Systems

Three main HVAC Systems Serve the Building

1. A basic heating-only furnace in the basement serves staff offices and common areas such as the living room, dining area, and basement weight room. This furnace responds to a thermostat in the main office/reception area. This system is at the end of its expected life and poorly suited to adequately ventilate and condition these varied spaces. It only includes low-efficiency washable filter, and the system return/outdoor balance is off as is the distribution to different rooms - largely due to the use of manually adjustable residential-style floor registers, many of which have been smashed by rolling furniture and heavy foot traffic. The furnace also appears to have internal insulation separating from the casing and partially blocking the fan. Because this system has no cooling, portable air conditioners are used during particularly hot portions of the summer.

2. An outdoor packaged air handling unit with gas heat and direct expansion cooling is in front of the building surrounded by a fenced enclosure and serves the original bedroom wing of the building including five bedrooms. This unit was installed in 2016 and distributes air to bedrooms and restrooms and returns air back to the unit from return grilles in the hallway to recirculate it again. There is no outdoor intake for this system, so it does not provide any ventilation. It appears that the outdoor intake was included in contract documents, but not installed. It is therefore essential for residents to use their windows for ventilation.

3. A small electric heat pump HP-1 provides air conditioning to the new wing of this system and was installed in 2018. The unit consists of an indoor fan coil with refrigerant coil for heating and cooling as well as an outdoor unit to the west of the building. This unit is in good condition and has the capacity to provide necessary ventilation.

The kitchen includes an exhaust hood with rooftop fan, a rooftop makeup up air unit discharging air to diffusers in front of the hood, a small fan coil located in the attic that recirculates air between the dry storage and kitchen while providing heat, and an additional small general exhaust fan between the cooktop and ware washing area. The kitchen system reportedly has issues getting cold in the winter as there is no heat in the makeup air provided to this space, and the small fan coil unit conditioning the kitchen cannot keep up with large amounts of cold air brought in. It appears that providing heated makeup air was considered as part of a 2005 remodel, but this was never implemented.

The classroom building is conditioned by a wall mounted packaged air conditioning unit typical for ‘portable’ buildings. The system appears to have adequate capacity for airflow to space. This system is not capable of accommodating true MERV-13 level filtration.

Additional HVAC Systems

Restrooms have individual fans providing constant exhaust. One of these fans provides a good airflow of 83 CFM, while the other three supply less than the mechanical code required 70 CFM (50 CFM per toilet and 20 CFM per shower). Three of the four restrooms have more air supplied from the air handling unit than the exhausted airflow, which means contaminated restroom air is pushed into the rest of the building. This is not only unpleasant but also a possible transmission vector for disease.

The ADA toilet includes a wall heater for supplemental heat.

Health and IAQ performance

Only the HP-1 system appears to be providing adequate ventilation.

Heating and Cooling Capacity

The furnace system serving the office and common areas has the capacity to provide enough heat to the portion of the building served but lacks the control features to get the right amount of heat to each room. It has no cooling.

The systems serving bedrooms have adequate heating and cooling capacity. The air distribution needs to be rebalanced to provide heating and cooling consistently to bedrooms.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Basement Furnace	Manuf:	American Std/Trane	Appx. Age:	40	Poor	80% AFUE
	Model:	Freedom 80	Est. Remaining Useful Life:	0		
Outdoor AHU Original Bedroom Wing	Manuf:	Trane	Appx. Age:	6	Poor	Gaspack unit with DC cooling and no outside air. 81% Efficient. Flue gases blow directly on gas supply piping. Scheduled for 110 CFM OA, but no economizer is
	Model:	4YCC4030A1070AA	Est. Remaining Useful Life:	0		

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
						provided, per construction docs.
Classroom AC	Manuf:	Bard	Appx. Age:	28	Fair	
	Model:	-	Est. Remaining Useful Life:	2		
HP-1A/ 1B Bedroom Addition	Manuf:	Mitsubishi	Appx. Age:	3	Good	550 CFM SA, 165 CFM OA, 0.24” ESP, 23 MBH htg, 18 MBH clg. 1.5 nom tons.
	Model:	PVA-A18AA7 / PUZ-A18NKA7	Est. Remaining Useful Life:	15		
Makeup Air Unit	Manuf:	Trane	Appx. Age:	5	Fair	Model # not visible
	Model:	-	Est. Remaining Useful Life:	15		
Kitchen Exhaust Fan	Manuf:	-	Appx. Age:	5	Fair	Rooftop Equipment not observed up close due to snowy conditions
	Model:	-	Est. Remaining Useful Life:	15		
Server Rm AC	Manuf:	Mitsubishi	Appx. Age:	5	Good	
	Model:	PUZ-A12NKA7	Est. Remaining Useful Life:	15		

Recommendations

Short Term

Replace the basement furnace system with:

1. Provide a new heat pump furnace and Energy Recovery Ventilator (ERV) for the common Entry/Living Dining Area. Provide MERV-14A V-Bank filter. Provide new heavy duty commercial floor grilles and separate balancing dampers, upstream to avoid air balance. Clean and pressure test ductwork, repair, and seal existing ducts as necessary.

2. Office Area: VRF with ducted indoor fan coil units located in the basement utility room with new ducting to existing floor grille locations. Include MERV-13 (MERV-10A) filters. Provide an ERV connected into the VRF system with MERV-14A V-Bank filter and 2” prefilter.

Replace the outdoor gas packaged unit with:

1. A Packaged Heat Pump for heating and cooling with MERV-14A filters. Locate unit so that intake comes from outside the enclosure screen without recirculation.

2. Replace supply registers in restrooms with small heavy duty tamper resistant grilles with separate balancing dampers in the attic. Recommend providing no more than 20 CFM supply air to restrooms.

3. Replace all grilles and registers with heavy duty tamper resistant models. Note transfer grilles between bedrooms and hallway should be selected with louvers angled to block light from hallway into the rooms.

4. Move thermostat from side hallway to wall opposite restrooms.

5. Balance outdoor airflow in the classroom.

<u>Mid Term</u>

1. Replace Classroom BARD wall mounted AC unit with new high efficiency wall mounted heat pump including MERV-13 (MERV-10A) filtration. Provide ERV with capacity for 30 CFM/occupant and MERV14 filtration for operation during wildfires.

PICTURES

View of Facility from Parking Lot

Exterior view of common room from rear courtyard

Wood burning stove and wood pass-through door

Floor Register near Entry

Floor Register in Living Room

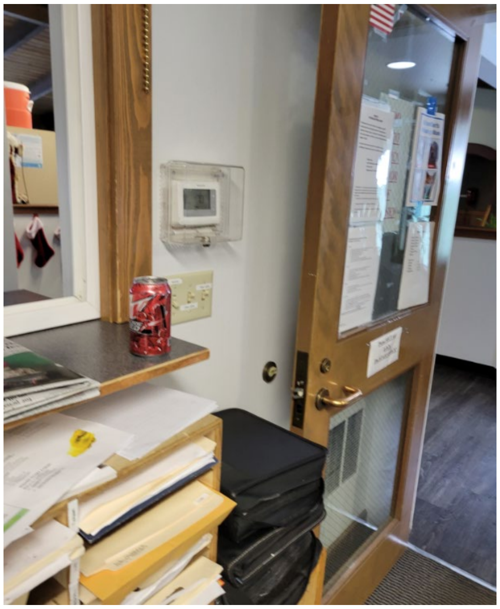
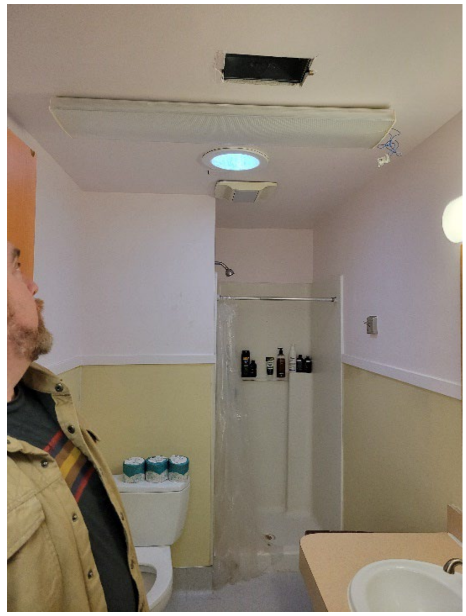
Ventilation for Typical Bedroom

Upper Grille is a residential adjustable register. Lower grille is a residential grade stamped grille transferring air back to hallway. These grilles admit substantial light from hallways disturbing resident sleep

Typical Bedroom Transfer Grill from Hall

Partially blocked by furring installed around fire sprinkler pipe

Kitchen Hood and Makeup Air Diffusers with Fabricated Shields

 *Thermostat in Reception Office Controlling the Basement Furnace* *Note: Return grille for furnace system behind door*	 *Typical Bathroom, Supply Grille Missing*
 *Ductwork to Furnace System Floor Grille*	 *Basement Ducts and Registers in Fitness Room*

Crawlspace Air Distribution

Furnace Serving Common Space and Office

Interior of Furnace, Insulation on the left is Getting Sucked into Fan Intake Obstructing Flow

Gas Fired Packaged AC Unit Serving Bedrooms

No Outdoor Intake. Note gas pipe is rusting where combustion flue discharges directly onto it

Kitchen Makeup Air Fan Coil in attic with Electric Heat

Kitchen Makeup Air Intake

Water Heater Air Intake

Interior of Water Heater Air Intake
Clogged with debris and lint

Crawlspace and Ductwork Below Office Area

Server AC Outdoor Unit

IV. ECHO GLEN CHILDRENS CENTER ASSESSMENT & RECOMMENDATIONS

Echo Glen Children's Center, located in Snoqualmie WA is one of two large full-security juvenile rehabilitation campuses, and houses approximately 100 youth. Originally build circa 1967, the campus is on a 160-acre property off I-90 surrounded by forest and bordering Lake Kittyprince. While the campus includes over 40 small to medium size buildings, this assessment of Echo Glen focuses on the 26 with enough occupancy to present high risk for airborne disease transmission for residents and staff:

1. Thirteen Residential "Cottages" housing up to 16 or 20 youth each. Cottages all follow a similar rectangular floor plan with a central day room flanked by single occupant sleeping cells. Cottages vary slightly based on renovations that have removed the original central fireplace and added different multipurpose and office spaces adjoining the day room. Two of these cottages (#4 and #11) are currently out of service pending substantial renovation, these two were not included in this evaluation. Each residence is largely independent with its own HVAC system.

2. Eight central campus buildings include a school, dining, office, visitation, and healthcare. These buildings share an underground utility tunnel/crawlspace that houses distribution piping and air handling equipment. The tunnel, which varies in height around 5 feet is the sole pathway for accessing HVAC equipment. Entrances to the tunnel are in the Commissary basement and via floor hatch in each a building.

3. Recreation Building, including Gym, lockers, and out-of-service indoor pool. This building is also connected to the Commissary heating and chilled water but has main air handling equipment located in a second floor mechanical 'loft' rather than in the tunnel.

4. School Vocational Building, built in 2002 includes classrooms and a woodshop. This building has its own boilers and is not connected to the campus hot and chilled water system.

5. Main Maintenance Building includes a variety of shop spaces as well as offices for the maintenance staff. The computer interface for the campus Building Automation System controlling most occupied buildings sits in the break/meeting room.

6. Canine Building is a prefabricated steel building housing a functioning animal shelter with a kennel, storage loft, and a shared office housing 3 staff.

7. Two double classroom buildings are located amongst the residential cottages.

Many of these buildings were included in the original 1967 campus and have been renovated under several contracts. Most buildings have had at least two significant renovations. An air-cooled chiller was added to the Commissary in the 1990's also serving Administration, Library, Healthcare Center, Social Services, and recreation buildings. The 11 cabins reviewed currently have three different types of HVAC systems. Most, but not all buildings have cooling.

In terms of outdoor air quality issues at this site, the location is subject to regular exposure to wildfire smoke in summer/fall, potentially at close range. Conifer pollen is a concern in the spring.

EEI observed Echo Glenn Children's Center on 1/23/2023 and 3/23/23, and found the HVAC equipment in generally good condition, but the control system for the buildings does not appear to be fully configured. Without complete control configuration, HVAC systems generally do not provide correct automatic control of ventilation, heating or cooling in most buildings. With controls in this condition, we could not perform the intended measurements at the site.

Cottages 1-3

Overview

Renovated in 2011, these are the most modern HVAC systems of the residential cottages. The common spaces adjacent to the main living room are a bit different between cottage 1 with 3 medium sized rooms and two smaller rooms and cottage 2 and 3 which have a large partitionable multipurpose room. These three buildings are particularly well shaded by surrounding trees.

Envelope

1. Walls 2x6” Studs 16” OC with R-21 batt insulation
2. Roof R-30 continuous rigid insulation with over wooden sheathing with light colored thermoplastic roofing membrane.
3. Windows are double pane with aluminum frame with multiple lights and high framing factor.

Main HVAC Systems

Three furnaces located in a readily accessible basement provide heating, cooling, and ventilation. One furnace serves each set of sleeping rooms while the third serves the central living, dining, and multipurpose spaces.

Each group of 8 sleeping rooms are controlled by to maintain temperature at a sensor located in one of the rooms. This appears to be a good approach given the significant surrounding shade minimizing the effect of solar gain on different exposures. Variances in temperature between rooms will primarily be driven by relative to differences in internal heat gain in each room. Construction of the rooms appears to be high mass painted concrete, so these should help with temperature stability in these rooms.

Furnace 2, serving the common areas is controlled by the average of signals from two temperature sensors, one located in the main living room and another in an adjacent multipurpose space. This control approach should keep rooms near the desired setpoint but will vary slightly when loads are different in the space.

Filtration is provided in enlarged sheet metal mixing plenums after the intersection of return and outdoor ductwork. This plenum allows two 2” deep MERV-13 (MERV-10A) filters to be provided in a V-configuration, which doubles the filtration surface area and substantially reduces the filter pressure drop.

Additional HVAC Systems

1. Bathrooms are heated via electric resistance floor mats.
2. Small unit heaters provide heating in the mechanical room to prevent freezing.

Health and IAQ performance

Based on design documents, it appears approximately 16 CFM are provided to each sleeping cell. While this meets code requirements, 20 CFM/person is recommended as a minimum. The MERV-13 (MERV-10A) filters provide an overall acceptable amount of aerosol filtration for this building but will not have a significant impact on wildfire smoke.

Heating and Cooling Capacity

The building has adequate heating and cooling capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
F-1/ CU-1	Manuf:	Trane	Appx. Age:	11	Good	
	Model:	TUH2B080/ 4TWA3036A3	Est. Remaining Useful Life:	14		
F-2/ CU-2	Manuf:	Trane	Appx. Age:	11	Good	
	Model:	TUH2D120/ 4TWA3060A3	Est. Remaining Useful Life:	14		
F-3/ CU-3	Manuf:	Trane	Appx. Age:	11	Good	
	Model:	TUH2B080/ 4TWA3036A3	Est. Remaining Useful Life:	14		
EF-1A thru EF-5	Manuf:	Greenheck	Appx. Age:	11	Good	Inline exhaust fans. Some direct drive, some belt drive.
	Model:	BSQ and SQ	Est. Remaining Useful Life:	9		

Recommendations

Mid Term

1. Modify ductwork to accommodate 2” prefilters and 12” V-Bank MERV-14A filters. Adjust/Confirm system balance.

Long Term (10 years)

1. Replace furnace and DX cooling equipment with new heat pump furnace with integral or intependent heat reovery.

PICTURES

 Cottage 3	 Furnaces
 Filter Section	 Furnace

 *Condenser Units*	

Cottages 5-8

Overview

Constructed in 1966 and most recently renovated around 2003, these cottages present the biggest operational challenge. The occupied portion of these buildings is like the other cottages; however, the mechanical system is quite different. These buildings include a common dayroom area, but do not include additions for multipurpose spaces that the more recent renovations include. These buildings are well shaded by surrounding trees.

Envelope

1. Walls: Wood Framed, insulation unknown
2. Roof: Standing Seam Metal, insulation unknown
3. Windows: Generally double pane, but some day room windows are single pane on Cottage 7.

Main HVAC Systems

The HVAC system includes four air handling units (AHUs) located in attic spaces accessed from the dayroom. Two AHUs condition the dayroom, and one AHU serves each of the two 'wings' of sleeping rooms. The AHUs include DX cooling coils as well as hot water heating coils and 2" filters MERV-8 filters. A condensing natural gas boiler and pump provide hot water to the air handling units. These units have had repeated problems with the heating coils freezing and bursting in the summer. Presumably this is a problem with controls and/or low refrigerant charge in these systems. Various strategies have been employed to solve this problem, but none have resolved it. Additionally, the hot water pump is in a nearly inaccessible corner of the mechanical room, and there have been issues with the flexible connections on these pumps bursting (flexible connections appear overextended).

Additional HVAC Systems

Inline fans located in the attic provide restroom exhaust.

Health and IAQ performance

It is unlikely that these systems will have appropriate airflows to all rooms. MERV-8 filters do not provide adequate removal of aerosols or particulate.

Heating & Cooling Capacity

These systems appear to have adequate heating capacity. Some systems have cooling capacity, others have low refrigerant charge and cannot provide adequate cooling capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
B-1	Manuf:	HTP	Appx. Age:	20	Good	Condensing Boiler
	Model:	MOD CON 500HL L-37620	Est. Remaining Useful Life:	5		
Heating Pump	Manuf:	Bell & Gossett	Appx. Age:	20	Fair	
	Model:	BQA 56A17D57E PL-37620	Est. Remaining Useful Life:	5		
AHU-1 thru 4	Manuf:	MxQuay	Appx. Age:	20	Poor	
	Model:		Est. Remaining Useful Life:	0		
CU-2&4	Manuf:	Lennox	Appx. Age:		Poor	No Condensing Units at Cottage 8
	Model:	TSA0660S4N44Y	Est. Remaining Useful Life:			
CU-1&3	Manuf:	Lennox	Appx. Age:		Poor	
	Model:	TSA036SN43Y	Est. Remaining Useful Life:			
EF-1 thru EF-3	Manuf:	Cook	Appx. Age:		Good	
	Model:	Gemini 420	Est. Remaining Useful Life:			

Recommendations

Immediate

1. Troubleshoot issue with freezing coils.
2. Rebalance system for appropriate airflows with MERV-13 (MERV-10A).
3. Reconfigure boiler room piping for good access to pumps and eliminate over-stretching of flexible connections that is leading to premature failure.

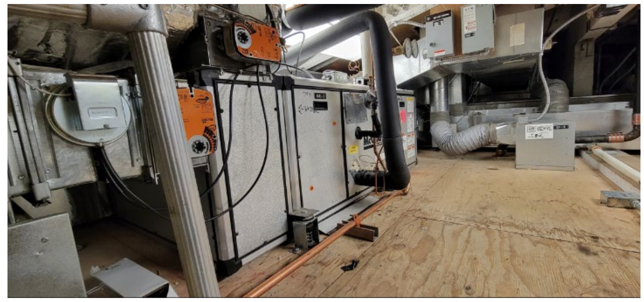
Medium Term

1. Overhaul system to remove AHUs from attic and arrange like Cabins 1-3 in mech room accessible from the exterior. Remove boilers and associated pumps, and piping.
2. Provide three furnaces 5,200 CFM total with DX heat pumps. Include two sets of 2” pre filters and MERV-14A V-Bank filters.

Provide Energy Recovery Ventilator for each furnace, or furnaces with integral energy recovery. 250 CFM for each sleeping cell furnace, 500 CFM for common area furnace.

PICTURES

Cottage 8



Attic with AHUs and Exhaust Fans

Air Handling Unit

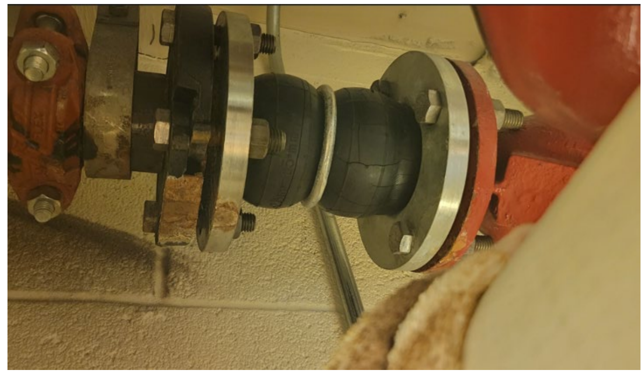
Exhaust Fan

Condenser Units

Cottage 7 AHU Cooling Coils Are Not Connected
No Cooling

Boiler Room

Boiler Room

 *Hot Water Pump Blocked by Domestic Hot Water Pipes*	 *Pump Flexible Connection Stretched and Cracking*

Cottages 9, 10, 12 & 13

Overview

These cottages were renovated between 2012 and 2014 and have a similar arrangement to Cottage 1 through 3 with 16 individual bedrooms and a basement mechanical space.

Envelope

1. Walls Wood construction
2. Roof Standing seam metal
3. Windows are double pane with aluminum frame with multiple lights and high framing factor.

Main HVAC Systems

Three furnaces are in a readily accessible basement. One furnace serves each set of sleeping room wings while the third serves the central living, dining, and multipurpose spaces. Cottages 11 and 12 were installed with a full system including cooling. Cottages 9 & 10 do not have cooling; their systems were installed “cooling ready” with cooling coils in the furnaces and power supplied to condenser locations, but no condenser units or refrigerant piping.

Compared to the Cabin 1 through 3 systems, the ductwork in the basement is more compact as it is not configured for high MERV filters.

These systems are operating well, with minimal control problems.

Additional HVAC Systems

Small unit heaters provide heating in the mechanical room to prevent freezing.

Small exhaust fans.

Health and IAQ performance

We anticipate that these systems need minor adjustments to airflows to meet target airflow rates of 20 CFM/person.

It would be worthwhile to investigate the maximum filtration these furnaces can handle to provide some removal of aerosols and fine particulate.

Heating and Cooling Capacity

The building has adequate heating and cooling capacity (where cooling is provided).

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
F-1/ CU-1	Manuf:	Trane	Appx. Age:	12	Good	
	Model:	TUH2B080A9V3VAA	Est. Remaining Useful Life:	10		
F-2/ CU-2	Manuf:	Trane	Appx. Age:	12	Good	
	Model:	TUH2D120A9V5VAA	Est. Remaining Useful Life:	10		
F-3/ CU-3	Manuf:	Trane	Appx. Age:	12	Good	
	Model:	TUH2B080A9V3VAA	Est. Remaining Useful Life:	10		
EF-1A thru EF-5	Manuf:	-	Appx. Age:	11	Fair	Not Observed
	Model:	-	Est. Remaining Useful Life:	9		

Recommendations

Short Term

1. Install outdoor condenser units and refrigerant piping for Cottages 9 &10. Configure for heat pump (heating and cooling) operation.
2. Modify mech room arrangement like cottages 1 through 3 to provide high performance filters. Include 2” prefilters and 12” MERV-14A V-Bank filters.
3. Rebalance system for appropriate airflows with MERV-14A filters.

Long Term (10 years)

Replace furnace and DX cooling equipment with new heat pump furnace with integral or intependent heat reovery.

PICTURES

Cottage 13

Air Grilles in Sleeping Rooms

Mechanical Room with Water Heater and Furnaces

Furnaces

Commissary

Overview

This 23,000 SF building houses the main kitchen for the campus, dining “café”, storage and central mechanical equipment that serves the core of the Echo Glen campus.

Envelope

1. Walls: brick and wood construction.
2. Roof: standing seam metal.
3. Windows are mostly double pane.

Main HVAC Systems

Central Plant

1. The Boiler Room, located in the basement of the Commissary building appears to have an extremely friable/fragile asbestos coating on the ceiling. Original mechanical system insulation is also likely to contain asbestos.
2. Two large 8.4 MM BTU Cleaver Brooks boilers from original construction are in good condition and appear well maintained. They provide duty-standby operation.
3. Heating hot water pumps of various ages are configured for duty/standby operation serving two different distribution loops: 1) Admin, Med Center, Social Services, Library, and Classrooms buildings. 2) Recreation, Commissary, and Commissary domestic hot water. Operation is switched manually. This is an unusual pumping arrangement for a central plant, and not compatible with efficient variable flow operation. Both pumps serving the Recreation building were out of service. A secondary loop of the recreation distribution loop circulates heating water through a heat exchanger bundle in a 922-gallon domestic hot water tank that serves the kitchen.
4. The cooling plant consists of an air-cooled chiller dating from around 1995 that is beyond its expected life, and constant volume primary only pumps of the same age. These serve the Admin, Health Center, Social Services, and Library. It is unlikely to make it more than one cooling season.
5. An 835,000 BTU steam boiler serves several kitchen fixtures that date to the original build out. This is a high maintenance system at the end of its useful life. The boiler feedwater pump has been recently replaced but sounds like it is failing again- possibly experiencing cavitation or bearing failure. Compared to the Cabin 1 thru 3 systems, the ductwork in the basement is more compact as it is not configured for high MERV filters.

Building HVAC

1. A 10,400 CFM heating only air handling unit located in a mechanical mezzanine conditions the dining area and kitchen. The unit receives power through a variable speed drive, but the control setup for variable flow was not completed, and it operates at a constant speed.
2. A new rooftop exhaust and makeup air system serves the kitchen hoods. This equipment appears to include DX capacity to temper makeup air being supplied to the space.

Additional HVAC Systems

1. Three centrifugal exhaust fans dating from the original installation discharge air from restrooms, storage rooms and garbage room.

2. Hot water unit heaters condition storage and receiving areas.

Health and IAQ performance

The possible presence of asbestos in the boiler room is a significant concern for facilities staff and all contractors working in this space.

It is likely that airflows in regularly occupied spaces are space are high for good dilution of aerosols and other indoor contaminants. This should be confirmed.

These systems are not set up to filter out fine outdoor particulate. High airflow systems will bring high quantities of PM2.5 inside during smoky conditions.

Heating and Cooling Capacity

The building air handling equipment has adequate heating capacity and cooling capacity but is not configured to operate efficiently.

The air-cooled chiller has started failing and controls component and manufacturer support are no longer available. The central chiller is not expected to function through Summer 2024.

The heating plant has capacity, notwithstanding problems with some pumps.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
B-1 & B-2	Manuf:	Cleaver Brooks	Appx. Age:	58	Good	High quality boilers have been kept up and refurbished
	Model:	CB428-200	Est. Remaining Useful Life:	10		
Duty HHW Pump (Admin, etc.)	Manuf:	Grundfos	Appx. Age:	5	Good	
	Model	MLE132F 2-213TC-JA	Est. Remaining Useful Life:	15		
Standby HHW Pump (Admin, etc.)	Manuf:	Paco	Appx. Age:	20	Fair	
	Model:	24-25707-13036A	Est. Remaining Useful Life:	5		
Duty HHW Pump (Commissary, etc.)	Manuf:	-	Appx. Age:	11	Poor	Not functioning. Nameplate Removed
	Model:	-	Est. Remaining Useful Life:	3		
Standby HHW Pump (Admin, etc.)	Manuf:	-	Appx. Age:	20	Poor	Not functioning. Nameplate Removed
	Model:	-	Est. Remaining Useful Life:	0		
Steam Boiler	Manuf:	Cleaver Brooks	Appx. Age:	20	Fair	
	Model:	CB 700-20	Est. Remaining Useful Life:	2		
	Manuf:	MTH	Appx. Age:	11	Poor	

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Steam Condensate Pump	Model:	142D BF	Est. Remaining Useful Life:	0		Operates extremely loud and vibrating
Dining AHU	Manuf:	McQuay	Appx. Age:	20	Fair	
	Model:	LSL122DH	Est. Remaining Useful Life:	2		
Kitchen Exhaust	Manuf:	-	Appx. Age:	4	Good	
	Model:	-	Est. Remaining Useful Life:	16		
Kitchen Makeup Unit	Manuf:	-	Appx. Age:	4	Good	
	Model:	-	Est. Remaining Useful Life:	16		
Various Exhaust	Manuf:	American Standard	Appx. Age:	58	Poor	
	Model:	-	Est. Remaining Useful Life:	2		

Recommendations

The staffing levels and expertise required to operate a modern central plant correctly are not realistic for Echo Glen. We recommend that buildings be transitioned off the central plant within the next year rather than continuing to waste time and money on the central plant.

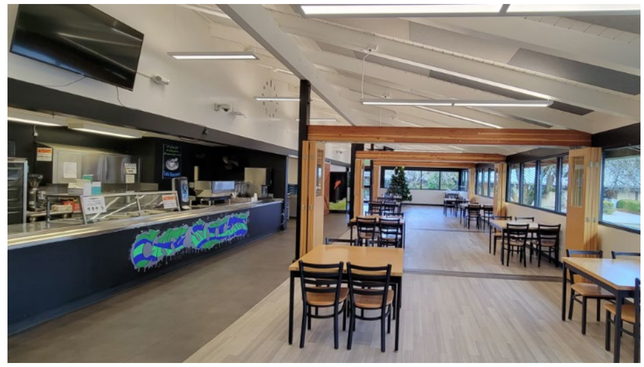
All work is recommended in the short term driven by the need to provide cooling before the central chiller fails completely.

Short Term

1. Remediate boiler room ceiling treatment if it contains asbestos.
2. Remove kitchen steam equipment. Replace with modern electric if necessary. Decommission steam system, including boiler, feedwater assembly, and piping, test and remediate asbestos containing materials as necessary.
3. Monitor domestic hot water use and determine required maximum hourly and daily demand. Replace boiler based hot water tank with new heat pump water heater, storage tanks and heat pumps. Test for Asbestos at tank insulation and pumps and remediate as necessary.
4. Replace existing air handling unit and provide remote DX heat pump for heating and cooling. Include capacity for MERV-14A filters and prefilters. Configure for cascading air to kitchen for hood makeup.
5. Survey current exhaust requirements for building (use has changed considerably) and replace existing fans with new.
6. Provide electric radiant heaters in receiving area to replace unit heaters. Provide an electrical unit heater in other back of house areas.
7. Balance and commission HVAC Systems

8. After connected buildings are taken off the central heating and cooling systems (see the following recommendations for buildings) decommission the chilled water and heating hot water systems, including proper abatement of Asbestos. Remove Boilers, pumps, accessories, and piping.

PICTURES

 *Commissary*	 *Dining Area*
 *Main Boiler*	 *Heating Pumps*

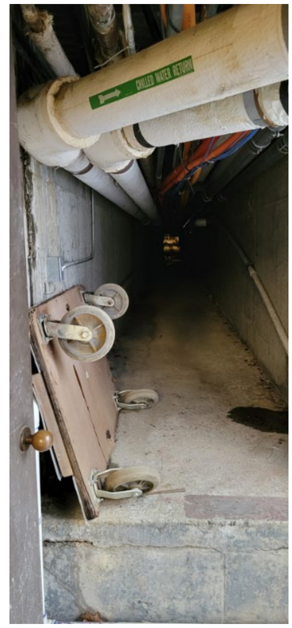
Expansion Tanks Against Ceiling

Campus Air Cooled Chiller

Commissary HHW Pumps

Steam Boiler

Steam System Feedwater Pump Assembly



Utility Tunnel
40” Clear Height

Mechanical Mezzanine

Dining AHU, abandoned legacy damper actuator for variable flow operation

AHU Speed Drive and Control Panels

Rooftop Kitchen Exhaust and Makeup Air Unit

Loading/Receiving Area Unit Heater

Administration, Health Center, and Social Services

Overview

These three single story buildings from the original campus construction serve as the main point of entry and exit to the campus. They house offices as well as medical examination rooms and a dental clinic. Each building was originally around 3,700 SF, however the dental wing was added to the health center in the 1990s (now 6,300 SF), and the security/entry area was added to the Administration building (now 4,000 SF).

These buildings have crawlspaces connected by the utility tunnel, which contain the mechanical and plumbing equipment serving the building. The crawlspace varies in height up to about 6' to structure but is often as low as 40" at the bottom of piping/conduit/ducts in many places requiring regular access. Edges of the crawlspaces are sloped at an approximate 45% angle, making equipment near the exterior very awkward to service from an uneven surface. Access is well below industry standards for an institutional campus.

Envelope

1. Walls: brick and wood construction.

2. Roof: Standing seam metal.

3. Windows are double pane at the medical expansion and security area. Original single pane in most other areas including floor to ceiling glazing facing the interior courtyard.

Main HVAC Systems

1. Air is supplied via equipment located in a tunnel/crawlspace beneath these buildings. These are small constant volume systems supplying spaces via floor grilles with separate reheat coils for most rooms to separately adjust temperature. The Medical Center operates with 100% outside air while Admin and Social Service wings mix return air with the outside air. The current Social Services air handler construction looks improvised with components from various eras stuck together. Generally, these systems are extremely inefficient and antiquated.

2. The Healthcare Center Air Handler includes 2" prefilters and 12" V-Bank final filters, the other buildings include only 2" MERV-8 filters.

3. Ductwork and piping are poorly arranged making access to equipment very awkward and inconvenient- crawling on hands and knees is required to get to AHU's for routine checks and maintenance. Entry to the crawlspace is via a floor hatch and ladder in each building or through a long and low tunnel to the commissary boiler room.

4. Centrifugal fans in the attic provide exhaust. Admin and social services each have two fans. The Medical wing has 3 or 4 fans (this portion of attic was inaccessible and current plans not available).

5. A security vestibule appears to be a relatively recent addition between the medical and administration wings. This previous breezeway has been enclosed with a double pane aluminum storefront on both sides to create a place for check-in and searches. No HVAC provisions are present in this location.

6. Problems with controls are particularly apparent in these buildings and many valves and dampers were observed not to be working properly due to failure of the mechanical component or an incorrectly installed actuator. Many settings of the buildings have been overridden in the campus Building Management System (BMS) or manually positioned such that the HVAC systems do not function automatically. Instead, they require manual adjustment for temperature control as the weather changes. Control issues in the Administration Building have been resolved since our first visit, however they persist in the Health Center and Social Services buildings.

Health and IAQ performance

The primary concern is that the entrance and security area have no ventilation at all. The only outdoor air is infiltration from doors.

Because so much manual adjustment of systems has taken place to provide comfort despite long standing control problems, it is unlikely airflows are appropriate in any buildings. In addition to providing the correct amount of outside air to each space, the Health Center medical spaces should be checked and adjusted to confirm appropriate pressure relationships between rooms.

The Health Center is already configured to use true MERV-14A filters. The other buildings will need reconfiguration to accommodate this level of filtration.

Heating and Cooling Capacity

These systems include adequate capacity for heating, however the lack of appropriate automatic control and component failures within the systems have the actual space conditions erratic and requiring daily manual adjustment by facilities staff.

The condition of the central air-cooled chiller is extremely poor and is expected to fail completely within the next two years, leaving these buildings with no cooling.

It would be beneficial to replace single pane windows throughout the buildings. In addition to reducing energy consumption, this will minimize the radiant effect of cold window surfaces that the HVAC system cannot fully compensate for.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-1 Admin	Manuf:	McQuay	Appx. Age:	7	Fair	
	Model:	LSL108CH	Est. Remaining Useful Life:	5		
AHU-2 Social Services	Manuf:	Canarm	Appx. Age:	7	Poor	This is a mix of components more than an integrated Air Handling Unit. Components are of various ages.
	Model:	210 INS	Est. Remaining Useful Life:	3		
Standby HHW Pump (Admin, etc.)	Manuf:	McQuay	Appx. Age:	20	Fair	
	Model:	LSL114DM	Est. Remaining Useful Life:	5		
Exhaust Fans	Manuf:	American Std./ Various	Appx. Age:	-	Poor	Belt driven fans are subject to failure with no indication.
	Model: Serial:	-	Est. Remaining Useful Life:	3		
Standby HHW Pump (Admin, etc.)	Manuf:	-	Appx. Age:	20	Poor	Not functioning. Nameplate Removed
	Model:	-	Est. Remaining Useful Life:	0		
Steam Boiler	Manuf:	Cleaver Brooks	Appx. Age:	20	Fair	
	Model:	CB 700-20	Est. Remaining Useful Life:	2		
Steam Condensate Pump	Manuf:	MTH	Appx. Age:	11	Poor	Operates extremely loud and vibrating
	Model: Serial:	142D BF	Est. Remaining Useful Life:	0		
Zone Coils and valves	Manuf:	-	Appx. Age:	50	Poor	Numerous coils appear to have failed valves. Many actuators have been replaced, we noted many have been installed incorrectly.
	Model:	-	Est. Remaining Useful Life:	?		

Recommendations

All work is recommended in the short term to provide ventilation to the entry vestibule and maintain cooling before the central chiller fails completely. Doing this work together should be significantly more cost effective and minimize disruptions.

Short Term

1. Provide maintenance stairwells to the crawlspace/basement on the West side of the Health Center and East side of the Social Services Building. This should be designed with the HVAC improvements to coordinate access pathways.

2. Replace single pane windows in the Administration and Social Service Buildings.

3. Demo existing AHU's and ductwork. Replace with VRF systems using ducted fan coil units located in the crawlspace. Fully duct all return airflow. Arrange new piping and ductwork to maximize clear height and clear access paths to equipment. Piping can route through floor trusses. Reuse existing supply floor grilles. Include 2" prefilters and 12" MERV-14A V-Bank filters.

4. Provide energy recovery ventilators for each building in lieu of exhaust fans and connect to VRF fan coils to provide appropriate ventilation to each zone. This will require some adjustment to existing exhaust grilles, ductwork, and new duct chases to get exhaust down to the basement.

5. Extend these systems to ventilate and condition the security entry vestibule.

6. Balance and commission HVAC Systems

7. Work can be phased in each building to minimize downtime, but two weeks of downtime in each building should be expected.

PICTURES

Health Center

Administration

Social Services

Security/Entry addition

Dental Clinic

Typical Single Pane Windows

ADMIN AHU
Access to filters is below ducts and piping on opposite side

Social Services AHU

Health Center AHU.
AHU and intake ductwork are partially set into the retaining wall.

Prefilters and V-Bank Filters. Some prefilters are missing and coil needs cleaning.

Exhaust Fans in Attic

Exhaust Fans in Attic

Library and School Administration

Overview

This 5,100 SF building from the original campus construction houses the library as well as office space for Issaquah School District staff running academics at Echo Glen Children's Center. The main library includes an expansive glass wall opening to the site subject to significant solar gain.

Envelope

1. Walls: Brick and wood construction
2. Roof: Standing seam metal
3. Windows are mostly single pane. A grey film is applied to the library window. Double pane at building entries.

Main HVAC Systems

Air conditioning is provided by the 1960's era 5,200 CFM constant volume air handling unit located in a mechanical 'loft' above the office side of the building. Reheat coils, also in the loft adjust temperature supplied to four different zones in the building. Air is distributed via floor grilles. This system has MERV-8 filtration and receives heating and cooling water from the central plant.

We noted some signs of small leaks in flexible connections to the unit.

Additional HVAC Systems

Restroom exhaust fans.

Health and IAQ performance

The equipment has good airflow capacity, but outside air volume should be checked and adjusted.

Filtration is not adequate to mitigate aerosols and fine particulate.

Heating and Cooling Capacity

Equipment has adequate capacity for heating and cooling.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Fan-2	Manuf:	American Standard	Appx. Age:	58	Fair	Leaks at flexible connections. Cooling coil added in 1990's
	Model	-	Est. Remaining Useful Life:	2		
Exhaust	Manuf:	American Standard	Appx. Age:	58	Fair	
	Model:	122BT	Est. Remaining Useful Life:	2		

Recommendations

Work is recommended in the short term to provide to maintain cooling before the central chiller fails completely.

Short Term

1. Provide energy Recovery Ventilator and VRF system to replace existing AHU, reheat coils, and exhaust fans in the attic. Include 2" V-bank filters on outdoor air intake and fan coil inlets.

2. Clean and seal existing ducts where reused.

PICTURES

Library

Floor Grilles Around Room Perimeter

Office

Air Handler

Note: One Belt is worn and slipping

Classroom Buildings

Overview

Four buildings totaling 7,000 SF include 22 Classrooms. These buildings date from 1967 construction and are some of the most worn and weathered on campus. The classrooms are arranged linearly side-by-side in two-classroom modules sharing a restroom and teacher office/storage room.

Envelope

1. Walls: Wood construction.
2. Roof: Standing seam metal, approximately 10 years old.
3. Windows are mostly single pane.

Main HVAC Systems

Heating only unit ventilators serve each classroom. These are relatively new and appear to be in working order, but do not have any distinguishing nameplate information.

Additional HVAC Systems

Exhaust fan and wall convector in each bathroom. Exhaust fans observed do not seem to be moving much air.

Teacher office/storage rooms include fin tube heaters or wall convectors for heating, but no ventilation.

One teacher interviewed said these classrooms have the most stagnant air he had experienced in many years of teaching, and he doesn't allow students to use the restroom "for #2".

Health and IAQ performance

Unit Ventilators likely have adequate ventilation capacity but are notoriously difficult to adjust properly. Ventilation rates for dilution are likely good in some rooms and bad in others.

Filtration is not adequate to mitigate aerosols and fine particulate. Portable HEPA units are a good temporary strategy for spaces when infection rates are high.

Inadequate exhaust in restrooms is a concern for infectious aerosols.

Heating and Cooling Capacity

Equipment has adequate capacity for heating. There is no cooling.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Unit Ventilators	Manuf:	Not indicated	Appx. Age:	5	Good	
	Model:	-	Est. Remaining Useful Life:	15		
Exhaust	Manuf:	-	Appx. Age:	58	Poor	
	Model:	-	Est. Remaining Useful Life:	0		
Fin Tube Convectors	Manuf:	Various	Appx. Age:	58	Poor	Restroom convectors are a point of vandalism and potential hiding place for contraband.
	Model	Various	Est. Remaining Useful Life:	0		

Recommendations

The following recommendations are in the case that classroom buildings are retained long term. It may be better to provide a new academic building.

Short Term

1. Provide 1000 CFM ERV at ceiling level of each teacher office serving adjacent two classrooms. Include 2” prefilter and 12” MERV-14A filters. Supply outdoor air to at least two grilles in each classroom for even air distribution.
2. Provide new exhaust fans and transfer air duct for restroom.
3. Provide dedicated wall mounted air conditioning units for each classroom.

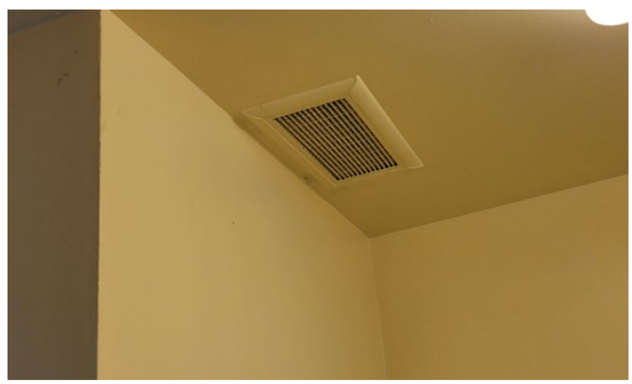
PICTURES

Classroom

Classroom Building

Note: Unit Ventilator Outdoor Intakes Below Window

Bathroom with Heating Convector



Bathroom Exhaust Grille

Recreation Building

Overview

The 19,000 SF recreation building houses a gym, locker rooms, abandoned pool, offices, and weight room (converted from a chapel). The pool is abandoned due to substantial leaks.

Envelope

1. Walls: Brick and wood construction
2. Roof: Standing seam metal
3. Windows are primarily single pane.

Main HVAC Systems

The following equipment is in the mechanical mezzanine:

1. 10,500 CFM original heat and vent unit serves the main gym.
2. 4,750 CFM heat and vent unit served the locker rooms.
3. 3,750 CFM heat and vent unit 8 serves the West side of the building including lobby, weight room and offices, and is not working: the fan bearings seized and broke the shaft on this large fan.
4. These units are from the original construction and are past their useful life. They are controlled manually and run 24/7. Filters are MERV-8 where present.
5. The layout in the mechanical mezzanine is poor, creating a maze to navigate when maintaining equipment. The original equipment was designed with very large components that cannot be readily replaced in the available clearances.

Additional HVAC Systems

1. Several utility set exhaust fans serve locker rooms and other spaces.
2. A 2,000 CFM heat and vent makeup air unit located in a back-of-house room on the first floor served the pool along with EF-12. Note these appear to be undersized to appropriately ventilate, exhaust, and control temperature/humidity for a pool. Inadequate HVAC for indoor pools can lead to severe structural damage.

Health and IAQ performance

The functioning systems have the capacity to provide adequate airflows to the Gym, but actual airflows should be confirmed. Dilution rates are likely adequate for aerosols, but current filtration will not significantly mitigate wildfire smoke.

The fitness area, office, and entry lobby have no functioning HVAC. Natural ventilation should be used if the spaces are used at all.

Heating and Cooling Capacity

The functioning systems have adequate heating capacity, but no cooling.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Gym Heat & Vent Unit	Manuf:	-	Appx. Age:	58	Poor	Equipment is not labeled, and no nameplates were found
	Model:	-	Est. Remaining Useful Life:	0		
Locker Heat & Vent Unit	Manuf:	-	Appx. Age:	58	Poor	Equipment is not labeled, and no nameplates were found
	Model:	-	Est. Remaining Useful Life:	0		
Weight/ Office/ Lobby Heat & Vent Unit	Manuf:	-	Appx. Age:	58	Poor	Equipment is not labeled, and no nameplates were found
	Model:	-	Est. Remaining Useful Life:	0		
Exhaust Fans	Manuf:	American Std./ Various	Appx. Age:	58	Poor	Some are missing belts
	Model:	-	Est. Remaining Useful Life:	0		

Recommendations

Keep pool space out of commission. Use electric unit heaters to provide basic freeze protection in this space.

Short Term

1. Provide new ~15,000 CFM AHU serving locker rooms and Gym, with air-to-air heat recovery and full economizer capacity. Provide DX coil in AHU tied to remote exterior ground mounted unit for cooling and full heating.
2. Provide new VRF system serving west side weight room, offices, and lobby. Provide dedicated ERV for weight room and a second ERV serving offices, lobby, and restrooms.
3. Include 2" prefilter and 12" MERV-14A filters. Mechanical mezzanine layout shall prioritize clear access paths and adequate clearances for equipment maintenance and repair.
4. Integrate all systems with the campus Building Automation System.
5. Replace single pane windows.

PICTURES

Recreation Building Facing Pool

Gym

Recreation Building Facing Weight Room

Windows at Weight Room are Particularly Weathered


Heat and Vent Unit Serving Locker Rooms

Exhaust Fan not Functioning Without Belts


Unit for Weight Room and Offices with Broken Fan Shaft


Heat and Vent Unit Serving Gym

Health Center AHU
AHU and intake ductwork are partially set into the retaining wall

Prefilters and V-Bank Filters. Some prefilters are missing and coil needs cleaning

Exhaust Fans in Attic

Exhaust Fans in Attic

Vocational Building

Overview

The 10,000 SF vocational education building includes a wood shop, two art classrooms, and four additional classrooms for hands on learning. Built in 2002, it is one of the newer buildings on campus. One space originally intended for independent learning skills, including cooking has been repurposed for hair styling. The woodshop is not currently in use.

Envelope

1. Walls: Concrete Masonry and metal siding.
2. Roof: Standing seam metal
3. Windows are double pane.

Main HVAC Systems

1. The vocational building is the only facility not on the campus BMS system.
2. Heating is provided by two gas fired natural draft boilers located in the mechanical mezzanine.
3. Dedicated AHU and Dust collection system for the wood shop. The dust collection system draws dust laden exhaust from equipment to outdoor equipment collectors for large sawdust, then filters the air (MERV-14) and sends it back into the shop. Some of the dust collection tubing is disconnected. In general, the dust capture components on the woodworking equipment appears only capable of capturing large dust, but not the majority of fine particulate.
4. 1,200 CFM Unit Ventilators for classrooms with economizer controls. Classroom 4 (Computer Classroom) includes a DX cooling coil.
5. Independent living classrooms include kitchen ranges with range hoods. One of these classrooms has been converted to a learning hair salon but does not appear to have general exhaust per Mechanical Code. The room does have residential kitchen exhaust hoods, but these are not getting used.

Additional HVAC Systems

Various exhaust fans

Health and IAQ performance

The wood shop system should be reviewed by an industrial hygienist before use. Recirculating exhausted air is not recommended (particularly without HEPA level filtration)

Outdoor airflow rates look good per design. Unit Ventilators cannot accommodate high levels of filtration to minimize aerosols and particulate.

Heating and Cooling Capacity

The systems have adequate heating capacity per design. Most spaces have no cooling.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-1	Manuf:	-	Appx. Age:	21	Fair	Wood Shop Air Handler
	Model:	-	Est. Remaining Useful Life:	4		
UV-1 thru UV-6	Manuf:	-	Appx. Age:	21	Good	no nameplates were found on Unit Ventilators
	Model:	-	Est. Remaining Useful Life:	0		
DC-1 Dust Collector	Manuf:	Sternvent	Appx. Age:	21	Fair	
	Model:	DKLB48015	Est. Remaining Useful Life:	5		
Exhaust Fans	Manuf:	-	Appx. Age:	21	Fair	
	Model:	-	Est. Remaining Useful Life:	5		
B-1 & B-2	Manuf:	-	Appx. Age:	21	Fair	
	Model:	-	Est. Remaining Useful Life:	5		
HWP-1 &2	Manuf:	-	Appx. Age:	21	Fair	
	Model:	-	Est. Remaining Useful Life:	5		
HWP-3 &4	Manuf:	-	Appx. Age:	21	Fair	
	Model:	-	Est. Remaining Useful Life:	5		

Recommendations

Short Term

1. Test and Balance HVAC equipment to confirm airflows.
2. Migrate building controls to new campus system. Commission to ensure systems are working correctly, including unit ventilator economizer and direct expansion cooling.

Mid Term

1. Before using wood shop with exterior rolling door closed, review operation with industrial hygienist. Retrofit equipment as necessary to limit particulate to level acceptable to OSHA and EPA.
2. Upgrade unit ventilators to include MERV 13 filters and DX cooling if operation is expected in summer months.

PICTURES

Vocational Building

Wood Shop

Dust Collector

Filters on Recirculated Dust Airflow

 *Grille Where Dust Exhaust is Returned to the Rom*	 *Unit Ventilator in Art Room*
 *Typical Unit Vent Outdoor Air Intake Integrated Into Storefront Glazing*	

Classroom 9/10 and 11/12 Buildings

Overview

The 2,100 and 2,500 SF semi/modular buildings were constructed around 2011. These buildings are located between the residential cottages they are named for. Each building includes two classrooms, restrooms and office space.

Envelope

1. Walls: Concrete Masonry and Hardie Board siding.

2. Roof: Standing seam metal

3. Windows are double pane.

Main HVAC Systems

HVAC systems are wall hung Bard air conditioning units for each classroom with exposed supply ductwork and a return grille in the wall. Units have gas heat.

Additional HVAC Systems

Restroom exhaust fans

Health and IAQ performance

These systems should be able to provide good outdoor airflow rates, however this should be tested for all occupied operating modes (heating, cooling, and within temperature band).

Portable HEPA units can be used in the event of wildfire smoke events.

Heating and Cooling Capacity

The systems have adequate heating and cooling capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AC Units	Manuf:	Bard	Appx. Age:	12	Fair	
	Model:	M42G1-BXB	Est. Remaining Useful Life:	10		
Exhaust Fans	Manuf:	-	Appx. Age:	12	Good	Not directly, but airflow appeared OK.
	Model:	-	Est. Remaining Useful Life:	10		

Recommendations

Short Term

1. Provide MERV-13 (MERV-10A) filters and test system operation and balance. Use MERV-11 filters if MERV-13 filters are too restrictive. Confirm acceptable outdoor airflow in all operating modes.

PICTURES

Classroom 9/10

Air Conditioning Units on the Back Wall

Main Maintenance Building

Overview

The 8,200 SF maintenance building is a metal 'butler building' housing offices for the maintenance staff as well as multiple shop areas for different types of repairs. The office area is built as a "box-in-a box" with framed geoboard walls inside the main building structure.

Envelope

1. Walls: Sheet metal with plastic lined batt insulation.
2. Roof: Sheet metal with plastic lined batt insulation.
3. Windows: Single pane with aluminum frames.

Main HVAC Systems

1. Gas unit heaters in high bay shop areas.
2. Gas fan coil serving office area.
3. The front-end computer for the campus BMS is in the office breakroom.

Additional HVAC Systems

Restroom exhaust fan

Health and IAQ performance

While the building is not heavily occupied, maintenance staff do regularly work out of the office area. Good ventilation will help keep staff healthy and minimize staffing issues.

Outdoor airflows per person are likely acceptable based on infiltration, however it would be beneficial to positively pressurize the office area with filtered air.

With the direct fired fan coil sitting above the breakroom, air quality should be tested for carbon monoxide in winter.

Heating and Cooling Capacity

The systems have adequate heating. No cooling is provided.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Unit Heaters	Manuf:	Various	Appx. Age:	-	Fair	
	Model:	Various	Est. Remaining Useful Life:	-		
Office Fan Coil	Manuf:	Climatrol	Appx. Age:	30	Fair	
	Model:	Not Indicated	Est. Remaining Useful Life:	0		
Exhaust Fan	Manuf:	-	Appx. Age:	30	Fair	Not visible
	Model:	-	Est. Remaining Useful Life:	5		

Recommendations

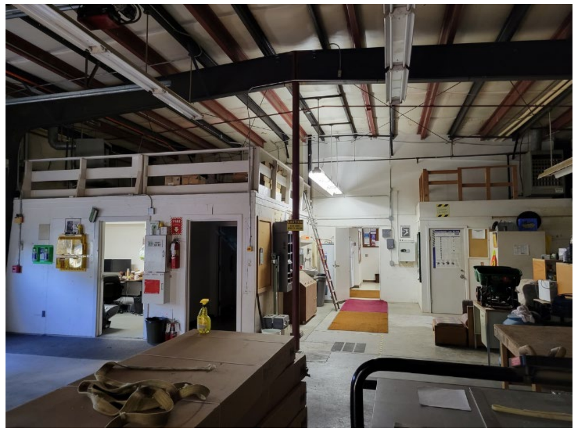
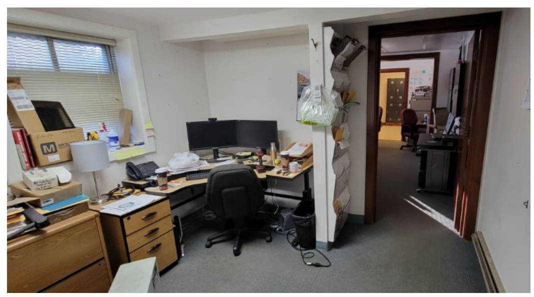
Short Term

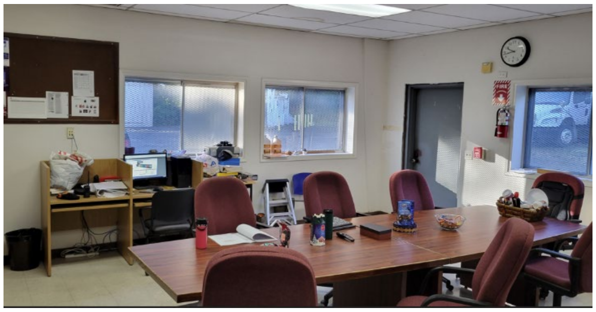
1. Test and Balance office area

Medium Term

1. Replace gas fan coil with heat pump and ERV for office area.

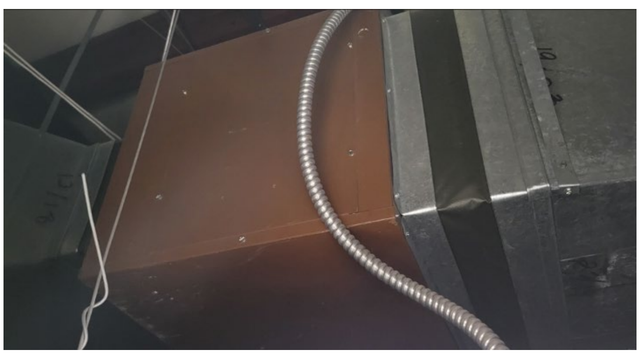
PICTURES

 *Maintenance Building*	 *Interior Facing Offices*
 *Interior*	 *Office*



Break Area.
BMS Computer on Far Wall

Gas Fan Unit above Break Area



Inline Exhaust Fan above Break Area

Canine Building

Overview

The 1,600 SF canine building is a metal 'butler building' housing a kennel and office for staff running a dog rescue shelter. Likely built in 90's or early 2000's

Envelope

1. Walls: Sheet metal exterior, gyp board interior.
2. Roof: Sheet metal exterior, gyp board interior.
3. Windows: Double pane.

Main HVAC Systems

1. Gas unit heater in kennel area
2. Office has electric resistance heat, operable windows, and a portable AC unit for hot summer days.
3. The front-end computer for the campus BMS is in the office breakroom.

Additional HVAC Systems

Restroom exhaust fan

Health and IAQ performance

Per Washington State Mechanical Code, the kennel should have exhaust. Air changes are likely high due to infiltration in the tall kennel area, but mechanical ventilation and positive pressurization would be beneficial in the office.

Heating and Cooling Capacity

The system has adequate heating. No permanent cooling is provided.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
Unit Heater	Manuf:	Renzor	Appx. Age:	10	Good	
	Model:	-	Est. Remaining Useful Life:	10		

Recommendations

Short Term

Provide 1500 CFM energy recovery ventilator to exhaust and ventilation the building. Include 12” MERV-14A filters and 2” prefilter.

Provide a heat pump for heating and cooling the building.

PICTURES

 *Canine Building*	 *Kennel Area* *Unit Heater in Upper Left*

V. GREEN HILL SCHOOL ASSESSMENT AND RECOMMENDATIONS

The Green Hill School, located in Chehalis WA was founded in 1889 as the Washington State Reform school. It is now a full-security juvenile rehabilitation campus housing approximately 140 male youth. The campus is on a 44-acre property on the outskirts of Chehalis adjacent to Interstate 5, agricultural fields, recreational fields, the Lewis County Juvenile Court, and a low-rise residential neighborhood. Despite the age of the institution, these buildings are fairly new: mostly constructed in 1999 or later. Most, but not all buildings have cooling.

This assessment of Green Hill School focuses on the 12 buildings with enough occupancy to present significant risk for airborne disease transmission for residents and staff:

1. Three X-shaped, 18,000 SF, single story residential buildings (H, M, S) with approximately 64 beds each. Building B is like these buildings but was not measured as a part of this assessment as it is currently under renovation.

2. Residential buildings C and W built in 2009 and 2012 are a similar size to H, M & S, but have different layout and HVAC systems. These buildings each have a single multizone style air handling.

3. Building X is the 20,000 SF Health Center & Administration building. It includes diagnostic and treatment spaces as well as offices. This building has an air-cooled chiller outside that serves both building X and C.

4. Building A is the 7,700 SF security and visitation building serving as a main entrance to the campus. It includes a large group visitation room and offices.

5. Building V is 37,000 SF vocational education building including classrooms, woodworking shop, automotive shop, computer lab, and AV recording space.

6. Building D is a 33,000 SF dining building and includes the main kitchen for campus and storage space.

7. Building F is a 3,300 SF building with multipurpose rooms and offices.

8. Building Y is a 28,000 SF Academic School, built in 1983, and includes 14 classrooms as well as office space and library. It has an unusual and antiquated HVAC system with no mechanical cooling.

9. Building Z, the Power Plant building, constructed in 1970 is the oldest of the buildings assessed and houses the campus' central boilers as well as backup power generators. This is the maintenance headquarters for the site with the main interface for campus building controls. The heating plant serves the rest of the buildings on campus.

Along with building B, noted above two other buildings were excluded from this assessment:

1. Recreational building T, slated for demolition.

2. Laundry building L, which has extremely low airborne infection risk due to a low staff-only occupancy and high exhaust rate from commercial dryers.

In terms of outdoor air quality issues at this site, the location is subject to regular exposure to wildfire smoke in summer/fall originating from distant fires. Pollen is a concern from spring through fall with a variety of grass, vegetable, and tree sources nearby. Proximity to I-5 is a source of pollution from automotive/truck exhaust and tire dust.

EEI observed the Green Hill School on 2/06/2023, and found the HVAC equipment in significant need of major overhaul or replacement:

1. Equipment from original construction in 1999 is generally at end of life. These systems do not meet the current energy code, so now is a good opportunity to upgrade to make future compatible for ventilation, reliability, operating cost/effort, energy savings and greenhouse gas emissions reductions.

2. The Campus heating system, while functioning, is not working well. The water balance to buildings appears to be starving some buildings, which requires an excessively high supply water temperature (nearly 200°F) for the whole system. The use of 3-way valves throughout the system results in a campus system that does not reduce flow in response to decreasing heating requirements, wasting significant pumping energy. Within buildings are many heating control valves are not working due to being clogged or having failed actuators. This requires that maintenance staff constantly manually adjust heating water flows throughout the campus to achieve reasonably comfortable conditions.

3. Controls are a major problem. Both of the two legacy controls systems controlling different buildings on Campus are no longer supported by the manufacturer, and replacement hardware is no longer available. Controller failures are taking place frequently. It is a major effort for staff to learn the two different systems. The control systems needs to be upgraded and combined.

4. Maintenance staff is overwhelmed trying to replace components which are constantly failing, and manually adjusting systems that were disabled from automatic operation.

Central Plant Building Z and Campus Heating Loop

Overview

The 8,400 SF Central Plant building, constructed in 1970, is the hub for campus facility operations as well as the heart of the campus heating system. The two-level building is sited on the Southern slope of the property with campus emergency generators outside. The upper level includes the main doors for the building, control room, workshop/storeroom, restroom, and balcony overlooking the lower level. The lower level houses the boilers as well as associated pumps and accessories. A major renovation of the heating system took place between 1988 and 1992 to convert the system from steam heat to hot water.

Envelope

Walls: Brick and Concrete

1. Roof: Standing Seam Metal over plywood decking.
2. Windows: Double pane in control room, single pane in main area.
3. Combustion Air Louvers: The South wall includes large combustion air louvers admitting outside air into the space.

Main HVAC Systems

A Primary, Secondary, Tertiary pumping system delivers heating hot water from the Building Z boiler plant to other buildings via insulated underground piping. Primary and secondary pumps are at the central plant (Building Z), while tertiary pumps are located within buildings served.

Two Burnham boilers at 400 BHP, one at 150 BHP. The second large boiler is for redundancy and small boiler is for summer base load (domestic water). Maintenance staff have been making major repairs to these boilers including swapping out failed blowers. One large boiler was down at the time of facility observation.

Triplex primary (lower level) and secondary pumps (upper level). Secondary pumps are on variable speed drives, but never ramp down because 3-way valves throughout the campus draw constant hot water flow regardless of heating demand.

Expansion tanks were recently repaired.

Campus piping appears to be insulated and directly buried in the ground. Distribution piping runs in two branches from Building Z: a 3” main to Buildings H, M & S, and an 8” main serving the rest of campus. Pipe runs underground between large vaults where branch piping can be isolated from smaller vaults where additional expansion joints are located.

1. The interior condition of this piping was not observed, but discussions with staff, as well as issues observed within buildings suggest that it is likely highly corroded due to a historic lack of proper water treatment and introduction of large quantities of fresh water containing dissolved oxygen in the system. Both significant ongoing small leaks and catastrophic failure of the system are serious risks.
2. Rubber flexible connections serving as thermal expansion joints are a weak point in the system, are showing signs of aging. While they are rated for the temperature and pressures

of the system, the unusually high temperature is likely aging these connections prematurely. One burst catastrophically recently.

3. Any failure of the piping main requires that major portions of the system go down for repairs- impacting multiple buildings.

4. Office containing campus BMS front end computers has an operable window, fin tube radiator, and through window AC unit.

There are two Building Management systems:

1. The oldest system from Delta controls dates to the 1980s and controls Buildings D, F, H, M, S & V.

2. The Andover system dating back to 1999 controls Buildings A, C, W, X, and the central plant. Andover recently stopped all support for the hardware and software for this system.

The central interface for each system runs on a separate windows PC in the control room.

While the central interface allows operators to monitor equipment and adjust settings, most of equipment control is accomplished by local digital controllers in each building. These local controllers are now failing, and replacements are no longer readily available. These hardware problems are so extensive that it is becoming infeasible to maintain temperatures in buildings, let alone ventilation rates.

Additional HVAC Systems

Hot water unit heaters provide heat to the shop and lower-level pump room.

Health and IAQ performance

The control booth is the most important part of this building for air quality as it is the portion most consistently occupied. Natural ventilation via the window is code compliant but does not provide the benefit of filtration. Ideally this room would be positively pressurized to keep out any fumes from the mechanical equipment and maintenance supplies. Occupancy levels are low, typically a single person is in the control room, though occasionally there are two or three.

Heating & Cooling Capacity

Heating capacity is adequate.

Boilers have N+1 good redundancy. At most one large and one small boiler are needed during peak heating season.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
B-Z1	Manuf:	Burnham	Appx. Age:	24	Fair	Fan Operates, but no controls
	Model:	3PV-150-50-GO-PF	Est. Remaining Useful Life:	10		
B-Z2	Manuf:	Burnham	Appx. Age:	24	Fair	Large number of problems with this system
	Model:	3PV-400-50-GO-PF	Est. Remaining Useful Life:	10		
B-Z3	Manuf:	Burnham	Appx. Age:	24	Poor	Out of service, awaiting replacement components
	Model:	3PV-400-50-GO-PF	Est. Remaining Useful Life:	10		
HWP-Z1	Manuf:	Bell & Gossett	Appx. Age:	24	Fair	Primary Pump serving B-Z1
	Model:	1510 4AC	Est. Remaining Useful Life:	10		
HWP-Z2 & Z3	Manuf:	Bell & Gossett	Appx. Age:	24	Good	Primary Pumps
	Model:	1510 4BC	Est. Remaining Useful Life:	10		
HWP-Z4 thru Z6	Manuf:	Bell & Gossett	Appx. Age:	24	Good	Secondary Pumps Variable Speed Drives
	Model:	1510 4G	Est. Remaining Useful Life:	10		
ET-Z1 thru Z3	Manuf:	Bell & Gossett	Appx. Age:	24	Good	210 Gallons each. Bladders were recently replaced but were failed for years.
	Model:	B-800	Est. Remaining Useful Life:	10		

Recommendations

Immediate

The campus needs a wholesale upgrade to campus controls including central plant and all buildings.

1. This is a critical investment. A new control system is vital to establish and verify appropriate ventilation rates on campus. It is essential that the new system be implemented by a control vendor who will offer reliable service over time.

2. Implementation will need to be staged and can be implemented along with HVAC upgrades in the buildings. Initial work on the system 'backbone' should be initiated as soon as possible.

3. Includes modifying 3-way valves to two-way valves and confirming system is working correctly for variable speed pumping.

Inspection of heating water system to assess condition, determine expected system life and develop water treatment program with qualified water treatment vendor. Engage the water treatment service provider in a permanent service contract to monitor and adjust system chemistry.

Mid Term

Provide a new heat pump water heater system serving the Laundry Facility. Decommission existing DHW equipment.

With all domestic hot water taken off the central loop and 2-way valves modulating flow throughout the campus, adjust heating water to lower temperature.

Provide heat recovery ventilator with MERV-14A filters and split system heat pump serving office.

Long Term

With all buildings converted to independent heat pump and VRF systems, decommission the campus water loop and central boilers. This facility can be maintained as a workshop and headquarters for operations.

The hot water loop is a valuable piece of infrastructure, and could be repurposed in the future, but for current planning purposes we recommend planning for decommissioning the system for the following reasons:

1. A high-performance, low emissions central plant would be much more complicated than the current boiler system.

2. Running a high-performance central plant is very challenging and requires highly trained expert operators. Long-term staffing at this level of expertise does not seem realistic at Green Hill School. Heat pump-based equipment proposed for the building level will be more familiar to staff, and more consistent with other DCYF facilities.

3. In Chehalis, getting good service from mechanical contractors on large central plant equipment will be much more difficult than smaller more commodity equipment proposed for individual buildings.

4. We expect the performance of distributed systems to be better than that of a central plant because these systems are less susceptible to human error. The performance of proposed systems is much better than existing and in line with State policy goals.

PICTURES

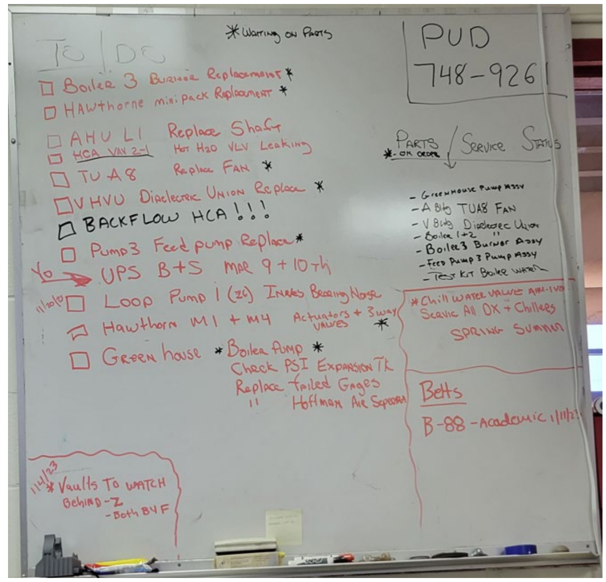
Central Plant Building

Upper Level with secondary pumps overlooking boilers

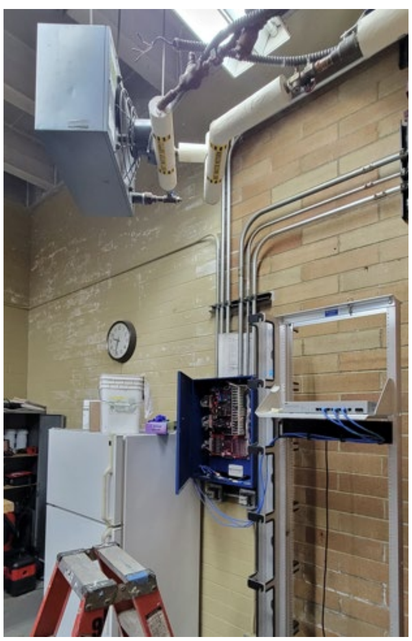
Boilers from above, outside control room

Boilers

Natural Gas Service to building



Maintenance Priorities Board in Office

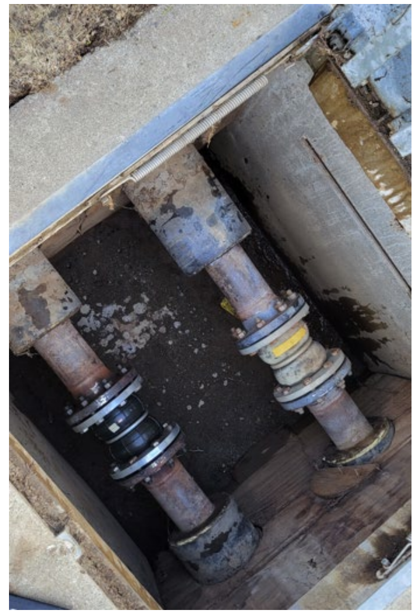


Unit heater and central plant controller in upper-level workshop

Primary pumps and expansion tanks at lower level

Pipe branch from main.

Vault was very warm (literally steamy) due to heat radiated from uninsulated pipe. The floor is covered with standing water as sump pump has failed.



Small vault for expansion couplings on branch piping. Coupling on the left replaced after bursting.

Original Expansion Coupling

Residential H, M & S

Overview

Built in 1999, these 18,000 SF, single story residential buildings are nearly identical. Each wing of the X-shaped floor plan includes sleeping rooms and restrooms along the perimeter and an open day room on the interior. The center of the building houses a control kiosk, multipurpose rooms, group counseling rooms and staff offices.

Building S was observed and measured as staff believed it to be functioning best out of the three and the best gauge of capacities at the three buildings.

Envelope

Walls: Wood and Concrete Masonry Unit, likely insulated, but R-value unknown.

1. Roof: Standing Seam Metal, likely insulated, but level unknown, Skylights at dayroom.

2. Windows may be single pane. With metal bars ~4” apart at cells.

Main HVAC Systems

The HVAC systems include a constant volume 4360 CFM air handling unit serving each wing (4 total) in a central mezzanine. Cooling for each air handling unit is provided by an R-22 direct expansion refrigerant coil connected to a dedicated outdoor condenser unit located in the ground outside. All air handling units and exhaust fans are in a central mechanical mezzanine space.

2” deep MERV-8 filters are provided in the AHU for each wing.

The major HVAC equipment is at the end of its expected useful life and in need of replacement. Outdoor condenser units are failing, and indoor AHU’s have a variety of issues including failing flexible connections (AHU-S4) missing crank arm for outside air damper (AHU-S3), and damper actuators loose (not working).

Additional HVAC Systems

1. Central exhaust fan dedicated to each wing located in the mechanical mezzanine.

Health and IAQ performance

AHU-S4 was measured as representative for systems in these buildings:

This unit performed poorly with very low outside air and total filtered supply air. This appears to be a result of 1) the unit has ripped flexible connections around the supply fan allowing a substantial portion of air to short-circuit within the air handling unit casing rather than distribute to the building. 2) The outside air damper is too far closed bringing too little outside air into the building, even in proportion to the low supply airflow. In general, dampers at all air handling units appear random in their position with outdoor air intakes too closed off.

Heating and Cooling Capacity

The cooling equipment sizing appears adequate, but the DX cooling equipment is failing and in need of replacement. Heating capacity should be adequate, but many of the units are having issues with heating control valves and actuators.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-S1	Manuf:	Temtrol	Appx. Age:	24	Poor	
	Model:	WF-DH14	Est. Remaining Useful Life:	0		
AHU-S2	Manuf:	Temtrol	Appx. Age:	24	Poor	
	Model:	WF-DH14	Est. Remaining Useful Life:	0		
AHU-S3	Manuf:	Temtrol	Appx. Age:	24	Poor	
	Model:	WF-DH14	Est. Remaining Useful Life:	0		
AHU-S4	Manuf:	Temtrol	Appx. Age:	24	Poor	
	Model:	WF-DH14	Est. Remaining Useful Life:	0		
EF-S1	Manuf:	Cook	Appx. Age:	24	Fair	
	Model:	120 CPV	Est. Remaining Useful Life:	0		
EF-S2	Manuf:	Cook	Appx. Age:	24	Fair	
	Model:	135 CPV	Est. Remaining Useful Life:	0		
EF-S3	Manuf:	Cook	Appx. Age:	24	Fair	
	Model:	120 CPV	Est. Remaining Useful Life:	0		
EF-S4	Manuf:	Cook	Appx. Age:	24	Fair	
	Model:	135 CPV	Est. Remaining Useful Life:	0		

Recommendations

Immediate

1. Inspect all flexible connections in these units, including flexible connections internal to the units at fans and tape up any broken flex connections. Monitor periodically until units are replaced.

2. Increase to MERV-13 filters and rebalance systems to minimum outdoor air damper position and airflow at each grille and diffuser in the space. The room airflows indicated on drawing sheet M247 is generally adequate, with the exception that double occupancy cells should be increased to 95 CFM of supply air.

3. Short Term (before summer 2024)

   Plan to replace air handlers, but rather than replacing equipment like for like, reconfigured as follows:

   1. Ensure outdoor air capacity for each occupant AND compliance with ASHRAE 241 *ECAi*.

   2. Provide capacity for MERV-14A filters for airborne disease reduction, wildfire smoke, and traffic exhaust.

   3. Include direct drive fans with ECM motors for greater efficiency and eliminating ongoing belt maintenance.

   4. Include air-to-air heat recovery for modern energy performance.

   5. Provide new condenser units with EPA SNAP compliant refrigerant. Configure heat pump operation to provide heating as well as cooling.

   6. Include heating coil with campus heat as a backup source if the condenser unit is out of service. Size to be compatible with 120°F heating water temperature.

   7. Maintain the wing-by-wing HVAC operation to ensure operational flexibility.

   8. Connect air supply and exhaust ductwork in the central mezzanine and size air handling equipment to provide N+1 redundancy between the three air handling units- allowing the building to continue full operation if any one unit is down for maintenance.

   9. Provide two-way valves to vary flow.

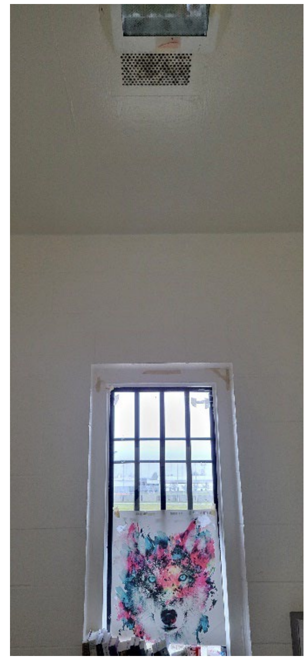
   10. Update building control and integrate with new campus system.

   11. Measure and trend outdoor and total supply airflow at each system.

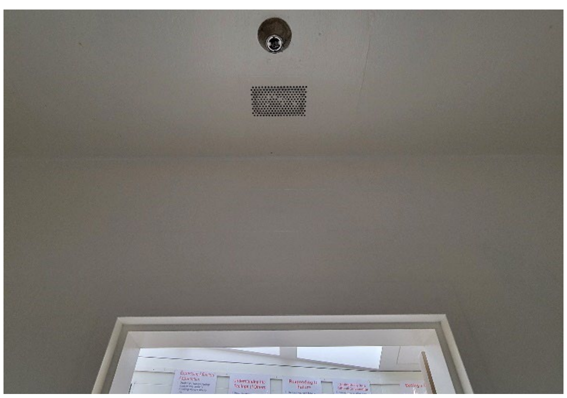
   12. The buildout can be staged to minimize disruption to operations, but purchase equipment in bulk from a single manufacturer, if possible, to get consistent equipment to standardize parts and maintenance. Stock extra motors, compressors, and condenser unit fans for future maintenance.

PICTURES

Exterior view at sleeping rooms



Sleeping room, ceiling return grille



Supply Grille

Day Room Skylights

Mechanical Mezzanine and Air Handling Units

Typical Return Intake

Typical AHU Return Fan
Note flexible connection tear starting in lower corner

AHU-S1 Mixing box

AHU-S2 Mixing Box
Note: Outdoor air damper is closed.

AHU-S3 Mixing Box
Note: Both return and outdoor air dampers are fully closed.

AHU-S4 Mixing Box

AHU-S1 Mixing box

AHU-S4 Supply Fan
Note: Torn flexible connection

AHU-S4 Supply Fan
With torn flexible connection

Typical AHU 3-way control valve.

Automatic flow control valve

Building S heating water service

Building S interior heating water pumping station (Tertiary)

Condenser Units

Condenser Units

Cedar, Building C, MHU

Overview

Built in 2012, this 18,000 SF residential building includes two main wings each with 8 single resident rooms and a day room as well as an additional acute wing too with 3 additional resident rooms and a smaller day room. The building also includes two multi-purpose spaces, control booth, offices, and staff locker room.

Envelope

1. Walls: Wood and Concrete Masonry Unit, likely insulated, but level unknown.

2. Roof: Standing Seam Metal, likely insulated, but level unknown, Skylights at dayroom.

3. Windows: Double pane.

Main HVAC Systems

The HVAC system includes a single 12,000 CFM multizone air handling unit (MZU-1) located in a mechanical mezzanine which provides all the heating, cooling, ventilation, and exhaust for the building. This system provides nearly 100% outside air to the building. MZU-1 includes a duct connection with multiple dampers to mix warm and cold air adjusting the temperature supplied to each of 6 thermal zones in the building. This air handling unit includes a heat exchanger, cold deck chilled water coil served by an air-cooled chiller, and hot deck coil on campus heating water. Both the supply and exhaust fans are on Variable Frequency Drives, which adjust speed to maintain a consistent pressure and airflow in the duct system.

The heat recovery core is configured with a normally closed bypass for frost protection. This is set to bypass exhaust air around the heat exchanger if the exhaust airstream coming out of the heat exchanger drops below 20°F. This is not ideal as exhaust air is comingled and blended with supply air. This air stream is very diluted with only a small amount of leakage of exhaust to supply air during normal operation. A significant bypass should only be only during extreme cold conditions. Filters are 2” deep MERV-8.

For zones serving residential rooms, multiple return air temperatures are measured and averaged from multiple rooms. This is a good approach.

The equipment appears to be in good condition and functioning well. The system provides exceptionally high ventilation rates efficiently with heat recovery. The only concern is that indoor air quality will closely follow outdoor air quality during wildfire events. One minor issue is that the airflow sensor that can be used for monitoring the system does not appear to be giving consistently reliable results- it should be checked and calibrated. Additionally, the structural base supporting the unit looks flimsy compared to support for comparable air handling units in this seismically active region.

Additional HVAC Systems

1. A Split System Air Conditioning Unit serves cools the server room.
2. Unit heaters provide freeze protection behind house spaces such as the mechanical room.
3. Ceiling Exhaust fans serve the mechanical and electrical rooms.

Health and IAQ performance

The system provides high outside air rates, so indoor contaminants are highly diluted. Filtration of outdoor contaminants is the key to good air quality here.

It is advisable to revise the frost protection approach to the air handling unit, but this is not a high priority.

Heating Capacity

The system appears to have ample heating and cooling capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
MZU-1	Manuf:	Temtrol	Appx. Age:	11	Good	Both hot and cold deck are 100% outside air
	Model:	WF-RSA-DH24-E	Est. Remaining Useful Life:	15		
CH-1	Manuf:	Trane	Appx. Age:	11	Good	35 Ton Air Cooled Chiller
	Model:	CGAM 035	Est. Remaining Useful Life:	9		
AC-1	Manuf:	Mitsubishi	Appx. Age:	11	Fair	2.5 Ton Split AC unit
	Model:	PKA/PUY 030	Est. Remaining Useful Life:	9		
EF-1 & EF-2	Manuf:	COOK	Appx. Age:	11	Fair	Elec and Mech Room ventilation
	Model:	GC 620	Est. Remaining Useful Life:	9		

Recommendations

Short Term (Two years)

1. Callibrate outdoor airflow station to monitor ventilation rate.
2. Migrate system to new BAS.
3. Install MERV-14A filters and Prefilters. Verify system airflows (test and balance).
4. Review and if necessary, reinforce support for MZU-1.

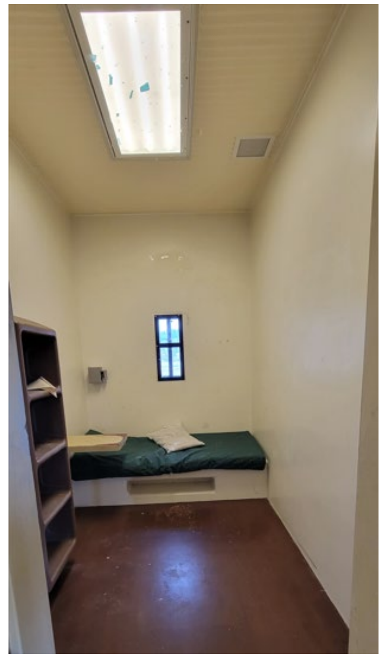
1. Add control mode for poor outdoor air quality. This would temporarily reduce outdoor airflows to code minimum ventilation requirements. This mode should be manually enabled and end automatically after two weeks if not manually disabled.

Long Term (10 Years)

1. Replace Chiller (end of life) with new air source heat pump capable of changeover operation between heating and cooling. Replace AHU coils and valves to appropriately control air temperatures with a new heat source.
2. Modify system to eliminate defrost exhaust recirculation and enable better cooling operation during poor outdoor air quality events.
3. Replace MZU-1 fans with multiple direct drive fans (fan wall, etc.) to provide N+1 redundancy and eliminate the requirement for changing fan belts.

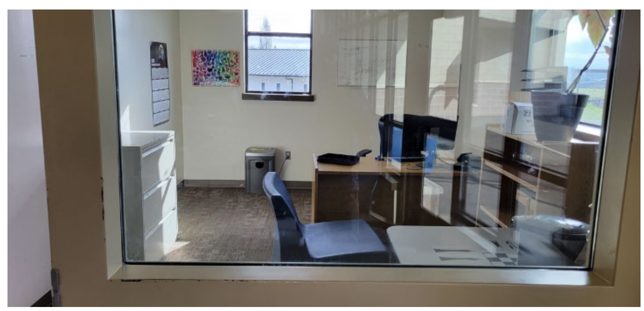
PICTURES

Cedar Building "C"

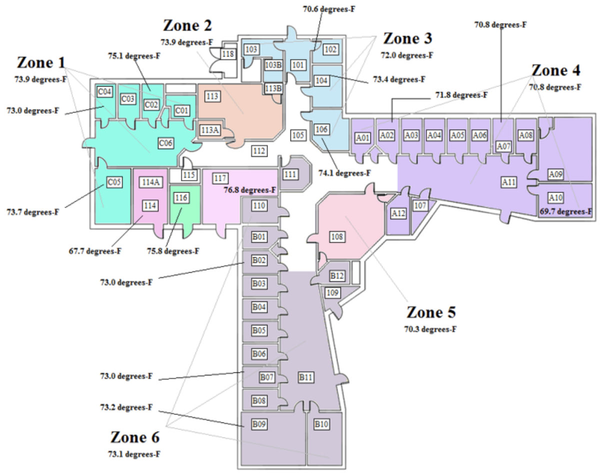


Typical Sleeping Cell

Classroom

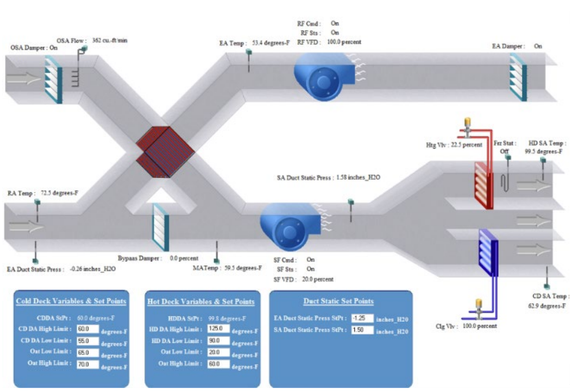


Counselor Office



Zoning per existing Control Graphics

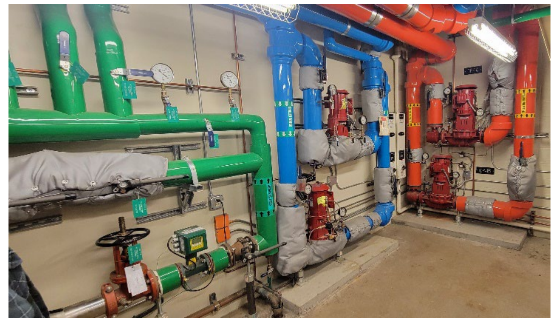
MZU-1



MZU-1 Diagram per existing Control Graphics

Relief Air Louver

Outdoor Air Intake



Building C Pumps

Air Cooled Chiller CH-1

Willow, Building W, IMU

Overview

Built in 2009, this 21,000 SF residential building includes three wings each with 12 single resident cells a day room, and classroom. The building also includes a control booth, offices, and staff spaces.

Envelope

1. Walls: Concrete Masonry Units.
2. Roof: Standing Seam metal.
3. Windows: Double pane. Skylights in Day Rooms.

Main HVAC Systems

Single 13,000 CFM multizone air handling unit (MZU-1) located in a mechanical mezzanine which provides all the heating, cooling, and ventilation. MZU-1 includes a duct connection with multiple dampers to mix warm and cold air adjusting the temperature supplied to each of 8 thermal zones in the building. This air handling unit includes filters, supply fan, return fan, cold deck chilled water coil, and hot deck coil on campus heating water. Chilled water is supplied by the chilled at the neighboring HCA building.

4” deep MERV-8 filters.

The MZU-1 system includes a return fan (EF I-3) and mixing dampers exterior to the MZU-1. No heat recovery is included in the system.

Both the MZU-1 supply, and external exhaust fans are on Variable Frequency Drives.

For zones serving residential rooms, multiple return air temperatures are measured and averaged from multiple rooms. This is a good approach.

The equipment appears to be in good condition and functioning well.

Additional HVAC Systems

Several recirculating hot water heating units provide heat in the event of loss of power and are manually operated by facilities staff.

Small Exhaust fans serve restrooms.

Health and IAQ performance

This system has good capacity and appears to be operating correctly, but would benefit from improved filtration.

Heating Capacity

The system appears to have ample cooling and heating capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
MZU-1	Manuf:	Seasons 4	Appx. Age:	14	Good	
	Model:	3MJ125	Est. Remaining Useful Life:	15		
EF I-1	Manuf:	Cook	Appx. Age:	14	Choose an item.	
	Model:	GC 520	Est. Remaining Useful Life:	10		
EF I-2	Manuf:	Cook	Appx. Age:	14	Choose an item.	
	Model:	GN 520	Est. Remaining Useful Life:	10		
EF I-3	Manuf:	Cook	Appx. Age:	14	Choose an item.	
	Model:	300 SQIB	Est. Remaining Useful Life:	10		

Recommendations

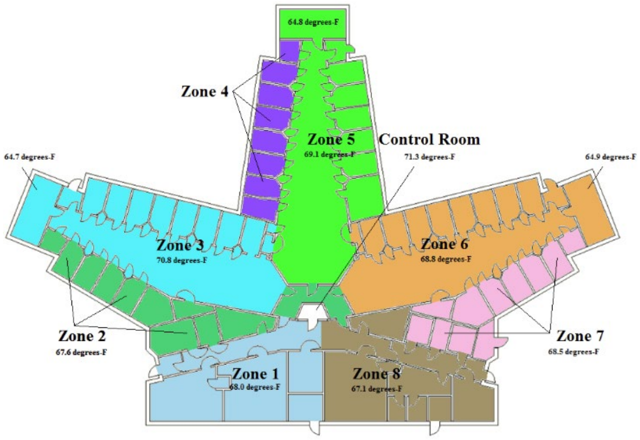
Short Term

1. Install outdoor airflow station to monitor ventilation rate.
2. Replace 3-way heating control valves with 2-way valves.
3. Install MERV-14A filters and prefilters. Verify system airflows (test and balance).
4. Migrate system to new BAS.

Long Term

1. Modify airside system to provide energy recovery.
2. Provide Air Source Heat Pump(s) for heating and cooling.
3. Replace AHU coils and valves to appropriately control air temperatures with new heat source.
4. Replace individual supply with multiple direct drive fans (fan wall, etc.) to provide N+1 redundancy and eliminate the requirement for changing fan belts.

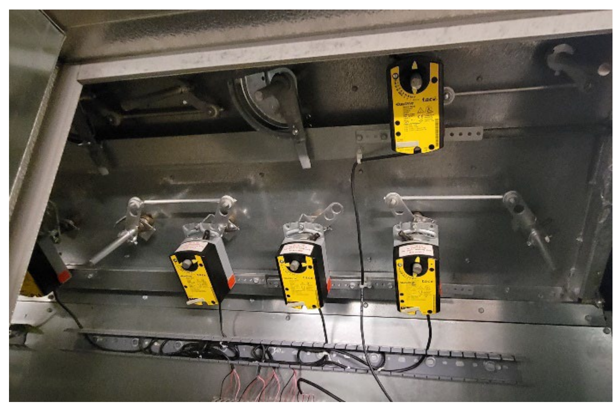
PICTURES



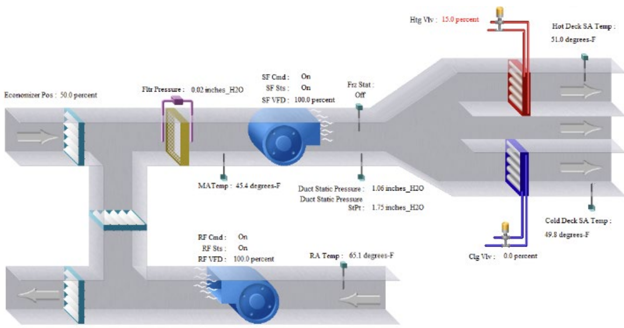
IMU Thermal Zones

Mechanical Mezzanine and MZU-1

Return Damper, OA damper, and Filters



MZU Zone Damper Actuators



MZU-1 Control Graphics

Health Center and Admin Building X, HCA

Overview

The Health Center and Administration building was constructed along with the IMU in 2009. The first floor provides rooms for medical and dental evaluations and procedures. The second-floor houses administrative offices for the Green Hill School Campus.

Envelope

1. Walls: Concrete Masonry Units.
2. Roof: Standing Seam Metal.
3. Windows: Double pane.

Main HVAC Systems

The HVAC system includes a single 16,200 CFM air handling unit located in the basement, an external 14,000 CFM return fan also in the basement, and 33 series fan powered terminal units serving the rooms. The system is variable volume with speed drives on supply and return fans. The system also has an airflow sensor in the outside air intake to directly control the volume of outside air brought into the building.

4" MERV-8 filters are installed in this unit.

Cooling for the air handling unit is provided by a 72-ton air-cooled chiller adjacent to the building, also serving the nearby Cedar Building (C).

The main air handling equipment is generally in good physical condition, but the basement duct layout unfortunately requires crawling below to service equipment, including filter changes. Controls components for the system are not reliably functioning and the temperature control is largely being manually adjusted at the control valves. When we first observed the system, the supply fan belt was broken, and the return fan was pumping air out of the building intake. This was promptly resolved by maintenance staff, but it is worth noting that there was no indication of the problem in the Building Management System. Testing the building with the fan belt fixed we found ample airflow overall, but the controls set to provide almost no outside air.

Additional HVAC Systems

1. Eight small to medium exhaust fans discharge air to side wall louvers in the building.
2. Unit heaters provide freeze protection in back-of-house spaces such as the mechanical room.

Health and IAQ performance

The system was not functioning properly and providing almost no outside air to the building, despite having good fan capacity and comprehensive components to measure and maintain the minimum outside airflow.

Heating & Cooling Capacity

The system appears to have ample heating and cooling capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-HCA-1	Manuf:	McQuay	Appx. Age:	14	Good	Control components are not functioning properly.
	Model:	CAH035GDDC	Est. Remaining Useful Life:	10		
	Serial:					
RF-H1-1	Manuf:	Greenheck	Appx. Age:	14	Good	
	Model:	BSQ-360-75-X	Est. Remaining Useful Life:	10		
CH1-1	Manuf:	McQuay	Appx. Age:	14	Good	
	Model:	AQWZ-075C	Est. Remaining Useful Life:	10		

Recommendations

Immediate

1. Troubleshoot/commission AHU outside airflow control.
2. Migrate controls to new BAS and return system automatic function consistent with design intent.
3. Confirm pressure relationships and airflows at health care rooms for current and anticipated future use. Balance system for loaded MERV-14 filters.
4. Commission system to verify performance.

Medium Term

1. Replace domestic hot water equipment with heat pump water system.

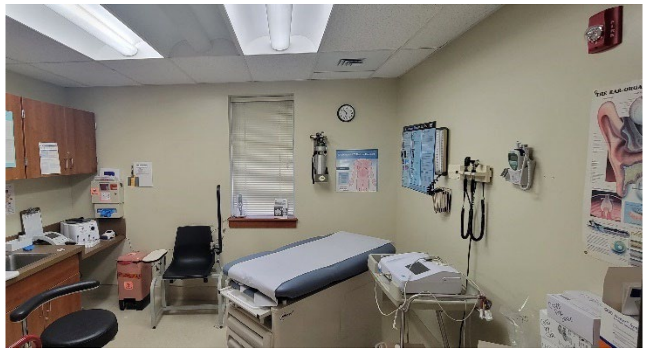
Long Term (8 years)

1. Replace fan powered terminal units with VAV boxes. Size coils for 120°F heating water. Evaluate new flows required by these coils and strategically modify piping.
2. Replace AHU including direct drive supply and return fans with N+1 redundancy. Route exhaust to basement and provide energy recovery for minimum ventilation.
3. Reconfigure basement layout to provide clean access to equipment.

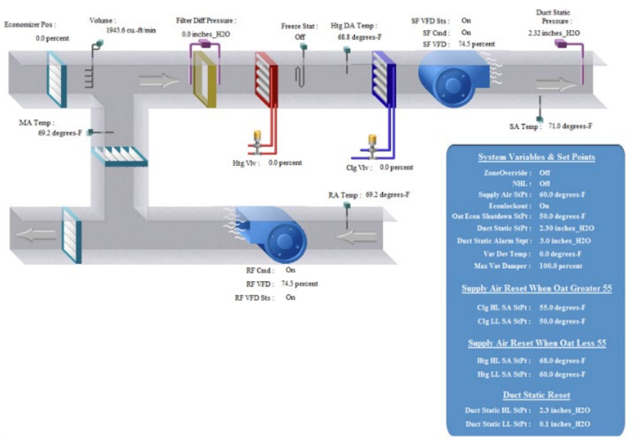
4. Replace Chiller (end of life) with an air to water source heat pump serving the HCA exclusively (the IMU should be independent at this point. Disconnect from central hot water plant.

PICTURES

HCA Building X



Exam Room



Air Handling Equipment BMS Graphics

Maintenance Access to HCA Equipment is Below this Duct

HCA Air Handling Unit (Left)
& Return Fan (Right)

Chiller Serving HCA and IMU

Air Intake in Area Well with Airflow Station

Air Intake in Area Well


Heating Water Pumps


Chilled Water Pumps

Building A Security and Visiting

Overview

Built in 1999, this 7,700 SF single story building includes the main security portal to the campus, security staff offices, and a large group visitation room.

Envelope

Walls: Wood, Concrete, and CMU, insulation level not known

1. Roof: Not observed.
2. Windows: Double pane.

Main HVAC Systems

The HVAC system includes a single 7825 CFM air handling unit located in a mechanical mezzanine and series fan powered terminal units serving different rooms. The air handling unit was originally variable volume based on an adjustable inlet cone; however, the inlet cone has been fixed in place in roughly a half-way position. There is a rip in the flexible connection at the supply fan. Cooling for the air handling unit is provided by an R-22 direct expansion refrigerant coil connected to a dedicated outdoor condenser unit located in the ground outside.

1. 2” deep MERV-8 filters.
2. The Major HVAC equipment is at the end of its expected useful life and in need of replacement. Outdoor condenser units are failing, and indoor AHU’s antiquated variable volume control is disabled, and flexible connections on the supply fan have ripped.

Additional HVAC Systems

1. Hot water baseboard convector heaters in visiting room
2. Exhaust fan and split system AC unit in server room. Note an older AC unit indoor fan coil is abandoned in the server room ceiling.
3. Central exhaust fan.

Health and IAQ performance

Design values for airflow look appropriate per available building drawings, but measured airflow was 17% low for total supply air and 62% low for outdoor airflow.

Heating and Cooling Capacity

The existing system has adequate heating capacity, but the failing equipment is not providing adequate cooling.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-S1	Manuf:	Temtrol	Appx. Age:	24	Poor	Original Air Handling Unit
	Model:	WF-DH14	Est. Remaining Useful Life:	0		
Server Room AC	Manuf:	Daikin	Appx. Age:	5	Good	Split System
	Model:	-	Est. Remaining Useful Life:	15		
Server Room Exhaust	Manuf:	-	Appx. Age:	5	Good	Sidewall Centrifugal
	Model:	Exhaust Fan	Est. Remaining Useful Life:	15		

Recommendations

Immediate:

1. Inspect all flexible connections in these units, including flexible connections internal to the units at fans and tape up any broken flex connections. Monitor periodically until units are replaced.

2. Increase to MERV-13 (MERV-10A) filters and rebalance system to original airflows including minimum outdoor airflow and supply airflow to each room. This is expected to require adjustment or removal of the supply fan inlet vane.

3. Provide portable HEPA air cleaning devices in the conference room and family visitation rooms. The conference room HEPA units should have a rated Clean Air Delivery Rate (CADR) of 400. Family visitation rooms should have a CADR of 40 x Number of Visitors.

Short Term (Before summer 2024)

1. Upgrade the HVAC system: Replace with a VRF system and energy recovery ventilators.

2. Provide at least 20 CFM outside air per occupant and *ECAi* per ASHRAE 241.

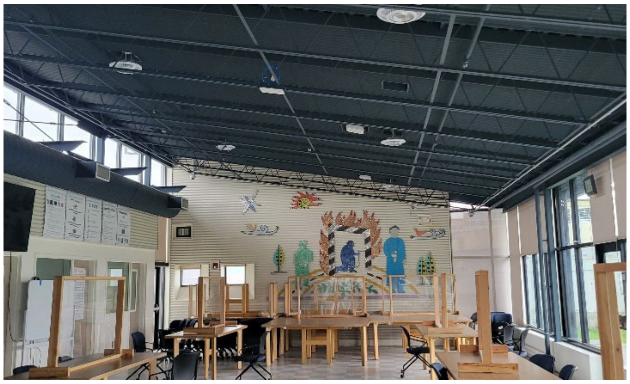
3. Provide MERV-13 filters on recirculating VRF equipment and MERV-14A filters on ERV equipment providing outdoor air. Include airflow stations/flow rings to measure outdoor airflow and total supply airflow in each system.

4. Update building controls and integrate with new campus system.

Medium Term

1. Replace the building's domestic hot water heating equipment with a heat pump water heater.

PICTURES

 *Group Visitation Room*	 *Mechanical Mezzanine*
 *AHU-A1 Mixing Dampers*	 *AHU-A1 Filters*

 AHU-A1 Cooling Coil	 Supply Fan Supply to building via grate in lower left
 Fan Powered Terminal Units	 Coil Connection with 3-Way Valve

<table>
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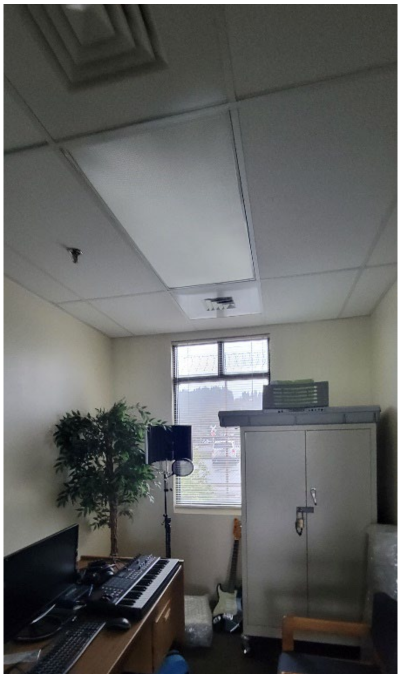
<td>
Office</td>
<td>
Outdoor Condenser Equipment for AHU-A1 and Server AC
Not: Improvised addition of extension to reduce recirculation of hot discharge air and sprinkler to reduce ambient temperature</td>
</tr>
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Dining Building D

Overview

The Dining Building, constructed in 1999, includes the primary commercial kitchen for the campus as well as a dining room and storage associated with the food service program. The dining building also serves as a hub for supplying heating water and chilled water to the adjacent Vocational and Laundry buildings. Our focus was on the cafeteria area, as this is the space with the most significant risk of airborne disease transmission.

Envelope

1. Walls: Metal, Concrete at dining.
2. Roof: Standing Seam Metal.
3. Windows: Double Pane curtainwall.

Main HVAC Systems

180-ton air cooled screw Chiller & Pumps serves Buildings D&V, in recently replaced and in good condition.

10,300 CFM AHU-D1 serves dining area and misc. kitchen support spaces via eight series fan powered terminal units. Originally variable volume with inlet vane, but this has been disabled.

15,000 CFM AHU-D2 serves kitchen.

4,800 CFM AHU-D3 back of house storage areas.

12,500 CFM HVU-D1 grease hood makeup (tempered).

EF-D7 and EF-D8 are rooftop kitchen hoods, 7,800 CFM each.

The Building D HVAC system is past its useful life. Multiple control components and airside equipment failures are preventing automatic operation of this air handling equipment. AHU-D1 system is not currently capable of controlling ventilation, heating or cooling to the dining area because so many of the terminal units have failed.

We observed that the heating water piping arrangement is not consistent with the design, this has likely been throwing the system out of balance since the building was first brought online.

Additional HVAC Systems

Unit heaters provide freeze protection in back-of-house spaces such as the mechanical room.

Health and IAQ performance

The kitchen area system appeared to be functional with kitchen exhaust and makeup air providing high air changes. It is not a concern for airborne infectious aerosols.

The dining system was not working, despite multiple attempts by maintenance staff and our team to get the system online. The AHU was forced into manual operation and was measured at 7,376 out of 10,245 CFM total, but it is hard to tell how this is being impacted by the failed terminal units downstream, versus the air handling equipment itself. We recommend avoiding the use of the dining room until this system can be replaced.

Heating & Cooling Capacity

The heating coil control valve was not functional, so we were not able to check the heating capacity.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-D-1	Manuf:	Temtrol	Appx. Age:	24	Poor	Large number of problems with this system
	Model:	WF-DH21	Est. Remaining Useful Life:	0		
AHU-D2	Manuf:	Temtrol	Appx. Age:	24	Fair	Appears functional, but at end of life
	Model:	-	Est. Remaining Useful Life:	2		
AHU-D3	Manuf:	Temtrol	Appx. Age:	24	Fair	Not observed. Serves back of house spaces.
	Model:	-	Est. Remaining Useful Life:	2		
EF-D7 & D8	Manuf:		Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:		Est. Remaining Useful Life:	5		

Recommendations

Immediate

1. Do not use the dining room until the AHU-D1 system is replaced.

Short Term

1. Replacing all air handling equipment with new and tie back to existing duct distribution. Include demand control kitchen ventilation and redundant direct drive fans. Select heating coils to be compatible with future heat recovery chiller supply temperature of 120 F.

2. Provide all new controls for this equipment.

Mid Term

1. New heat pump water heater. Decommission existing DHW equipment.

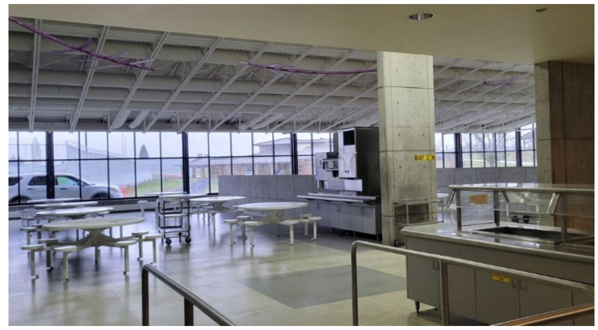
Long Term

1. Provide air source heat pump to provide heating hot water to both Dining and Vocational Buildings in lieu of campus hot water. Note that to disconnect from campus hot water, Laundry and Security (A) buildings downstream must also be off the system.

2. The existing chiller should have another 5-10 years of life at this point.

PICTURES

Dining Building



Dining Room

Baseboard Heaters at Dining Curtainwall

Dining air distribution with slot diffusers

Building D Mechanical Mezzanine

Building D Mechanical Mezzanine

Ground level Mech room with Hydronic Pumps

Heating Pump

 *Chilled water pump*	 *Chiller*

Vocational Building V

Overview

The 36,100 SF Vocational Building, also constructed in 1999 houses spaces to learn a variety of practical skills including welding, woodwork, automotive work, computers, recording studios, and hairstyling. This building is directly adjacent to the Dining Building and shares a common main entrance hall.

Envelope

1. Walls: Metal

2. Roof: Standing Seam Metal.

3. Windows: Double pane punched openings in SE facade.

Main HVAC Systems

13,250 CFM AHU-V1 and 14,200 CFM AHU-V2 are variable volume systems with 25 series fan powered boxes serving classrooms and support spaces. The original inlet vanes in these air handling units are no longer in operation. One third of the fan powered boxes appear to be out of commission with failed controllers or fans. These systems are functioning poorly.

2000 CFM, 160 MBH gas fired makeup air unit MU-V1, gas fired radiant heater and exhaust fan 1,800 CFM EF-V4 serve the auto shop. This system appears to be in working order.

11,800 CFM HVU-V2 serves the welding shop along with 4200 CFM EF-V5. This system appears to be in working order.

9,000 CFM HVU-V3 serves the woodshop along with 4,6000 CFM dust collection system with outdoor shaker. Stationary power tools that were once attached to the dust collection system have been removed and the system now provides general exhaust only. The shop is being used to build tiny home shelters with hand tools. The system is not in use as a dust collector as new regulations require integral fire suppression that the system does not include.

No dedicated exhaust was observed where hairstyling was taking place. Note that per the Washington State Mechanical Code (Table 403.3.1.1), 0.6 CFM/SF of exhaust is required for spaces acting as hair salons and air from this space is not permitted to recirculate to other spaces.

Additional HVAC Systems

Unit heaters provide freeze protection in back-of-house spaces such as the mechanical room.

Health and IAQ performance

The rooms on the AHU-V1 and AHU-V2 Systems are a concern. Looking at the system level, the total measured outdoor airflow of the systems was 25 and 44% low respectively.

In general, shop spaces are not a considerable risk from the perspective of infectious aerosols due to low occupant densities and relatively high airflow rates. They have not been evaluated in detail as part of this assessment. It is worth noting that the use of shops, particularly the wood shop, may have changed significantly since the base building systems were originally constructed. It would be worthwhile consulting an industrial hygienist to confirm appropriate levels of air quality are being achieved with current practices and safety equipment.

Heating & Cooling Capacity

Due to the combination of equipment failures on these systems. It appears that only about half of the rooms on the AHU-V1 and V2 systems can respond to changing heating and cooling needs. None of the shops have cooling.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-V1	Manuf:	Temtrol	Appx. Age:	24	Poor	Large number of problems with this system
	Model:	WF-DH27	Est. Remaining Useful Life:	0		
AHU-V2	Manuf:	Temtrol	Appx. Age:	24	Poor	Large number of problems with this system
	Model:	WF-DH29	Est. Remaining Useful Life:	0		
MU-V1	Manuf:	Renzor	Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:	ADF 1200	Est. Remaining Useful Life:	2		
HVU-V2	Manuf:	Temtrol	Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:	WF-DH20	Est. Remaining Useful Life:	5		
HVU-V3	Manuf:	Temtrol	Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:	WF-DH16	Est. Remaining Useful Life:	5		
EF-V3	Manuf:	General Resource Corp.	Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:		Est. Remaining Useful Life:	5		
EF-V4	Manuf:	General Resource Corp.	Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:	BIB-135	Est. Remaining Useful Life:	5		

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
EF-V5	Manuf:	General Resource Corp.	Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:		Est. Remaining Useful Life:	5		
Dust Collector	Manuf:	PM Wright	Appx. Age:	24	Fair	Appear to be operating, but not examined in detail.
	Model:	M-50	Est. Remaining Useful Life:	5		

Recommendations

Short Term (1 year)

1. Replace AHU-V1 and AHU-2 systems. Provide pinch-box VAV systems in lieu of fan powered units. Include direct drive fans. Select heating coils to be compatible with future heat recovery chiller supply temperature of 120°F.

2. Migrate all building controls to new campus system. Test, balance, and commission the building to ensure systems are working correctly.

3. No modifications are currently recommended to the gas-powered makeup/heat and vent units serving shops. That said, operation of these shops is not recommended during wildfire smoke or extremely hot conditions. We recommend evaluating the appropriate modifications for these systems in three to five years based on the demands of expected space use, maintenance practices, and other policy goals.

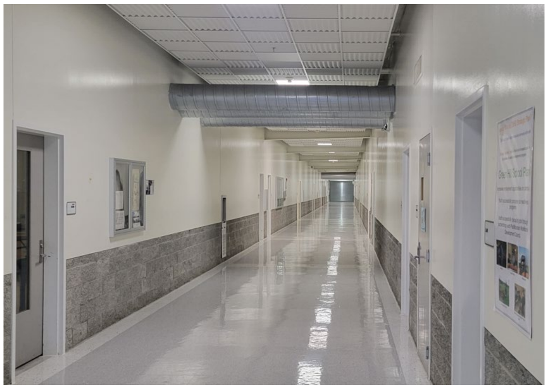
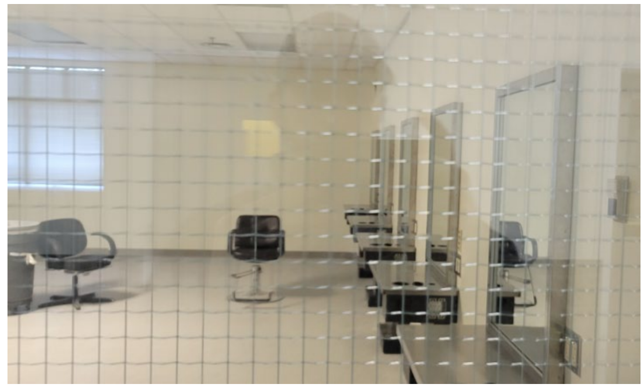
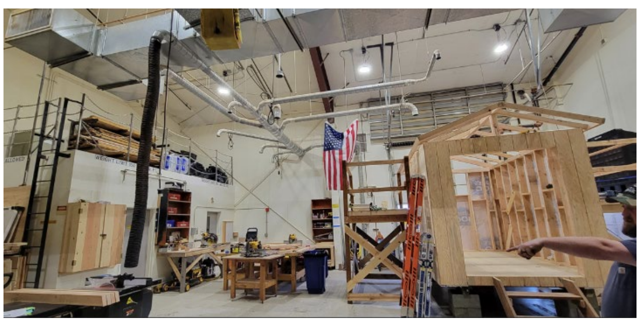
Mid Term (4 Years)

1. New heat pump water heater. Decommission existing DHW equipment.

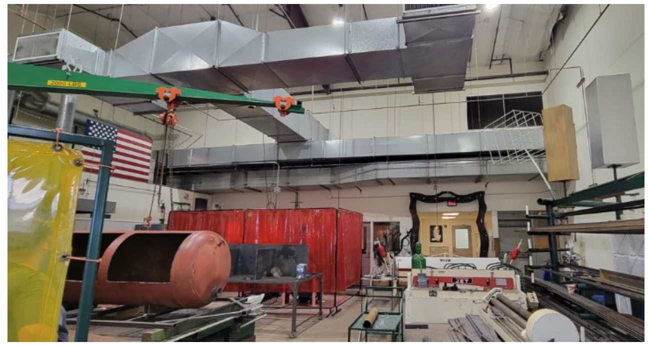
Long Term (10 years)

1. Adjust controls and recommission system after the Dining Building heat pump comes online.

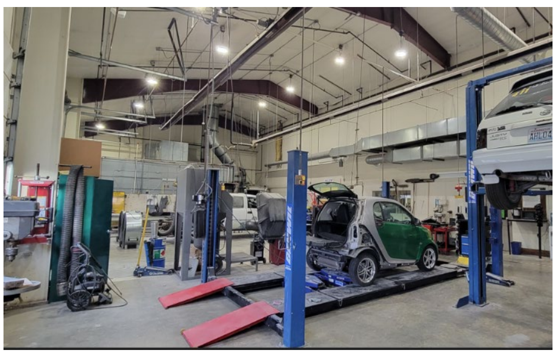
PICTURES

 *Main hallway*	 *Barber Classroom*
 *Wood Shop*	 *Dust Collector/Exhaust Control*

Dust Collector



Welding Shop



Auto Shop

Mechanical Catwalk and HVAC Equipment above Main Hallway

 *MU-V1, EF-V3, EF-V4, EF-V5*	 *HVU-2*

Multifunction and Special Services Building F

Overview

The 3,300 SF Multifunction building includes three private offices and a large multipurpose room primarily used for staff training sessions.

Envelope

1. Walls: Concrete and Curtainwall
2. Roof: Standing Seam Metal
3. Windows: Double pane curtainwall

Main HVAC Systems

The private offices are served by the single zone constant volume AHU-F1 designed for 510 CFM total.

The multifunction space is conditioned by 2,090 CFM constant volume AHU-F2 as well as baseboard hot water radiators at the large windows.

Both units are in a large mechanical mezzanine. They have hot water heating coils on the campus loop and remote DX condensers for cooling located on the roof. Both units have variable speed drives, but these are used to set the constant flow, not vary with demand.

2” MERV-8 Filters. Units have airflows higher than the design values, so it should be easy to change to MERV-13 and 14 filters.

Health and IAQ performance

The AHU-F1 system is has a total and outdoor airflow significantly higher than necessary. This would provide good dilution of indoor contaminants for the three office rooms, but better efficiency would be achieved by providing reduced airflows consistent with design.

AHU-F2 has a total airflow slightly higher than design but an outside airflow was 58% low assuming 45 occupants.

Heating & Cooling Capacity

Heating capacity is adequate.

Cooling compressor units are at the end of their expected life and are expected to fail soon.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU-F1	Manuf:	Temtrol	Appx. Age:	24	Fair	Unit is in fair condition with exception of condensing unit, which is at the end of its useful life
	Model:	WF-DH2	Est. Remaining Useful Life:	8		
AHU-F2	Manuf:	Temtrol	Appx. Age:	24	Fair	Unit is in fair condition with exception of condensing unit, which is at the end of its useful life
	Model:	WF-DH6	Est. Remaining Useful Life:	8		

Recommendations

Immediate

1. Provide MERV-13 (MERV-10A) filters and rebalance systems for design airflows.

Short Term (1 year)

1. Replace AHU-F1 and F2 condensing units. Provide airflow measuring and demand control ventilation to vary the outdoor airflow relative to occupancy. Integrate with new Campus Building Management System.

Long Term (8 years)

1. Provide air source heat pump for heating in lieu of connection to central plant. Redesign HVAC system for lower temperature heating water and replace air handling equipment (end of life).

PICTURES

Multipurpose Building F

Mechanical Mezzanine with AHUs

Condenser unit for AHU-F1

Condenser unit for AHU-F1

 Condenser unit for AHU-F2	 Condenser unit for AHU-F2

Academic School Building Y

Overview

The 27,800 SF Academic School Building, constructed in 1983, houses Classrooms and a Library. The central hallway of the L-shaped school creates a tall, open, daylit space.

Envelope

1. Walls: Brick and concrete.
2. Roof: Standing seam metal over plywood decking. There is a tall ceiling space above classroom ceilings.
3. Windows: Double pane.

Main HVAC Systems

The original constant volume air handling unit with supply fan, filters, and heating coil is located in the basement at the center of the building. This unit supplies air into a large concrete plenum/hallway that extends to the ends of the building. Ducts for each classroom/zone tap into this plenum and extend below grade to floor grilles at the perimeter of the rooms. A heating coil at the inlet of the underfloor duct is provided to control the air temperature supplied to the room. No cooling is provided. The unit runs 24/7.

Return fan in an attic level mechanical room pushes air back down to the air handler and out a discharge louver.

The system was originally pneumatically controlled and has no connection to either of the campus BAS systems. The entire pneumatic system has been disabled and all aspects of the system are manually set and adjusted when outdoor conditions change significantly to adjust temperatures in the occupied space.

Hydronic pumps in the basement appear to be bypassed and water is flowing through the building on pressure from secondary campus loop pumps.

Note that the basement is subject to flooding when groundwater level rises. The building's main electrical panel is also in the basement and presents a significant risk in the case of another flood. Despite the presence of sump pumps, there are 'high water' marks on mechanical equipment and walls from previous flooding.

Additional HVAC Systems

A small fan provides exhaust to a janitor nook (top of stairs to basement). This fan appeared to be out of service.

Health and IAQ performance

Total supply airflow provided from the Air Handling Unit was measured at 13,380 CFM. 1320 CFM was measured at the outdoor air intake. Based on a maximum occupancy in the building of 100 people, the outdoor airflow requirement per the Mechanical Code would be 5700 CFM, so the building is approximately 77% low.

Heating & Cooling Capacity

The building has adequate heating capacity, though it is currently not automatically controlled in response to space temperature. The approximate building temperature is maintained by daily manual adjustment of heating valves. The building does not have cooling.

Equipment Table

MARK	EQUIPMENT		YEARS		CONDITION	NOTES
AHU	Manuf:	-No Indication-	Appx. Age:	40	Poor	Fan Operates, but no controls
	Model:	-	Est. Remaining Useful Life:	0		
Return Fan	Manuf:	Mammoth	Appx. Age:	40	Fair	Large number of problems with this system
	Model:	B-8800	Est. Remaining Useful Life:	0		

Recommendations

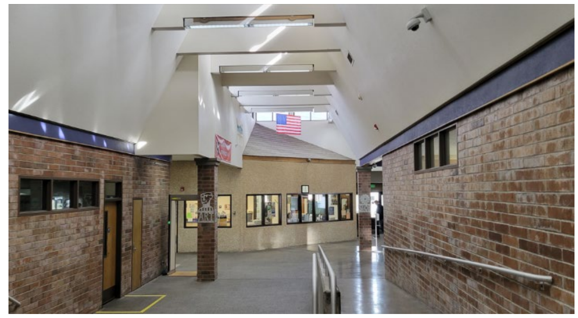
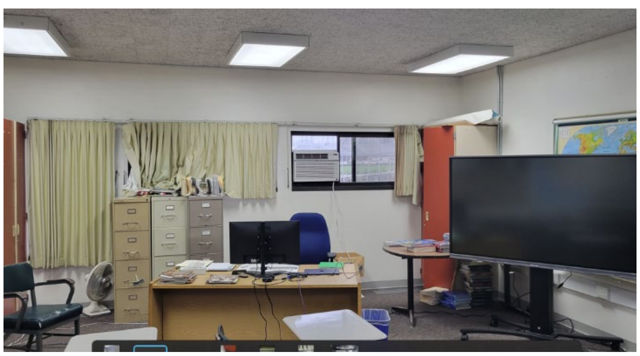
Short Term (1 year)

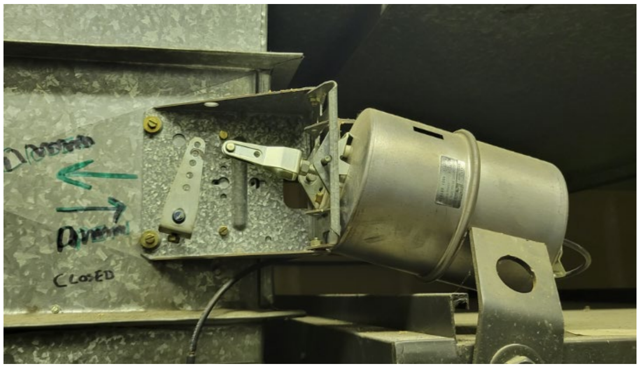
1. Provide 7,000 CFM energy recovery ventilator in upper mechanical room, and supply 300 to 400 CFM to each classroom.
2. Provide VRF heating and cooling system with vertical fan coil units in classrooms and supply air above the ceiling. Route refrigerant pipes above the ceiling.
3. Provide barometric relief based on existing return air paths.
4. Connect building controls to new campus system. Test, balance, and commission the building to ensure systems are working correctly.
5. Provide duplex sump pump with alarms to campus Building Management System.

Mid Term (4 Years)

1. New heat pump water heater. Decommission existing DHW equipment.
2. Relocate or reconfigure main electrical equipment to mitigate flood risk.

PICTURES

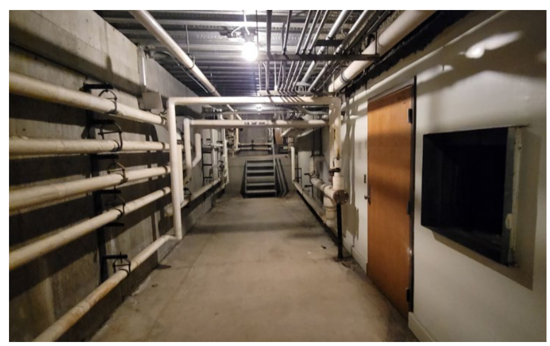
 *Academic Building*	 *Central Hallway*
 *Classroom*	 *Typical Floor Grille*



Disabled Pneumatic Return/Outdoor Air Mixing Actuator

Air Handling Unit in Basement Mechanical Room

Supply ducts from AHU to basement supply plenum



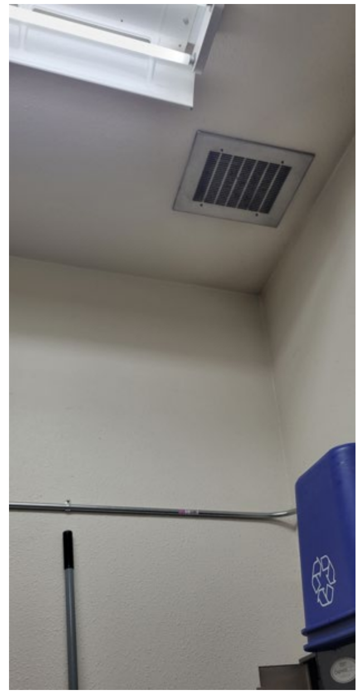
Basement Supply Air Plenum

Basement Supply Air Plenum
with zone heating pipe and sump pit.
View of central corner from West

Typical supply branch to below-grade duct with heating coil. Pneumatic Control Valve that originally responded to thermostat is disabled.

Heating and Domestic Hot Water Piping in Basement Mechanical Room.

Building (Tertiary) Hot Water Pumps are disabled
(Note Valve Position)

 *Internal pump (left above) components (motor and impeller) have been removed. This pump casing is functioning as a pipe for campus water to flow through.*	 *Exhaust fan at janitor nook not working*
 *Ceiling Space above classrooms*	 *Ceiling Space above classrooms*

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APPENDICES

ENGINEERING ECONOMICS, INC.

APPENDIX A

Background Information

VENTILATION

Ventilation is the introduction of outside air to a building and exhaust of air from a building. This controlled changeover of indoor air supports indoor air quality by diluting all indoor air contaminants, including microbe-laden aerosols, bioeffluents, and Volatile Organic Compounds (VOCs) from numerous sources such as furniture, building materials, cleaning products, cosmetics, cooking byproducts.

The dilution effect of mechanical (fan forced) ventilation can be complimented by air exchange due to infiltration (building leakage) and natural ventilation (windows), however these provide inconsistent airflows based on changes in outdoor temperatures and wind conditions. These uncontrolled airflows often introduce unwanted outdoor contaminants and moisture, and defeat temperature control in spaces. In this report, the term ventilation refers to mechanical ventilation, unless noted otherwise.

DCYF facilities have been constructed to provide ventilation rates according to the Washington State Mechanical Code which follows the ASHRAE 62.1 & 62.2 ventilation standards. These codes standards have varied over the years generally requiring between six (6) and 20 cubic feet per minute (CFM) of outside air per person. These historical ventilation rates were established to limit the concentration of objectionable odors and secondarily limit acute Sick Building Syndrome but have not been tailored to limit the spread of infectious disease. It is also important to note that these standards and codes were developed as minimum legal limits rather than optimal airflows.

Current scientific opinion is that these historical standards include ventilation rates that are too low for airborne infectious disease control for many space types.

Ventilation Codes have not yet been updated based on experience and research during the COVID-19 pandemic, but ASHRAE recently published a new Standard 241 to address airborne infectious disease control in non-healthcare environments.

Several benchmarks have been used for evaluating the appropriate ventilation airflows:

- ASHRAE Standard 62.1 is the established engineering standard and Mechanical Code basis for ventilation rates, however it is primarily focused on perception of odors and sick building syndrome symptoms, not infectious aerosols.
- A taskforce convened by the Lancet medical journal published similar recommendations for airflow rates tailored to mitigating airborne infectious aerosols.
- ASHRAE Standard 241 released this month (July 2023). This standard focuses specifically on mitigating airborne infectious aerosols.

Both ASHRAE 241 and the Lancet guidelines offer similar criteria, and these are consistent with our engineering and assessment experience through the COVID-19 Pandemic, including major pushes to get schools and offices ready to reopen. The main criteria is the *Equivalent Clean Air for Infection risk mitigation* (*ECAi*). This value accounts for the combined effects of outdoor air and filtration for diluting infectious aerosols.

In terms of balancing practicality and health benefits, we generally recommend setting minimum criteria of:

- Minimum 20 CFM/person of outdoor air supplied to each space. This provides a good level of baseline ventilation to dilute all indoor contaminants.
- *ECAi* per Standard 241

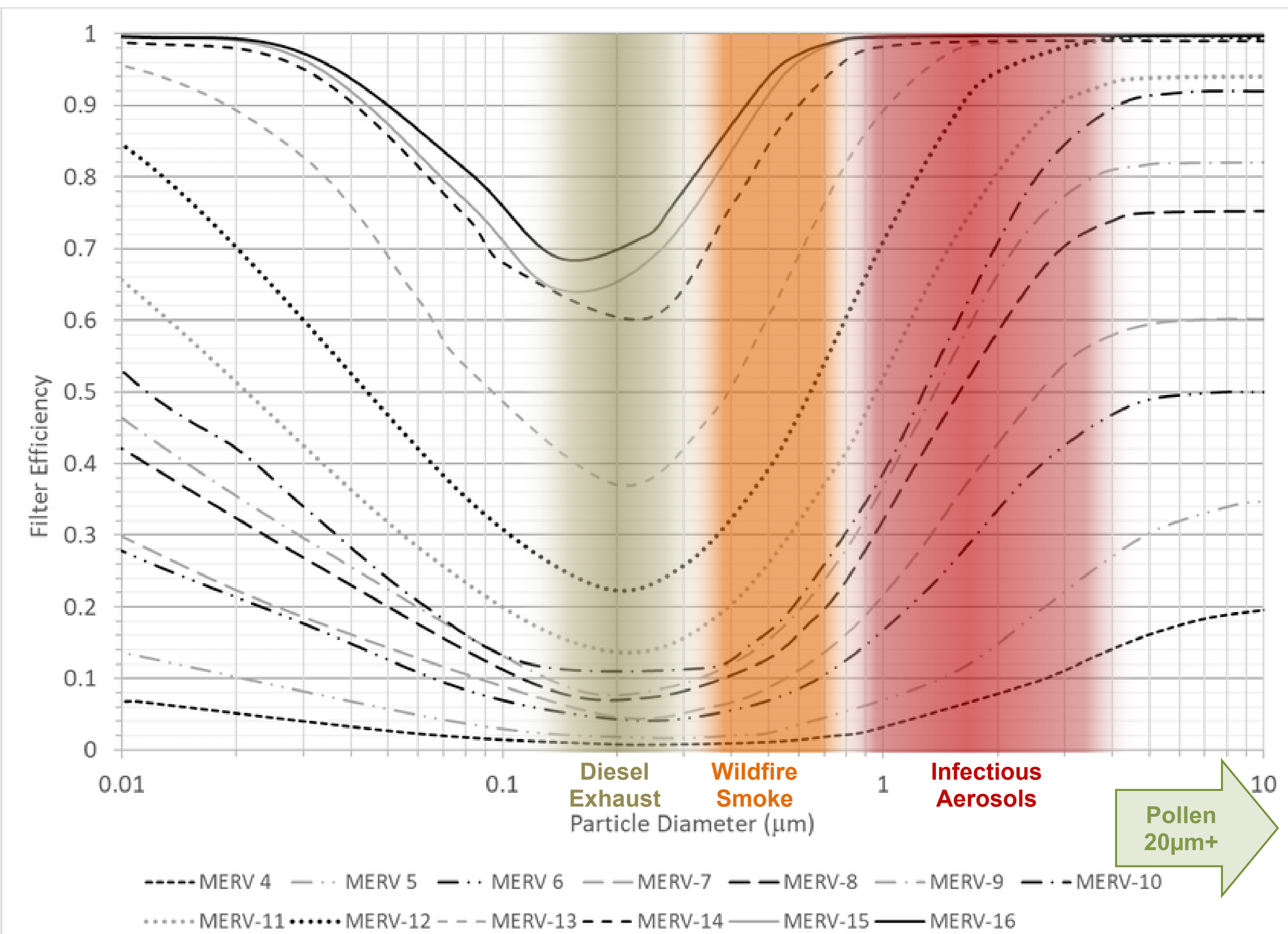
Space Type	*ECAi* (CFM/person)
Sleeping Cell	30
Dayroom	40
Residential Common Spaces	50
Cafeteria	60
Gym	80
Office	40
Classroom	40
Music Classroom/Studio	80

The *ECAi* is typically achievable for typical HVAC systems that mix outdoor and recirculated air if MERV-13 of MERV-14 filters are included.

FILTRATION

Filtration is another critical process for providing a healthy environment.

The effectiveness of filters at removing airborne particles varies with the filter construction as well as the size of the particle. A given filter is typically most effective for particles 5 micrometers (µm) and above and has a minimum effectiveness for particles around 2 µm. The Minimum Efficiency Reporting Value (MERV) rating, defined by ASHRAE Standard 52.2 is the typical way to rate filter performance across all particle sizes, with higher MERV ratings being better, up to MERV-16 as indicated in the figure below.



Beyond MERV-16 are High Efficiency HEPA filters, which must capture 99.97% of all particles greater than 0.3 μm

Most HVAC filters are MERV-8 or lower, which removes a significant portion of large particles, such as visible dust which collect inside HVAC systems and settle out on indoor surfaces. These filters, however, do a poor job removing smaller solid and liquid (aerosol) particles that are a much greater health concern. Particles smaller than 4 μm are typically invisible to the naked eye and will remain airborne for hours if not indefinitely. The smaller they are, the deeper they penetrate our respiratory system, with smaller particles passing through our lung tissue and into the circulatory system where they can affect the entire body. These particles do physical damage and carry dangerous chemicals and infectious microbes. The primary health concern for this assessment is airborne transmission of infectious diseases via exhaled aerosols. These aerosols are primarily concentrated in the 1 to 3μm range.

MERV-13 filters are typically recommended as they remove over 85% of the exhaled aerosol in this range in a single pass. Filters MERV-14 and above will remove nearly all exhaled aerosols in an airstream.

Wildfire smoke is another significant indoor air quality issue for DCYF facilities. Wildfire season now starts as early as June and lasts through September in Washington State. Wildfire smoke is a mixture of airborne particulate and gases. The most dangerous contaminant associated with smoke is particulate, which is generated in massive quantities primarily in the range of 0.4 to 0.7μm. While the concentration of this particulate typically drops with distance to the fire, dangerous concentrations are distributed hundreds of miles. The mixture of toxic gases including ozone, carbon monoxide, benzenes, and aldehydes is a secondary concern. Unfortunately, gaseous toxins pass right through standard particle filtration and specialized filters including a combination of activated carbon and potassium permanganate are needed to adsorb these toxic gases.

Another important function of filtration is pollen removal, as 26% of US adults have been diagnosed with allergic rhinitis (hay fever). In Washington State, different plants produce pollen in succession from Spring through Fall. Fortunately, pollen are relatively large particles and are easily removed by filtration in mechanical systems. While natural ventilation via operable windows is a code compliant and historically common way to dilute indoor contaminants, it is completely unfiltered and introduces all the pollen in the outdoor air. For this reason, we recommend that filtered mechanical ventilation be provided for all indoor spaces. Natural ventilation provisions can be a beneficial supplement to be used during mild weather when no allergic individuals are present.

A critical issue often overlooked is that the performance of some common filters degrades over time. Synthetic pleated filters initially have a static electrical charge that boosts their performance. As the filter ages, this charge wears off and the performance plummets by as much as three MERV points. That means a synthetic filter rated at MERV-13 (85% aerosol removal) will only perform at a MERV-10 level (50% aerosol removal) over time. ASHRAE Standard 52.2 includes an optional rating for long-term performance. Filters' long-term performance is noted by a MERV "A" rating. A synthetic MERV-13 filter will have a long-term performance of MERV-10A, while a fiberglass filter with a MERV-13 rating will also be rated MERV-13A.

In selecting appropriate filters, the filter's airflow restriction must be considered. Air is subject to friction moving through filters, which adds to the pressure that fans must overcome. This friction gets higher the finer the filter mesh. The friction gets lower if the surface area of the filter is increased as the air moves slower through the material. In general, higher filtration rates can be accommodated by selecting a filter with greater internal surface area, adjusting the installation for greater filter face area, or if necessary increasing fan power.

There are many types of filters, but our recommendation for DCYF facilities is to use 12” dcee[MERV-14A V-Bank Filters with 2” MERV-8 Pleated Prefilters. This is consistent with the type of filters installed at the Healthcare Center at Echo Glen Children’s Center.

This combination of filters will achieve excellent removal of aerosols and good removal of PM2.5 substantially improving indoor air quality. Note the 12” V-Bank filters are more costly and space consuming, but the replacement period is much longer. They typically last 18 to 24 months.

ADDRESSING WILDFIRES

Addressing wildfires is an important issue for all locations in Washington, and particularly acute at DCYF facilities from Snoqualmie East where the chances of being in close proximity to wildfires is high. Focus on PM2.5. While toxic gases may be present very near fires, particulate is by far more dangerous. Never compromise particulate levels (High MERV Ratings) during a wildfire event.

For Central and Eastern Washington sites, including Echo Glen, consider stocking 2” pleated filters (~MERV-8) loaded with activated carbon or carbon + potassium permanganate. These can be swapped for standard 2” prefilters to adsorb toxic gases while maintaining MERV-14A filters in place for particulate removal.

Outside of these filter recommendations we highly recommend operators consult ASHRAE’s *Planning Framework For Protecting Commercial Building Occupants from Smoke During Wildfire Events*. This includes excellent recommendations and a proactive process to prepare and adapt facilities to smoke events.

Woodworking Shops

Some DCYF facilities have wood shops. The health impacts of wood dust created by power tools are severely underestimated, but are very serious, including asthma, bronchitis, and cancer. Most people associate woodworking with relatively course sawdust which consists of particles 10 μm and higher, but as with wildfire smoke, invisible fine particles smaller than 5 μm are the main health risk.

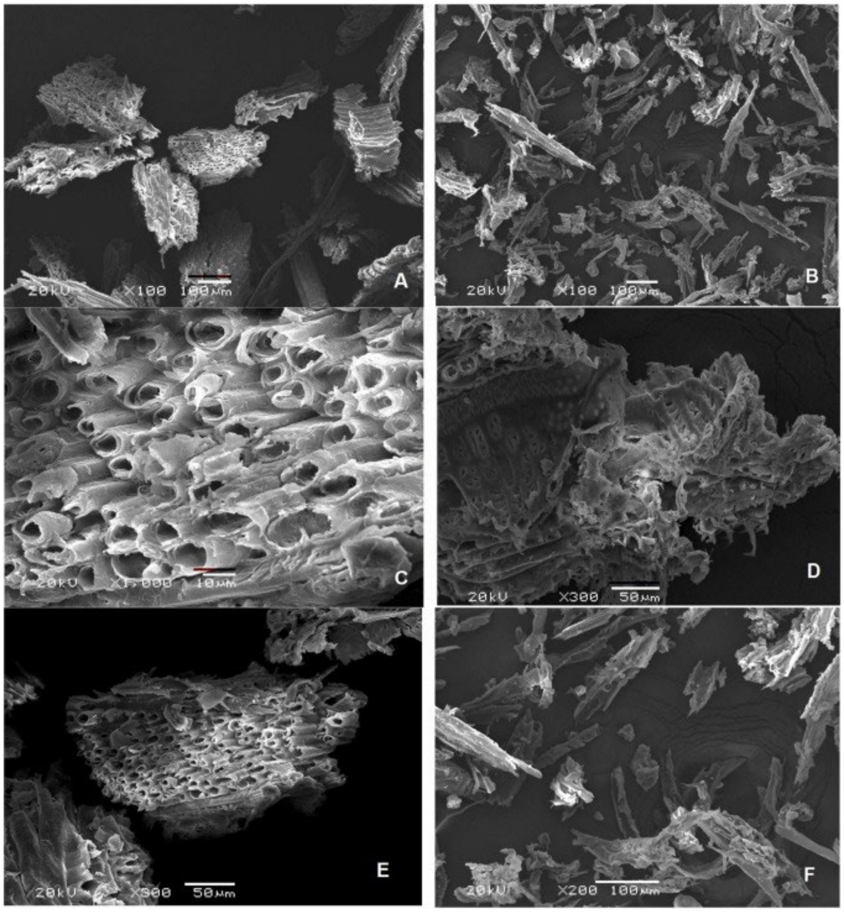


Figure 1: Wood Particles Under Electron Microscope

Alba Santamaría-Herrera, F. Javier Hoyuelos, Carlos Casado-Marcos, Characterization of the explosiveness of wood dust, Process Safety and Environmental Protection, Volume 169, 2023, Pages 252-259

Even assuming good shop practices, woodworking creates massive quantities invisible respirable particulate. These particles carry the same risks as wildfire smoke but are more likely to be chronically present.

Typical source capture is rarely sufficient to keep respirable particles below the EPA’s limit of 0.1 milligrams per cubic meter of indoor air. Effects are usually not immediately apparent but substantially impact lung capacity and health over time.

While fine wood dust is readily dispersed and degraded when exposed to normal outdoor conditions, these particulate stays airborne indefinitely and will not breakdown indoors. This means it can accumulate and migrate to adjacent spaces if HVAC equipment provides inadequate pressure differentials and airflows.

Overall, a layered approach is needed to fully address the risk of fine wood dust:

- Best practice source capture with dust collection outdoors.
- High Air exchanges dilute the fine dust that does escape, diminishing airborne particulate.
- Pressure differential between shop and adjacent spaces. Tightly sealed physical barriers are required in addition to HVAC exhaust and supply to maintain adequate pressure differentials.

We recommend each regularly used wood shop be evaluated by an industrial hygienist to identify and mitigate risks including the critical issue of source capture.

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APPENDIX B

Summary of Intervention Costs and Priorities

WA Juvenile Rehab Ventilation HVAC Improvements

13-Jul-23

BUDGET ESTIMATES SUMMARY In future escalated dollars	COMMUNITY FACILITIES BUDGET	SITE WKS	ECHO GLEN CHILDREN'S CTR. BUDGET	SITE WKS	GREEN HILL SCHOOL BUDGET	SITE WKS	PORTFOLIO TOTALS BUDGET	SITE WKS
2023	$180,455	5	$398,230	12	$358,654	10	**$937,339**	**27**
2024	$3,843,465	2	$2,192,770	27	$16,088,693	124	**$22,124,928**	**153**
2025	$682,517	6	$0	0	$0	0	**$682,517**	**6**
2026	$0	0	$0	0	$0	0	**$0**	**0**
2027	$526,639	2	$5,591,384	0	$2,176,559	15	**$8,294,583**	**17**
2028	$991,370	8	$0	0	$0	0	**$991,370**	**8**
2029	$0	0	$0	0	$0	0	**$0**	**0**
2030	$429,428	3	$1,233,883	36	$1,850,200	12	**$3,513,511**	**51**
2031	$0	0	$0	0	$0	0	**$0**	**0**
2032	$0	0	$0	0	$3,036,785	18	**$3,036,785**	**18**
2033	$303,935	2	$3,496,455	48	$5,222,659	36	**$9,023,050**	**86**
2034	$0	0	$0	0	$0	0	**$0**	**0**
2035	$0	0	$0	0	$0	0	**$0**	**0**
ALL YEARS escalated future dollars	**$6,957,808**	**28**	**$12,912,723**	**123**	**$28,733,551**	**215**	**$48,604,082**	**366**

GENERAL ESTIMATE ASSUMPTIONS

See building specific sheets for exceptions

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING & PROJ. MAN.	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVG. ESCALATION = 6.0% Short Term 4.0% Long Term

End of Budget Estimates Summary

APPENDIX C

Building Cost Estimates

Cost Estimate
Washington State Juvenile Rehabilitation - Ventilation and HVAC Assesssment

Canyon View Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2028	LONG TERM
BASE COST (2023 DOLLARS)		$78,000	$278,000	
BASE COST (ESCALATED)		$82,680	$372,027	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$20,670	$93,007	
TAXES		$8,475	$38,133	
ENGINEERING AND PROJECT MANAGEMENT		$21,200	$74,405	
PERMITS		$5,300	$5,580	
WARRANTY		$827	$3,720	
BOND AND INSURANCE		$4,961	$22,322	
COMMISSIONING		$8,480	$8,480	
OVERHEAD AND PROFIT		$8,268	$37,203	
TOTAL ESTIMATED PROJECT COST		**$160,860**	**$654,876**	
Cost \ Square Foot:		$23	$92	
Onsite Weeks		2	4	

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2028	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$50,000	$200,000	
Test and Balance		$8,000	$8,000	
DIVISION 25 - Controls				
Design & Construction		$5,000	$25,000	
DIVISION 26 - Electrical				
Design & Construction		$0	$30,000	
Miscellaneous				
Architectural Modifications		$15,000	$15,000	
Total		$78,000	$278,000	

ESTIMATE ASSUMPTIONS

BUILDING AREA 7,100 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Oakridge Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2028	LONG TERM 2033
BASE COST (2023 DOLLARS)		$210,000	$140,000	$113,000
BASE COST (ESCALATED)		$222,600	$187,352	$167,268
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$55,650	$46,838	$41,817
TAXES		$22,817	$19,204	$17,145
ENGINEERING AND PROJECT MANAGEMENT		$44,520	$37,470	$33,454
PERMITS		$5,300	$5,300	$6,083
WARRANTY		$2,226	$1,874	$1,673
BOND AND INSURANCE		$13,356	$11,241	$10,036
COMMISSIONING		$8,480	$8,480	$9,733
OVERHEAD AND PROFIT		$22,260	$18,735	$16,727
TOTAL ESTIMATED PROJECT COST		**$397,209**	**$336,493**	**$303,935**
Cost \ Square Foot:		$50	$42	$38
Onsite Weeks		4	4	2

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2028	LONG TERM 2033
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$150,000	$100,000	$80,000
Test and Balance		$10,000	$5,000	$3,000
DIVISION 25 - Controls				
Design & Construction		$20,000	$10,000	$10,000
DIVISION 26 - Electrical				
Design & Construction		$20,000	$10,000	$10,000
Miscellaneous				
Architectural Modifications		$10,000	$15,000	$10,000
Total		$210,000	$140,000	$113,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 8,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Cost Estimate
Washington State Juvenile Rehabilitation - Ventilation and HVAC Assesssment

Parke Creek Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM
BASE COST (2023 DOLLARS)		$706,000	$179,000	
BASE COST (ESCALATED)		$748,360	$225,983	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$187,090	$56,496	
TAXES		$76,707	$23,163	
ENGINEERING AND PROJECT MANAGEMENT		$149,672	$45,197	
PERMITS		$11,225	$5,300	
WARRANTY		$7,484	$2,260	
BOND AND INSURANCE		$44,902	$13,559	
COMMISSIONING		$14,967	$8,480	
OVERHEAD AND PROFIT		$74,836	$22,598	
TOTAL ESTIMATED PROJECT COST		**$1,315,243**	**$403,036**	
Cost \ Square Foot:		$164	$50	
Onsite Weeks		12	2	

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$400,000	$120,000	
Test and Balance		$6,000	$4,000	
DIVISION 25 - Controls				
Design & Construction		$30,000	$30,000	
DIVISION 26 - Electrical				
Design & Construction		$50,000	$15,000	
Miscellaneous				
Replace Single Pane Windows		$180,000		
Architectural Modifications		$20,000	$10,000	
IT and Fire Alarm wiring cleanup in attic		$20,000		
Total		$706,000	$179,000	

ESTIMATE ASSUMPTIONS

BUILDING AREA 8,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Ridgeview Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$488,000		
BASE COST (ESCALATED)		$517,280		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$129,320		
TAXES		$53,021		
ENGINEERING AND PROJECT MANAGEMENT		$103,456		
PERMITS		$7,759		
WARRANTY		$5,173		
BOND AND INSURANCE		$31,037		
COMMISSIONING		$10,346		
OVERHEAD AND PROFIT		$51,728		
TOTAL ESTIMATED PROJECT COST		**$909,120**		
Cost \ Square Foot:		$144		
Onsite Weeks		8		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$350,000		
Test and Balance		$8,000		
DIVISION 25 - Controls				
Design & Construction		$50,000		
DIVISION 26 - Electrical				
Design & Construction		$50,000		
Miscellaneous				
Architectural Modifications		$30,000		
Total		$488,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 6,300 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Sunrise Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM	MID MID TERM 2026	LONG TERM 2030
BASE COST (2023 DOLLARS)	$21,000		$408,000	$183,000
BASE COST (ESCALATED)	$21,000		$485,935	$240,816
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$5,250		$121,484	$60,204
TAXES	$2,153		$49,808	$24,684
ENGINEERING AND PROJECT MANAGEMENT	$5,000 *		$97,187	$48,163
PERMITS			$7,289	$5,624
WARRANTY			$4,859	$2,408
BOND AND INSURANCE	$1,260		$29,156	$14,449
COMMISSIONING	$2,000 *		$9,719	$8,999
OVERHEAD AND PROFIT	$2,100		$48,593	$24,082
TOTAL ESTIMATED PROJECT COST	**$38,763**		**$854,030**	**$429,428**
Cost \ Square Foot:	$7		$155	$78
Onsite Weeks	2		6	3

* Cost tailored to non-construction scope, and not per Development Cost assumptions below.

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM	MID MID TERM 2026	LONG TERM 2030
DIVISION 22 &23 - Plumbing & HVAC				
Construction	$15,000		$300,000	$150,000
Test and Balance	$6,000		$8,000	$3,000
DIVISION 25 - Controls				
Design & Construction			$40,000	$10,000
DIVISION 26 - Electrical				
Design & Construction			$40,000	$10,000
Miscellaneous				
Architectural Modifications			$20,000	$10,000
Total	$21,000		$408,000	$183,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 5,500 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Touchstone Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)	$20,000	$345,000		
BASE COST (ESCALATED)	$20,000	$387,642		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$5,000	$96,911		
TAXES	$2,050	$39,733		
ENGINEERING AND PROJECT MANAGEMENT	$20,000	$77,528		
PERMITS	$5,000	$5,815		
WARRANTY	$200	$3,876		
BOND AND INSURANCE	$1,200	$23,259		
COMMISSIONING	$8,000	$8,989		
OVERHEAD AND PROFIT	$2,000	$38,764		
TOTAL ESTIMATED PROJECT COST	**$63,450**	**$682,517**		
Cost \ Square Foot:	$9	$100		
Onsite Weeks	1	6		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction	$10,000	$300,000 *		
Test and Balance	$5,000	$5,000		
DIVISION 25 - Controls				
Design & Construction		$40,000		
DIVISION 26 - Electrical				
Design & Construction		Separate Rennovation Scope		
Review elec service and system for upgrades and renno.	$5,000			
Miscellaneous				
Architectural Modifications		Separate Rennovation Scope		
Total	$20,000	$345,000		

*Includes allowance for work directly associated with new HVAC systems included a rennovation, but not architectural, structural, electrical, or other work.

ESTIMATE ASSUMPTIONS

BUILDING AREA 6,800 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Twin Rivers Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2036
BASE COST (2023 DOLLARS)	$33,000	$336,000		$215,000
BASE COST (ESCALATED)	$33,000	$356,160		$357,991
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$8,250	$89,040		$89,498
TAXES	$3,383	$36,506		$36,694
ENGINEERING AND PROJECT MANAGEMENT	$20,000	$71,232		$71,598
PERMITS		$5,342		$5,370
WARRANTY	$330	$3,562		$3,580
BOND AND INSURANCE	$1,980	$21,370		$21,479
COMMISSIONING	$8,000	$8,480		$7,160
OVERHEAD AND PROFIT	$3,300	$35,616		$35,799
TOTAL ESTIMATED PROJECT COST	**$78,243**	**$627,308**		**$629,169**
Cost \ Square Foot:	$13	$105		$105
Onsite Weeks	2	6		6

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2036
DIVISION 22 &23 - Plumbing & HVAC				
Construction	$20,000	$200,000		$150,000
Test and Balance	$8,000	$6,000		$4,000
DIVISION 25 - Controls				
Design & Construction		$40,000		$30,000
DIVISION 26 - Electrical				
Design & Construction	$5,000	$40,000		$25,000
Miscellaneous				
Architectural Modifications		$50,000		$6,000
Total	$33,000	$336,000		$215,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 6,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Woodinville Community Facility

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM
BASE COST (2023 DOLLARS)		$230,000	$44,000	
BASE COST (ESCALATED)		$243,800	$55,549	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$60,950	$13,887	
TAXES		$24,990	$5,694	
ENGINEERING AND PROJECT MANAGEMENT		$48,760	$25,250	
PERMITS		$5,300	$5,300	
WARRANTY		$2,438	$555	
BOND AND INSURANCE		$14,628	$3,333	
COMMISSIONING		$8,480	$8,480	
OVERHEAD AND PROFIT		$24,380	$5,555	
TOTAL ESTIMATED PROJECT COST		**$433,726**	**$123,603**	
Cost \ Square Foot:		$75	$21	
Onsite Weeks		5		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$170,000	$30,000	
Test and Balance		$5,000	$3,000	
DIVISION 25 - Controls				
Design & Construction		$20,000	$3,000	
DIVISION 26 - Electrical				
Design & Construction		$20,000	$3,000	
Miscellaneous				
Architectural Modifications		$15,000	$5,000	
Total		$230,000	$44,000	

ESTIMATE ASSUMPTIONS

BUILDING AREA 5,800 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Cottage 1

Cottage 2&3 Same

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE	SHORT TERM	MID MID TERM	LONG TERM
	2023	0	2026	2030
BASE COST (2023 DOLLARS)			$25,000	$175,000
BASE COST (ESCALATED)			$29,775	$230,288
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY			$7,444	$57,572
TAXES			$3,052	$23,605
ENGINEERING AND PROJECT MANAGEMENT			$23,820	$46,058
PERMITS				$5,624
WARRANTY			$298	$2,303
BOND AND INSURANCE			$1,787	$13,817
COMMISSIONING			$596	$8,999
OVERHEAD AND PROFIT			$2,978	$23,029
TOTAL ESTIMATED PROJECT COST			**$69,749**	**$411,294**
Cost \ Square Foot:			$12	$71
Onsite Weeks			2	12

COST BREAKDOWN in 2023 dollars	IMMEDIATE	SHORT TERM	MID MID TERM	LONG TERM
	2023		2026	2030
DIVISION 22 &23 - Plumbing & HVAC				
Construction			$20,000	$100,000
Test and Balance			$5,000	$10,000
DIVISION 25 - Controls				
Design & Construction				$25,000
DIVISION 26 - Electrical				
Design & Construction				$25,000
Miscellaneous				
Architectural Modifications				$15,000
Total			$25,000	$175,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 5,800 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Cottage 5

Cottage 6-8 Same

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM	MID MID TERM 2027	LONG TERM
BASE COST (2023 DOLLARS)	$47,000		$630,000	
BASE COST (ESCALATED)	$47,000		$795,360	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$11,750		$198,840	
TAXES	$4,818		$81,524	
ENGINEERING AND PROJECT MANAGEMENT	$20,000		$159,072	
PERMITS			$11,930	
WARRANTY	$470		$7,954	
BOND AND INSURANCE	$2,820		$47,722	
COMMISSIONING	$8,000		$15,907	
OVERHEAD AND PROFIT	$4,700		$79,536	
TOTAL ESTIMATED PROJECT COST	**$99,558**		**$1,397,846**	
Cost \ Square Foot:	$17		$241	
Onsite Weeks	3		18	

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM	MID MID TERM 2027	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction	$20,000		$250,000	
Test and Balance	$12,000		$10,000	
DIVISION 25 - Controls				
Design & Construction	$15,000		$50,000	
DIVISION 26 - Electrical				
Design & Construction			$85,000	
Miscellaneous				
Architectural Modifications			$235,000	
Total	$47,000		$630,000	

ESTIMATE ASSUMPTIONS

BUILDING AREA 5,800 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Cottage 9

Cottage 10 Same

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2033
BASE COST (2023 DOLLARS)		$95,000		$336,000
BASE COST (ESCALATED)		$100,700		$497,362
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$25,175		$124,341
TAXES		$10,322		$50,980
ENGINEERING AND PROJECT MANAGEMENT		$21,200		$99,472
PERMITS		$5,300		$7,460
WARRANTY		$1,007		$4,974
BOND AND INSURANCE		$6,042		$29,842
COMMISSIONING		$8,480		$9,947
OVERHEAD AND PROFIT		$10,070		$49,736
TOTAL ESTIMATED PROJECT COST		**$188,296**		**$874,114**
Cost \ Square Foot:		$32		$151
Onsite Weeks		4		12

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2033
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$35,000		$150,000
Test and Balance		$5,000		$5,000
DIVISION 25 - Controls				
Design & Construction		$25,000		$75,000
DIVISION 26 - Electrical				
Design & Construction		$25,000		$100,000
Miscellaneous				
Architectural Modifications		$5,000		$6,000
Total		$95,000		$336,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 5,800 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Cottage 12

Cottage 13 Same

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2033
BASE COST (2023 DOLLARS)		$27,000		$336,000
BASE COST (ESCALATED)		$28,620		$497,362
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$7,155		$124,341
TAXES		$2,934		$50,980
ENGINEERING AND PROJECT MANAGEMENT		$21,200		$99,472
PERMITS				$7,460
WARRANTY		$286		$4,974
BOND AND INSURANCE		$1,717		$29,842
COMMISSIONING		$8,480		$9,947
OVERHEAD AND PROFIT		$2,862		$49,736
TOTAL ESTIMATED PROJECT COST		**$73,254**		**$874,114**
Cost \ Square Foot:		$13		$151
Onsite Weeks		2		12

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2033
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$15,000		$150,000
Test and Balance		$5,000		$5,000
DIVISION 25 - Controls				
Design & Construction		$5,000		$75,000
DIVISION 26 - Electrical				
Design & Construction				$100,000
Miscellaneous				
Architectural Modifications		$2,000		$6,000
Total		$27,000		$336,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 5,800 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Commissary Building

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$1,610,000		
BASE COST (ESCALATED)		$1,706,600		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$426,650		
TAXES		$174,927		
ENGINEERING AND PROJECT MANAGEMENT		$341,320		
PERMITS		$25,599		
WARRANTY		$17,066		
BOND AND INSURANCE		$102,396		
COMMISSIONING		$34,132		
OVERHEAD AND PROFIT		$170,660		
TOTAL ESTIMATED PROJECT COST		**$2,999,350**		
Cost \ Square Foot:		$130		
Onsite Weeks		24		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$1,000,000		
Test and Balance		$10,000		
DIVISION 25 - Controls				
Design & Construction		$200,000		
DIVISION 26 - Electrical				
Design & Construction		$200,000		
Miscellaneous				
Architectural Modifications		$200,000		
Total		$1,610,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 23,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Administrative Building

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$378,000		
BASE COST (ESCALATED)		$400,680		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$100,170		
TAXES		$41,070		
ENGINEERING AND PROJECT MANAGEMENT		$80,136		
PERMITS		$6,010		
WARRANTY		$4,007		
BOND AND INSURANCE		$24,041		
COMMISSIONING		$8,480		
OVERHEAD AND PROFIT		$40,068		
TOTAL ESTIMATED PROJECT COST		**$704,662**		
Cost \ Square Foot:		$176		
Onsite Weeks		6		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$170,000		
Test and Balance		$8,000		
DIVISION 25 - Controls				
Design & Construction		$50,000		
DIVISION 26 - Electrical				
Design & Construction		$50,000		
Miscellaneous				
Architectural Modifications		$100,000		
Total		$378,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 4,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Health Center

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$480,000		
BASE COST (ESCALATED)		$508,800		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$127,200		
TAXES		$52,152		
ENGINEERING AND PROJECT MANAGEMENT		$101,760		
PERMITS		$7,632		
WARRANTY		$5,088		
BOND AND INSURANCE		$30,528		
COMMISSIONING		$10,176		
OVERHEAD AND PROFIT		$50,880		
TOTAL ESTIMATED PROJECT COST		**$894,216**		
Cost \ Square Foot:		$142		
Onsite Weeks		7		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$170,000		
Test and Balance		$10,000		
DIVISION 25 - Controls				
Design & Construction		$50,000		
DIVISION 26 - Electrical				
Design & Construction		$50,000		
Miscellaneous				
Architectural Modifications		$200,000		
Total		$480,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 6,300 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Social Services Building

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$480,000		
BASE COST (ESCALATED)		$508,800		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$127,200		
TAXES		$52,152		
ENGINEERING AND PROJECT MANAGEMENT		$101,760		
PERMITS		$7,632		
WARRANTY		$5,088		
BOND AND INSURANCE		$30,528		
COMMISSIONING		$10,176		
OVERHEAD AND PROFIT		$50,880		
TOTAL ESTIMATED PROJECT COST		**$894,216**		
Cost \ Square Foot:		$242		
Onsite Weeks		7		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$170,000		
Test and Balance		$10,000		
DIVISION 25 - Controls				
Design & Construction		$50,000		
DIVISION 26 - Electrical				
Design & Construction		$50,000		
Miscellaneous				
Architectural Modifications		$200,000		
Total		$480,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 3,700 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center School Library and Administration Bldg.

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$388,000		
BASE COST (ESCALATED)		$435,957		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$108,989		
TAXES		$44,686		
ENGINEERING AND PROJECT MANAGEMENT		$87,191		
PERMITS		$6,539		
WARRANTY		$4,360		
BOND AND INSURANCE		$26,157		
COMMISSIONING		$8,989		
OVERHEAD AND PROFIT		$43,596		
TOTAL ESTIMATED PROJECT COST		**$766,464**		
Cost \ Square Foot:		$150		
Onsite Weeks		6		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$200,000		
Test and Balance		$8,000		
DIVISION 25 - Controls				
Design & Construction		$50,000		
DIVISION 26 - Electrical				
Design & Construction		$50,000		
Miscellaneous				
Architectural Modifications		$80,000		
Total		$388,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 5,100 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Classroom Buildings

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 0	LONG TERM 0
BASE COST (2023 DOLLARS)		$820,000		
BASE COST (ESCALATED)		$869,200		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$217,300		
TAXES		$89,093		
ENGINEERING AND PROJECT MANAGEMENT		$173,840		
PERMITS		$13,038		
WARRANTY		$8,692		
BOND AND INSURANCE		$52,152		
COMMISSIONING		$17,384		
OVERHEAD AND PROFIT		$86,920		
TOTAL ESTIMATED PROJECT COST		**$1,527,619**		
Cost \ Square Foot:		$204		
Onsite Weeks		12		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$400,000		
Test and Balance		$20,000		
DIVISION 25 - Controls				
Design & Construction		$100,000		
DIVISION 26 - Electrical				
Design & Construction		$150,000		
Miscellaneous				
Architectural Modifications		$150,000		
Total		$820,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 7,500 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION — Short/Mid Term = 6.0% — Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Recreation Building

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$1,120,000		
BASE COST (ESCALATED)		$1,187,200		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$296,800		
TAXES		$121,688		
ENGINEERING AND PROJECT MANAGEMENT		$237,440		
PERMITS		$17,808		
WARRANTY		$11,872		
BOND AND INSURANCE		$71,232		
COMMISSIONING		$23,744		
OVERHEAD AND PROFIT		$118,720		
TOTAL ESTIMATED PROJECT COST		**$2,086,504**		
Cost \ Square Foot:		$110		
Onsite Weeks		16		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$700,000		
Test and Balance		$20,000		
DIVISION 25 - Controls				
Design & Construction		$100,000		
DIVISION 26 - Electrical				
Design & Construction		$150,000		
Miscellaneous				
Architectural Modifications		$150,000		
Total		$1,120,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 19,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Vocational Building

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM 2026	LONG TERM
BASE COST (2023 DOLLARS)		$120,000	$110,000	
BASE COST (ESCALATED)		$134,832	$131,012	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$33,708	$32,753	
TAXES		$13,820	$13,429	
ENGINEERING AND PROJECT MANAGEMENT		$26,966	$26,202	
PERMITS		$5,618	$5,618	
WARRANTY		$1,348	$1,310	
BOND AND INSURANCE		$8,090	$7,861	
COMMISSIONING		$8,989	$8,989	
OVERHEAD AND PROFIT		$13,483	$13,101	
TOTAL ESTIMATED PROJECT COST		**$246,855**	**$240,275**	
Cost \ Square Foot:		$25	$24	
Onsite Weeks		8	6	

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM 2026	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction			$50,000	
Test and Balance		$10,000	$10,000	
DIVISION 25 - Controls				
Design & Construction		$100,000	$20,000	
DIVISION 26 - Electrical				
Design & Construction			$20,000	
Miscellaneous				
Architectural Modifications		$10,000	$10,000	
Total		$120,000	$110,000	

ESTIMATE ASSUMPTIONS

BUILDING AREA 10,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Classroom 9/10

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$5,000		
BASE COST (ESCALATED)		$5,300		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$1,325		
TAXES		$543		
ENGINEERING AND PROJECT MANAGEMENT		$10,000 *		
PERMITS				
WARRANTY				
BOND AND INSURANCE				
COMMISSIONING				
OVERHEAD AND PROFIT		$530		
TOTAL ESTIMATED PROJECT COST		**$17,698**		
Cost \ Square Foot:		$7		
Onsite Weeks		0.5		

*Value is below standard minimum assumption due to simple nature of work.

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction				
Test and Balance		$5,000		
DIVISION 25 - Controls				
Design & Construction				
DIVISION 26 - Electrical				
Design & Construction				
Miscellaneous				
Architectural Modifications				
Total		$5,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 2,500 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Classroom 12/13

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$5,000		
BASE COST (ESCALATED)		$5,300		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$1,325		
TAXES		$543		
ENGINEERING AND PROJECT MANAGEMENT		$10,000 *		
PERMITS				
WARRANTY				
BOND AND INSURANCE				
COMMISSIONING				
OVERHEAD AND PROFIT		$530		
TOTAL ESTIMATED PROJECT COST		**$17,698**		
Cost \ Square Foot:		$7		
Onsite Weeks		0.5		

*Value is below standard minimum assumption listed below due to simple nature of work.

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction				
Test and Balance		$5,000		
DIVISION 25 - Controls				
Design & Construction				
DIVISION 26 - Electrical				
Design & Construction				
Miscellaneous				
Architectural Modifications				
Total		$5,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 2,500 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Main Maintenance Building

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2028	LONG TERM
BASE COST (2023 DOLLARS)		$5,000	$40,000	
BASE COST (ESCALATED)		$5,300	$53,529	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$1,325	$13,382	
TAXES		$543	$5,487	
ENGINEERING AND PROJECT MANAGEMENT		$5,000 *	$26,765	
PERMITS			$5,300	
WARRANTY			$535	
BOND AND INSURANCE			$3,212	
COMMISSIONING			$8,480	
OVERHEAD AND PROFIT		$530	$5,353	
TOTAL ESTIMATED PROJECT COST		**$12,698**	**$122,042**	
Cost \ Square Foot:		$2	$15	
Onsite Weeks		1	1	

* Value is below standard minimum costs noted below

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2028	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction			$10,000	
Test and Balance		$5,000	$5,000	
DIVISION 25 - Controls				
Design & Construction			$10,000	
DIVISION 26 - Electrical				
Design & Construction			$10,000	
Miscellaneous				
Architectural Modifications			$5,000	
Total	$0	$5,000	$40,000	$0

ESTIMATE ASSUMPTIONS

BUILDING AREA 8,200 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Echo Glen Children's Center Canine Building

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM	LONG TERM
BASE COST (2023 DOLLARS)		$40,000		
BASE COST (ESCALATED)		$44,944		
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$11,236		
TAXES		$4,607		
ENGINEERING AND PROJECT MANAGEMENT		$22,472		
PERMITS		$5,618		
WARRANTY		$449		
BOND AND INSURANCE		$2,697		
COMMISSIONING		$8,989		
OVERHEAD AND PROFIT		$4,494		
TOTAL ESTIMATED PROJECT COST		**$105,506**		
Cost \ Square Foot:		$66		
Onsite Weeks		1		

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2025	MID MID TERM	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$10,000		
Test and Balance		$5,000		
DIVISION 25 - Controls				
Design & Construction		$10,000		
DIVISION 26 - Electrical				
Design & Construction		$10,000		
Miscellaneous				
Architectural Modifications		$5,000		
Total		$40,000		

ESTIMATE ASSUMPTIONS

BUILDING AREA 1,600 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Central Plant Building Z

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM	MID MID TERM 2027	LONG TERM 2035
BASE COST (2023 DOLLARS)	$1,150,000		$371,000	$101,000
BASE COST (ESCALATED)	$1,150,000		$468,379	$161,704
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$287,500		$117,095	$40,426
TAXES	$117,875		$48,009	$16,575
ENGINEERING AND PROJECT MANAGEMENT	$230,000		$93,676	$32,341
PERMITS			$7,026	$5,849
WARRANTY			$4,684	$1,617
BOND AND INSURANCE	$69,000		$28,103	$9,702
COMMISSIONING	$23,000		$9,368	$9,359
OVERHEAD AND PROFIT	$115,000		$46,838	$16,170
TOTAL ESTIMATED PROJECT COST	**$1,992,375**		**$823,176**	**$293,744**
Cost \ Square Foot:	$237		$98	$35
Onsite Weeks	2	50 *	5	4

*Hours are continuation of controls work contracted in 2023

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM	MID MID TERM 2027	LONG TERM 2035
DIVISION 22 &23 - Plumbing & HVAC				
Construction			$220,000	$50,000
Test and Balance			$20,000	
DIVISION 25 - Controls				
Design & Construction	$1,100,000		$15,000	$20,000
DIVISION 26 - Electrical				
Design & Construction			$110,000	$25,000
Miscellaneous				
Architectural Modifications			$6,000	$6,000
Campus Heating Water System Corrosion Inspection	$50,000			
Total	$1,150,000		$371,000	$101,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 8,400 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Hawthorn (H) Building 41 (S & M Similar)

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2026	LONG TERM
BASE COST (2023 DOLLARS)	$28,700	$1,185,333	$197,000	
BASE COST (ESCALATED)	$28,700	$1,256,453	$234,630	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$7,175	$314,113	$58,658	
TAXES	$2,942	$128,786	$24,050	
ENGINEERING AND PROJECT MANAGEMENT	$20,000	$251,291	$46,926	
PERMITS		$18,847	$5,300	
WARRANTY		$12,565	$2,346	
BOND AND INSURANCE	$1,722	$75,387	$14,078	
COMMISSIONING	$8,000	$25,129	$10,000 *	
OVERHEAD AND PROFIT	$2,870	$125,645	$23,463	
TOTAL ESTIMATED PROJECT COST	**$71,409**	**$2,208,217**	**$419,450**	
Cost \ Square Foot:	$4	$123	$23	
Onsite Weeks	2	10	3	

* Intentionally above estimate assumptions below.

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2026	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction	$6,700	$840,000	$100,000	
Test and Balance	$12,000	$12,000	$10,000	
DIVISION 25 - Controls				
Design & Construction		$150,000	$20,000	
DIVISION 26 - Electrical				
Design & Construction		$83,333	$50,000	
Miscellaneous				
Architectural Modifications	$10,000	$100,000	$17,000	
Total	$28,700	$1,185,333	$197,000	

ESTIMATE ASSUMPTIONS

BUILDING AREA 18,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Cedar, Menal Health Unit Building 51

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2033
BASE COST (2023 DOLLARS)		$209,000		$664,000
BASE COST (ESCALATED)		$221,540		$982,882
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$55,385		$245,721
TAXES		$22,708		$100,745
ENGINEERING AND PROJECT MANAGEMENT		$44,308		$196,576
PERMITS		$5,300		$14,743
WARRANTY		$2,215		$9,829
BOND AND INSURANCE		$13,292		$58,973
COMMISSIONING		$8,480		$19,658
OVERHEAD AND PROFIT		$22,154		$98,288
TOTAL ESTIMATED PROJECT COST		**$395,383**		**$1,727,415**
Cost \ Square Foot:		$22		$96
Onsite Weeks		12		12

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM	LONG TERM 2033
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$45,000		$500,000
Test and Balance		$14,000		$14,000
DIVISION 25 - Controls				
Design & Construction		$100,000		$50,000
DIVISION 26 - Electrical				
Design & Construction				$50,000
Miscellaneous				
Architectural Modifications				
Struc Review and Strengthening MSU Support		$50,000		$50,000
Total		$209,000		$664,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 18,000 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Willow, IMU Building W

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2030
BASE COST (2023 DOLLARS)		$196,000	$320,000	$800,000
BASE COST (ESCALATED)		$207,760	$403,993	$1,052,745
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$51,940	$100,998	$263,186
TAXES		$21,295	$41,409	$107,906
ENGINEERING AND PROJECT MANAGEMENT		$41,552	$80,799	$210,549
PERMITS		$5,300	$6,060	$15,791
WARRANTY		$2,078	$4,040	$10,527
BOND AND INSURANCE		$12,466	$24,240	$63,165
COMMISSIONING		$8,480	$8,480	$21,055
OVERHEAD AND PROFIT		$20,776	$40,399	$105,275
TOTAL ESTIMATED PROJECT COST		**$371,647**	**$710,417**	**$1,850,200**
Cost \ Square Foot:		$17	$32	$83
Onsite Weeks		12	5	12

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2030
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$50,000	$100,000	$600,000
Test and Balance		$20,000		$20,000
DIVISION 25 - Controls				
Design & Construction		$120,000	$20,000	$60,000
DIVISION 26 - Electrical				
Design & Construction			$150,000	$60,000
Miscellaneous				
Architectural Modifications		$6,000	$50,000	$60,000
Total		$196,000	$320,000	$800,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 22,400 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Health Care & Administration (HCA) Building X

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2026	LONG TERM 2032
BASE COST (2023 DOLLARS)	$34,000	$150,000	$105,000	$1,214,000
BASE COST (ESCALATED)	$34,000	$159,000	$125,057	$1,727,901
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$8,500	$39,750	$31,264	$431,975
TAXES	$3,485	$16,298	$12,818	$177,110
ENGINEERING AND PROJECT MANAGEMENT	$20,000	$31,800	$25,011	$345,580
PERMITS		$5,300	$5,300	$25,919
WARRANTY	$340	$1,590	$1,251	$17,279
BOND AND INSURANCE	$2,040	$9,540	$7,503	$103,674
COMMISSIONING	$25,000 *	$8,480	$8,480	$34,558
OVERHEAD AND PROFIT	$3,400	$15,900	$12,506	$172,790
TOTAL ESTIMATED PROJECT COST	**$96,765**	**$287,658**	**$229,190**	**$3,036,785**
Cost \ Square Foot:	$5	$14	$11	$147
Onsite Weeks	2	6	2	18

*Allowance is above typical assumptions below for room pressurization and additional troubleshooting

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2026	LONG TERM 2032
DIVISION 22 &23 - Plumbing & HVAC				
Construction	$20,000		$50,000	$850,000
Test and Balance	$14,000			$14,000
DIVISION 25 - Controls				
Design & Construction		$150,000	$15,000	$100,000
DIVISION 26 - Electrical				
Design & Construction			$40,000	$150,000
Miscellaneous				
Architectural Modifications				$100,000
Total	$34,000	$150,000	$105,000	$1,214,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 20,700 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Security and Visiting Building A

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM
BASE COST (2023 DOLLARS)	$13,000	$1,160,000	$90,000	
BASE COST (ESCALATED)	$13,000	$1,229,600	$113,623	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY	$3,250	$307,400	$28,406	
TAXES	$1,333	$126,034	$11,646	
ENGINEERING AND PROJECT MANAGEMENT	$20,000	$245,920	$25,250	
PERMITS		$18,444	$5,300	
WARRANTY		$12,296	$1,136	
BOND AND INSURANCE	$780	$73,776	$6,817	
COMMISSIONING	$8,000	$24,592	$10,000	
OVERHEAD AND PROFIT	$1,300	$122,960	$11,362	
TOTAL ESTIMATED PROJECT COST	**$47,663**	**$2,161,022**	**$213,540**	
Cost \ Square Foot:	$6	$281	$28	
Onsite Weeks	2	16	2	

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM
DIVISION 22 &23 - Plumbing & HVAC				
Construction	$5,000	$800,000	$50,000	
Test and Balance	$8,000	$10,000		
DIVISION 25 - Controls				
Design & Construction		$150,000		
DIVISION 26 - Electrical				
Design & Construction		$150,000	$40,000	
Miscellaneous				
Architectural Modifications		$50,000		
Total	$13,000	$1,160,000	$90,000	

ESTIMATE ASSUMPTIONS

BUILDING AREA 7,700 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Dining Building D

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2033
BASE COST (2023 DOLLARS)		$770,000	$250,000	$1,270,000
BASE COST (ESCALATED)		$816,200	$315,619	$1,879,910
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$204,050	$78,905	$469,978
TAXES		$83,661	$32,351	$192,691
ENGINEERING AND PROJECT MANAGEMENT		$163,240	$63,124	$375,982
PERMITS		$12,243	$5,300	$28,199
WARRANTY		$8,162	$3,156	$18,799
BOND AND INSURANCE		$48,972	$18,937	$112,795
COMMISSIONING		$16,324	$8,480	$37,598
OVERHEAD AND PROFIT		$81,620	$31,562	$187,991
TOTAL ESTIMATED PROJECT COST		**$1,434,472**	**$557,434**	**$3,303,942**
Cost \ Square Foot:		$43	$17	$99
Onsite Weeks		16	3	12

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2033
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$400,000	$150,000	$850,000
Test and Balance		$10,000	$4,000	$20,000
DIVISION 25 - Controls				
Design & Construction		$150,000	$20,000	$200,000
DIVISION 26 - Electrical				
Design & Construction		$150,000	$70,000	$150,000
Miscellaneous				
Architectural Modifications		$60,000	$6,000	$50,000
Total		$770,000	$250,000	$1,270,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 33,500 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Vocational Building V

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2033
BASE COST (2023 DOLLARS)		$1,420,000	$196,000	$65,000
BASE COST (ESCALATED)		$1,505,200	$247,445	$96,216
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$376,300	$61,861	$24,054
TAXES		$154,283	$25,363	$9,862
ENGINEERING AND PROJECT MANAGEMENT		$301,040	$49,489	$29,605
PERMITS		$22,578	$5,300	$5,849
WARRANTY		$15,052	$2,474	$962
BOND AND INSURANCE		$90,312	$14,847	$5,773
COMMISSIONING		$30,104	$8,480	$9,359
OVERHEAD AND PROFIT		$150,520	$24,745	$9,622
TOTAL ESTIMATED PROJECT COST		**$2,645,389**	**$440,005**	**$191,302**
Cost \ Square Foot:		$73	$12	$5
Onsite Weeks		16	3	12

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2033
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$1,000,000	$70,000	$15,000
Test and Balance		$20,000		$10,000
DIVISION 25 - Controls				
Design & Construction		$150,000	$20,000	$40,000
DIVISION 26 - Electrical				
Design & Construction		$150,000	$100,000	
Miscellaneous				
Architectural Modifications		$100,000	$6,000	
Total		$1,420,000	$196,000	$65,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 36,100 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Multipurpose Building F

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID TERM	LONG TERM 2031
BASE COST (2023 DOLLARS)		$125,000		$355,000
BASE COST (ESCALATED)		$132,500		$485,842
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$33,125		$121,461
TAXES		$13,581		$49,799
ENGINEERING AND PROJECT MANAGEMENT		$26,500		$97,168
PERMITS		$5,300		$7,288
WARRANTY		$1,325		$4,858
BOND AND INSURANCE		$7,950		$29,151
COMMISSIONING		$8,480		$9,717
OVERHEAD AND PROFIT		$13,250		$48,584
TOTAL ESTIMATED PROJECT COST		**$242,011**		**$853,867**
Cost \ Square Foot:		$73		$259
Onsite Weeks	1	2		4

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID TERM	LONG TERM 2031
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$50,000		$150,000
Test and Balance	$5,000	$5,000		$5,000
DIVISION 25 - Controls				
Design & Construction		$40,000		$50,000
DIVISION 26 - Electrical				
Design & Construction		$20,000		$100,000
Miscellaneous				
Architectural Modifications		$10,000		$50,000
Total		$125,000		$355,000

ESTIMATE ASSUMPTIONS

BUILDING AREA 3,300 SQFT

DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

Green Hill School Vocational Building Y

13-Jul-23

PROJECT ESTIMATE SUMMARY	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2033
BASE COST (2023 DOLLARS)		$1,164,000	$111,000	
BASE COST (ESCALATED)		$1,233,840	$140,135	
DEVELOPMENT COSTS (ESCALATED)				
CONTINGENCY		$308,460	$35,034	
TAXES		$126,469	$14,364	
ENGINEERING AND PROJECT MANAGEMENT		$246,768	$28,027	
PERMITS		$18,508	$5,300	
WARRANTY		$12,338	$1,401	
BOND AND INSURANCE		$74,030	$8,408	
COMMISSIONING		$24,677	$8,480	
OVERHEAD AND PROFIT		$123,384	$14,013	
TOTAL ESTIMATED PROJECT COST		**$2,168,474**	**$255,162**	
Cost \ Square Foot:		$78	$9	
Onsite Weeks		16	2	

COST BREAKDOWN in 2023 dollars	IMMEDIATE 2023	SHORT TERM 2024	MID MID TERM 2027	LONG TERM 2033
DIVISION 22 &23 - Plumbing & HVAC				
Construction		$650,000	$50,000	
Test and Balance		$14,000		
DIVISION 25 - Controls				
Design & Construction		$100,000	$15,000	
DIVISION 26 - Electrical				
Design & Construction		$200,000	$40,000	
Relocate Main Electrical Panel			Reccommendation not costed in this scope	
Miscellaneous				
Architectural Modifications		$200,000	$6,000	
Total		$1,164,000	$111,000	$0

ESTIMATE ASSUMPTIONS

BUILDING AREA 27,800 SQFT

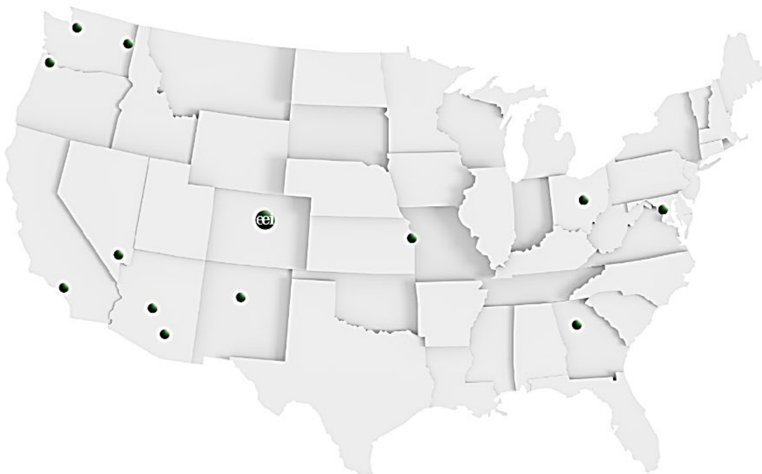
DEVELOPMENT COSTS			MINIMUMS
CONTINGENCY	=	25.0%	
TAXES	=	10.25%	
ENGINEERING AND PROJECT MANAGEMENT	=	20.0%	$20,000
PERMITS	=	1.50%	$5,000
WARRANTY	=	1.00%	
BOND AND INSURANCE	=	6.0%	
COMMISSIONING	=	2.0%	$8,000
OVERHEAD AND PROFIT	=	10.0%	

ANNUAL AVERAGE ESCALATION Short/Mid Term = 6.0% Long Term = 4.0%

End of Building Cost Estimates

CONTACT US

ENGINEERING ECONOMICS, INC.



LOCATIONS

Arizona (Phoenix) | Arizona (Tucson) | California | Colorado | Georgia
Kansas | Nevada | New Mexico | Ohio | Oregon
Washington (Liberty Lake) | Washington (Seattle) | Washington D.C.

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