The Evergreen State College

2021-23 CAPITAL PROJECT EVALUATION

LAB II HVAC UPGRADE

2020 PROJECT PROPOSAL CHECKLIST
2021-23 Biennium Four-year Higher Education Scoring Process

INSTITUTION	CAMPUS LOCATION
376 - The Evergreen State College	Olympia
PROJECT TITLE	**FPMT UNIQUE FACILITY ID # (OR NA)**
LAB II HVAC Upgrade	N/A
PROJECT CATEGORY	**PROJECT SUBCATEGORY**
Infrastructure	Standalone
PROPOSAL IS	
New or Updated Proposal (for scoring)	Resubmitted Proposal (retain prior score)
☒ New proposal ☐ Resubmittal to be scored (more than 2 biennia old or significantly changed)	☐ Resubmittal from 2017-19 biennium ☐ Resubmittal from 2019-21 biennium
CONTACT	**PHONE NUMBER**
William Ward	360 867 6115

PROPOSAL CONTENT

- ☒ Project Proposal Checklist: this form; one for each proposal
- ☒ Project Proposal Form: Specific to category/subcategory (10-page limit)
- ☒ Appendices: templates, forms, exhibits and supporting/supplemental documentation for scoring.

INSTITUTIONAL PRIORITY

- ☒ Institutional Priority Form. Sent separately (not in this packet) to: Darrell Jennings.

Check the corresponding boxes below if the proposed project meets the minimum threshold or if the item listed is provided in the proposal submittal.

MINIMUM THRESHOLDS

- ☒ Project is not an exclusive enterprise function such as a bookstore, dormitory or contract food service.
- ☒ Project meets LEED Silver Standard requirements.
- ☒ Institution has a greenhouse gas emissions reduction policy in place in accordance with RCW 70.235.070 and vehicle emissions reduction policy in place per RCW 47.01.440 or RCW 43.160.020 as applicable.
- ☐ Design proposals: A complete predesign study was submitted to OFM by July 1, 2020.
- ☐ Growth proposals: Based on solid enrollment projections and is more cost-effectively providing enrollment access than alternatives such as university centers and distance learning.
- ☐ Renovation proposals: Project should cost between 60 – 80% of current replacement value and extend the useful life of the facility by at least 25 years.
- ☐ Acquisition proposals: Land acquisition is not related to a current facility funding request.
- ☐ Infrastructure proposals: Project is not a facility repair project.
- ☒ Stand-alone, infrastructure and acquisition proposals: is a single project requesting funds for one biennium.

2020 PROJECT PROPOSAL CHECKLIST

2021-23 Biennium Four-year Higher Education Scoring Process

REQUIRED APPENDICES

- ☒ Capital Project Report CBS 002
- ☒ Project cost estimate:
  - CBS 003 for projects between $2 million and $5 million
  - Excel C-100 for projects greater than $5 million
- ☐ Degree Totals and Targets template to indicate the number of Bachelors, High Demand and Advanced degrees expected to be awarded in 2021. (Required for Overarching Criteria scoring criteria for Major Growth, Renovation, Replacement and Research proposals).
- ☐ Availability of Space/Campus Utilization template for the campus where the project is located. (Required for all categories/subcategories except Infrastructure and Acquisition proposals).
- ☐ Assignable Square Feet template to indicate program-related space allocation. (Required for Growth, Renovation and Replacement proposals, all categories/subcategories).

OPTIONAL APPENDICES

Attach supplemental and supporting project documentation, *limit to materials directly related to and needed for the evaluation criteria*, such as:

- ☐ Degree and enrollment growth projections
- ☐ Selected excerpts from institutional plans
- ☐ Data on instructional and/or research space utilization
- ☐ Additional documentation for selected cost comparables (acquisition)
- ☐ Selected materials on facility conditions
- ☐ Selected materials on code compliance
- ☐ Tables supporting calculation of program space allocations, weighted average facility age, etc.
- ☐ Evidence of consistency of proposed research projects with state, regional, or local economic development plans
- ☐ Evidence of availability of non-state matching funds
- ☐ Selected documentation of prior facility failures, high cost maintenance, and/or system unreliability for infrastructure projects
- ☒ Documentation of professional assessment of costs for land acquisition, land cleanup, and infrastructure projects
- ☐ Selected documentation of engineering studies, site survey and recommendations, or opinion letters for infrastructure and land cleanup projects
- ☐ Other:

I certify that the above checked items indicate either that the proposed project meets the minimum thresholds or the corresponding items have been included in this submittal.

Name: William Ward Title: Associate Vice President Facilities

Signature: [signature] Date: August 12, 2020

Institution
The Evergreen State College
Project Title
LAB II HVAC Upgrades
Project Location (City)
Olympia

1. Problem Statement (short description of the project – the needs and the benefits)

SUMMARY NARRATIVE

The LAB II Building at the Evergreen State College has served the physical sciences needs of the campus since 1975. Its neighbor and academic partner, LAB I was built in 1973. Both have similar ventilation systems which are inefficient and ineffective for safe and reliable science education. This issue has been studied by staff, and by FSi & WILLDAN Consulting Engineers and a solution has been found that can be realized in a two-phase laboratory ventilation improvement project. Phase I of this project cost performed during the 2019-21 biennium at $4.4 million implementation and $4 million proposed in the second and final phase. With the first phase completion of LAB I providing an estimated $100,000 savings in energy usage and maintenance cost reductions annually, the college is now requesting funding approval to proceed with phase II to be completed during the 2021-2023 biennium. This request is for a standalone upgrade project that will affect the LAB II science building only.

This proposal recommends completion of comprehensive ventilation upgrades to improve energy efficiency and reduced maintenance costs to the LAB II Building at The Evergreen State College for a total cost of $4 million.

Statement of Problem

LABs I & II together have benefitted from a total of 10 major remodels since their original commissioning for an average of around 9 years between improvements. The last improvements for both buildings were begun in the 2015-17 biennium for basement improvements which added to the usable space inventory. Historically, laboratory building improvements have been intended to modernize classroom areas to keep pace with science facilities in higher education settings, and in fact, with high school labs which are becoming ever more sophisticated. The remodels tended to be improved workstations, cabinetry, floor resurfacing and finishes on a floor-by-floor basis. There have been roughly six projects on six different floors of the two buildings. Some of the above projects, plus a ventilation project in 2010 added improved fume extraction from chemistry and other spaces with the intent to improve safety.

While the above improvements added a modern appeal, each project was completed as a stand-alone package of work. In addition, each building was assumed to be isolated, from the ventilation system of the other. As changes were made to the buildings, this turned out to be

false. Each project added a separate set of ventilation controls which attempted to provide for the needs of that floor only. Although several projects added substantially to the fume extraction capacity of the two laboratories, no provision was made to improve the centralized ventilation supply systems, which were original to each building and are now operating at over 100% of their design capacity. Projects were managed this way because altering the single-point-of-delivery supply system for the whole building was not possible with case-by- case funding for a collection of individual, piecemeal projects. The added fume extraction capacity at several locations further impaired overall building air balances because fume hoods are variable volume devices, for the most part. When the fume hood sashes are open, they run at maximum exhaust airflow. When the sashes are closed, they withdraw far less volume. Rooms can go from low to high exhaust volumes in a matter of seconds depending on the number of students in the room who are using workstation ventilation equipment. The sudden change in pressure has a cascading effect from floor-to-floor and room-to-room as individual control systems try to manage the imbalances that occur from areas of the building they don't recognize. This causes doors to fly open or closed and sends fume hood air-flow safety sensors into alarm.

One should note that the effect of the combined ventilation problems is more serious in a laboratory environment than with an ordinary "office-type" building because all laboratories operate on what is termed a 100% outside air cycle for ventilation. This means that unlike other buildings air brought into a laboratory is never recycled. This is done for purposes of safety and it means that laboratories when operating perfectly, from a ventilation point of view, are costly to operate. Every ounce of air which passes only once through the laboratory has to be heated, cooled, filtered, etc.

HVAC costs for laboratories soar when increased extraction volume, coupled with the active controls and control elements that may be acting independently of each other and of other floors, cause parts of the system to be working against the other parts. In the case of LABs I and II, this happens virtually all of the time. The result is highly inefficient operation, increased service costs, wasted energy, and an untenable science education environment.

Proposed Solution

The solution to the above set of problems is a comprehensive, renovation to the ventilation systems of both laboratory buildings, in a two-phase project, starting with LAB I in the 2019-2021 biennium. The solution, which will be the same for both buildings will increase supply air capacities and will replace the floor-by-floor controls with a single building control system for each structure, capable of varying the rates of supply and exhaust flows as operating conditions require. The detailed aspects of the ventilation systems of the two buildings. Work on LAB II when complete will elevate the ventilation performance of LAB II to the same quality as that of completed LAB I.

Other alternatives considered included a plan to upgrade both buildings at once, and the no action alternative. Upgrading both buildings at once was more expensive of the two scenarios because the impacts to academic program space scheduling difficulties required

much more of the work to be done during non-standard work hours. The difference was on the order of the expected escalation in cost which will result from commencing the LAB II upgrades in the 2021-2023 biennium.

The "no-action" alternative is believed to be unacceptable because of the perceived small but real role the laboratory ventilation problem plays in FTE retention.

1. History of the project or facility

The LAB II Building at the Evergreen State College has served the physical sciences needs of the campus since 1975. Its neighbor and academic partner, LAB I was built in 1972. That science education is important to the college is evidenced by the fact that there has been a laboratory building on campus for 94 percent of its existence. Originally, flow at fume hoods and in general occupancy areas were controlled by fixed dampers that moderated the flow in the building between fixed speed supply fans and fixed speed exhaust fans. Dampers at fume hoods were set so that minimum ventilation flow was provided for the worst-case sash position. Such a system had few moving parts, was relatively easy to balance and was acceptably economical to operate because of low energy costs.

As energy costs rose and rooms were upgraded to offer more modern workstations and appearance, variable speed exhaust fans and some active dampers on modernized fume hoods were also added to reduce energy costs. In addition, the number of fume hoods grew substantially during laboratory remodels within the last 10 years. Variable speed exhaust fans were added to accommodate the increased and more highly variable load. Electronic hardware and software were also added with each project to control the increasingly complex ventilation system operation and requirements. As much of this work was done on an isolated, project-by-project basis, ventilation performance in the laboratories fell from an acceptable point to the point where it is today. Both laboratories have ventilation systems which are inefficient and ineffective for safe and reliable science education.

2. History of the project or facility

The LAB II Building at the Evergreen State College has served the physical sciences needs of the campus since 1975. Its neighbor and academic partner, LAB I was built in 1972. Science education is important to the college since there has been a laboratory building on campus for 94 percent of its existence. Originally, flow at fume hoods and in general occupancy areas were controlled by fixed dampers that moderated the flow in the building between fixed speed supply fans and fixed speed exhaust fans. Dampers at fume hoods were set so that minimum ventilation flow was provided for the worst-case sash position. Such a system had few moving parts, was relatively easy to balance and was acceptably economical to operate because of low energy costs.

As energy costs rose and rooms were upgraded to offer more modern workstations and appearance, variable speed exhaust fans and some active dampers on modernized fume hoods were also added to reduce energy costs. In addition, the number of fume hoods grew

substantially during laboratory modifications during the last ten years. Variable speed exhaust fans were added to accommodate the increased and more highly variable load. Electronic hardware and software were also added with each project to control the increasingly complex ventilation system operation and requirements. As much of this work was done on an isolated, project-by-project basis, ventilation performance in the laboratories fell from an acceptable point to the point where it is today. Both laboratories have ventilation systems which are inefficient and ineffective for safe and reliable science education.

3. University programs addressed or encompassed by the project

The interdisciplinary nature of many of the College's programs prompt students, who might not otherwise take science and math, into coursework that is offered in both school's laboratories. This interdisciplinary approach is one of the five foci of learning at The Evergreen State College. The others are collaborative learning, learning across significant differences, personal engagement and linking theory with practical applications. A solid science component to learning enhances all of the above.

The proposal supports state and national goals of improving education in the areas of Science, Technology, Engineering, and Math (STEM.) The project is also consistent with the governor's sustainable and clean energy goal to transition to more efficient buildings and industrial processes.

One hundred percent of the school's electrical energy is provided by sustainable sources through use of green energy credits. Reduction of energy use on campus frees up green energy availability, in general, allowing some transfer from fossil fuel generated energy to energy from renewable resources. Energy reduction in general is in line with the governor's clean energy objectives under Sustainable Energy Goals and Clean Environment, Executive order 18-01, Part 1, Paragraph e.; Part 2 (Agency Leadership, Paragraph e.) and Part 3, State Energy and Environmental Performance (SEEP.) The proposal is consistent with the institution's 2014 plan regarding improved efficiency in energy use and was approved by the College Board of Trustees in June of 2018. It is also consistent with Evergreen's greenhouse gas emissions plan.

4. Significant Health, Safety, and Code Issues:

The building does not meet fire codes in certain areas that use plenums rather that ductwork for air handling. The building will meet all such codes at the completion of the project. public building codes will be done at the same time. Fume hoods and associated valves and duct work is not of the type of material appropriate for the types of chemicals use in the Labs and have deteriorated to a state that needs upgraded. These conditions will be corrected by this project.

5. Evidence of increased repairs and/or service interruption:

The LAB II science building is in average (3) condition as defined in the 2016 Higher Education Facility Comparable Framework Study. The Facility Condition Survey Summary gives the overall building a rating of 2.68, and its HVAC system a rating of 2 in all categories

except terminal and package units, which it gives a score of "0" (see the Facility Condition Survey in the Appendix.) When laboratory fume hood sashes are open they run at maximum exhaust airflow. When the sashes are closed, they withdraw far less volume. Rooms can go from low to high exhaust volumes in a matter of seconds depending on the number of students in the room who are using workstation ventilation equipment. The sudden change in pressure has a cascading effect from floor-to-floor and room-to-room as individual control systems try to manage the imbalances that occur from areas of the building they don't recognize. This causes doors to fly open or closed and sends fume hood air-flow safety sensors into alarm.

The Evergreen Laboratory Operations Manager, who has held laboratory management positions for over twenty years, asserts that the ventilation performance of the two Evergreen College laboratory buildings has steadily declined to the point where science education in them is now possible only through constant effort to address ventilation deficiencies. Laboratory staff, and facilities maintenance staff must respond weekly to situations related to ventilation. This challenges both faculty ability to teach and student ability to learn. From work order records, it is estimated that maintenance labor, material and services is around $50,000 per year for both laboratories with the costs about evenly split between the two.

6. Impact on Institutional Operations without the Infrastructure Project:

The adequacy of the teaching space in LAB II is compromised by poor ventilation on all floors and potentially unsafe conditions. Fume hood alarms are a constant occurrence and when they happen, the student using the fume hood must be moved to another workstation. In addition, the inadequate ventilation system controls cause false ventilation failure or fire alarms to occur on an average of one or two times a year for each of the laboratory buildings. For students using LAB II this results in approximately 110 lost student-hours of instruction each year.

The Evergreen Laboratory Operations Manager, who has held laboratory management positions for over twenty years, asserts that the ventilation performance of the two Evergreen College laboratory buildings has steadily declined to the point where science education in them is now possible only through constant effort to address ventilation deficiencies. Laboratory staff, and facilities maintenance staff must respond weekly to situations related to ventilation. This challenges both faculty ability to teach and student ability to learn. The LAB II ventilation upgrade project will save energy, improve student retention and enrollment, and will reduce maintenance costs and the administrative effort required to keep the building useful for its intended purpose.

Poor ventilation in both of the laboratories causes about three emergency responses per year by the Black Lake Fire Department to check out the presence of fire or toxic fumes that aren't really present. When that happens, around 75 Evergreen employees are forced to leave their workstation for about an hour until the "all-clear" is sounded. These evacuation events cause work and education interruptions that are significant and according to an analysis by the College Engineer may be as much as $7,500 per year.

7. Reasonable Estimate:

If one goal of the governor's Results Washington initiative is to provide a "world-class" education to all who attend Washington's schools of higher learning is to be met, then costs associated with correcting the factors which hinder that achievement should not be the sole determinant of whether the remedy is undertaken. Yet costs are important and it's therefore imperative that some attempt be made to assess practical validity of the proposal. This section attempts to do so. The Builders Association, in partnership with Builders Exchange and the Association of General Contractors provides general information about the relative cost of various building elements across building types. According to their most recent report, heating, ventilation and air-conditioning costs, including building controls represent about 23 percent of the cost of new construction in a laboratory building.

At the same time, the expected project cost in adjusted dollars of science labs for Washington schools of higher education in the 2019-2021 Capital Project Evaluation System manual is $577 per GSF for the proposed project's midpoint of construction. The spot replacement value of LAB I would therefore be around $49,000,000. The estimated cost of this proposal in terms of the expected new construction cost is ($3,500,000) ÷ ($49,000,000) x 100% = 7.1% or about a third of the cost of new ventilation construction.

Even so, the LAB II ventilation upgrade project will save energy, improve student retention and enrollment, and will reduce maintenance costs and the administrative effort required to keep the building useful for its intended purpose. All of the above factors have associated costs, some of which are undocumented. Energy and maintenance costs for the subject building, on the other hand are quite well documented.

The Evergreen State College keeps close track of its utility and maintenance costs on a building-by building basis. Also, projects of this type are relatively common with state government buildings seeking to improve building energy use by guaranteed performance improvement contracts and certificates of participation. The companies providing such services are commonly referred to as ESCOs or Energy Service Companies. A certified Washington ESCO provider estimated that the energy savings (electric, heating and cooling) for a project such as the one envisioned in this proposal should be around 20%. Assuming that half of the electric energy supplied to LAB II operates ventilation equipment and that all of the recorded spending for steam and chilled water for the building are subject to savings, the expected reduction in direct operating costs should be around $50,000 per year.

False alarms are another cost. Poor ventilation in both of the laboratories causes about three emergency responses per year by the Black Lake Fire Department to check out the presence of fire or toxic fumes that aren't really present. When that happens, around 75 Evergreen employees are forced to leave their workstation for about an hour until the "all-clear" is sounded. These evacuation events cause work and education interruptions that are significant and according to an analysis by the College Engineer may be as much as $5,000 per year. The difficult to quantify effect of lab and building emergencies and inconsistent lab operation has an effect on enrollment and retention of both graduate and undergraduates. The College Engineer estimates that impact on enrollment could be as much as $40,000 per year.
The proposed lab ventilation improvement project portion of the request will cost around $4 million, and the expected life of the equipment installed is about 25 years. Thus the average

cost per year of the improvements over its life is around $140,000. It can be argued that over half of that annualized construction cost ($75,000) can be offset by readily identifiable or reasonably assumable expenses. But there are other costs as well that can't be assumed or estimated. These real costs include faculty turnover, administrative effort for laboratory staff, and the cost of false alarms which cause the Black Lake Fire Department to respond to spurious faults (about three times per year.) The latter not only endangers college personnel and students but puts the general public at risk because of unnecessarily engaged emergency response capacity. The cost of a true emergency response being thwarted by a false alarm is unmeasurable.

8. Engineering Study:

The detailed aspects of the proposal (Phase I for LAB I and Phase II for LAB II) are provided in an engineering study authored by FSi Consulting Engineers, copy attached. Treating the upgrade of each building as a stand-alone project will preserve the ability to operate them as separate entities at negligible additional cost and will have a lower impact on science education by allowing the uninvolved laboratory to receive a higher teaching load temporarily for the other during construction. This request is for $4 million for the second phase of the FSi Consulting Engineers recommendations. Funding will allow LAB II to operate according to the high standards of other competing higher education laboratories.

9. Supports Facilities Plan:

The proposal supports FTE retention. The "no-action" alternative is believed to be unacceptable because of the perceived small but real roll the laboratory ventilation problem plays in FTE retention. The difficult to quantify effect of lab and building emergencies and inconsistent lab operation has an effect on enrollment and retention of both graduate and undergraduates. The College Engineer estimates that impact on enrollment could be as much as $40,000 per year.

Space utilization will improve by approval of the proposal because LAB II will be deemed more reliable for conducting lab and STEM based classes. The proposal supports state and national goals of improving education in the areas of Science, Technology, Engineering, and Math (STEM.)

Efficiency of space allocation will not change; however, LAB II is already in accordance with the 1994 FEPG recommendations. See C-100 form in the Appendix. The proposal is consistent with the institution's 2014 plan regarding improved efficiency in energy use and was approved by the College Board of Trustees in June of 2018. It is also consistent with Evergreen's greenhouse gas emissions plan.

10. Resource Efficiency and Sustainability:

One hundred percent of the school's electrical energy is provided by sustainable sources through use of green energy credits. Reduction of energy use on campus frees up green energy availability, in general, allowing some transfer from fossil fuel generated energy to energy

from renewable resources. Energy reduction in general is in line with the governor's clean energy objectives under Sustainable Energy Goals and Clean Environment, Executive order 18-01, Part 1, Paragraph e.; Part 2 (Agency Leadership, Paragraph e.) and Part 3, State Energy and Environmental Performance (SEEP.) HVAC costs for laboratories soar when increased extraction volume, coupled with the active controls and control elements that may be acting independently of each other and of other floors, cause parts of the system to be working against the other parts. In the case of LABs I and II, this happens virtually all of the time. The result is highly inefficient operation, increased service costs, wasted energy, and an untenable science education environment. The proposed improvements will eliminate much of this waste A certified Washington ESCO provider estimated that the energy savings (electric, heating and cooling) for a project such as the one envisioned in this proposal should be around 20%. Assuming that half of the electric energy supplied to LAB II operates ventilation equipment and that all of the recorded spending for steam and chilled water for the building are subject to savings, the expected reduction in direct operating costs should be around $50,000 per year. These wasted resources will be free for other uses or for overall reduction in consumption.

11. Minimum Thresholds:

The following points are offered to certify that the proposed project meets minimum thresholds for evaluation.

- The proposed project is not an exclusive enterprise function.
- LEED certification is not an aspect of the proposed project.
- The Evergreen State College has a greenhouse gas and vehicle emissions reduction policy in place in compliance with RCW 70.236.070 and RCW 47.01.440.

Appendices

Appendix	Description
A	***Excel C-100 Form***
B	***CBS 002***
C	***CBS 003***
D	***Engineering Recommendation by FSi for HVAC system***

A

Excel C-100 Form

C-100(2020)

Updated June 2020

Quick Start Guide

GENERAL INFORMATION

1) The C-100(2020) tool was created to align with the estimating application in the Capital Budgeting System (CBS). The intended use is to enable project managers to communicate their project cost estimates to budget officers in the standard format required for capital project budget requests/submittals to OFM.

2) This workbook is protected so that the worksheets within it cannot be moved or deleted in the usual manner. This protection is necessary to ensure that the cost estimate details and formulas align with the estimating application in the Capital Budgeting System.

3) The estimating format to develop the maximum allowable construction cost (MACC) is presented in Uniformat II.

4) Form-calculated costs such as A/E Basic Design Service fees and Agency Project Management costs are dependent on other estimated project costs such as Acquisition, MACC, Equipment, etc.

5) Project estimates generated with this tool are not sufficient for budget request submittals to OFM. Use the Capital Budgeting System to submit capital project budget requests.

6) Contact your assigned OFM Capital Budget Analyst with questions.

OFM Capital Budget Analyst

INSTRUCTIONS

1) Only green cells are available for data entry.

2) Fill in all known cells in the 'Summary' tab prior to moving on to the cost entry tabs A-G.

3) It is recommended, but not required, to fill out cost entry tabs in the following order:

A. Acquisition, C. Construction Contracts, D. Equipment, G. Other Costs, B. Consultant Services, F. Project Management, then E. Artwork.

4) If additional rows are inserted to capture additional project costs, a description must be provided in the Notes column or within Tab H. Additional Notes. Be particularly detailed for additional costs estimated for contingencies and project management.

FORM-CALCULATED COSTS (FEE CALCULATIONS)

1) A/E Basic Design Services: AE Fee % (x) (MACC + Contingency)

2) Design Services Contingency: Contingency % (x) Consultant Services Subtotal

3) Construction Contingency: Contingency % (x) MACC

4) Artwork: 0.5% (x) Total Project Cost

5) Agency Project Management (Greater than $1million): (AE Fee % - 4%) (x) (Acquisition Total + Consultant Services Total + MACC + Construction Contingency + Other Costs)

STATE OF WASHINGTON
AGENCY / INSTITUTION PROJECT COST SUMMARY

Updated June 2020

Agency	The Evergreen State College
Project Name	LAB II HVAC Upgrades
OFM Project Number	

Contact Information	
Name	William Ward
Phone Number	360- 867-6115
Email	wardw@evergreen.edu

Statistics			
Gross Square Feet	85,269	MACC per Square Foot	$26
Usable Square Feet	68,439	Escalated MACC per Square Foot	$28
Space Efficiency	80.3%	A/E Fee Class	B
Construction Type	Science labs (teaching)	A/E Fee Percentage	12.49%
Remodel	Yes	Projected Life of Asset (Years)	50
Additional Project Details			
Alternative Public Works Project		Art Requirement Applies	No
Inflation Rate	2.38%	Higher Ed Institution	Yes
Sales Tax Rate %	9.20%	Location Used for Tax Rate	Olympia
Contingency Rate	10%		
Base Month	June-20	OFM UFI# (from FPMT, if available)	
Project Administered By	Agency		

Schedule			
Predesign Start		Predesign End	
Design Start	July-21	Design End	March-22
Construction Start	May-22	Construction End	August-22
Construction Duration	3 Months		

Green cells must be filled in by user

Project Cost Estimate

Total Project	**$3,831,424**	Total Project Escalated	**$4,009,304**
		Rounded Escalated Total	**$4,009,000**

STATE OF WASHINGTON
AGENCY / INSTITUTION PROJECT COST SUMMARY

Updated June 2020

Agency	The Evergreen State College
Project Name	LAB II HVAC Upgrades
OFM Project Number	

Cost Estimate Summary

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

Consultant Services			
Predesign Services	$0		
A/E Basic Design Services	$213,398		
Extra Services	$413,316		
Other Services	$125,874		
Design Services Contingency	$75,259		
Consultant Services Subtotal	**$827,847**	**Consultant Services Subtotal Escalated**	**$858,928**

Construction			
Construction Contingencies	$225,105	Construction Contingencies Escalated	$236,181
Maximum Allowable Construction Cost (MACC)	$2,251,050	Maximum Allowable Construction Cost (MACC) Escalated	$2,361,802
Sales Tax	$227,806	Sales Tax Escalated	$239,015
Construction Subtotal	**$2,703,961**	**Construction Subtotal Escalated**	**$2,836,998**

Equipment			
Equipment	$90,000		
Sales Tax	$8,280		
Non-Taxable Items	$0		
Equipment Subtotal	**$98,280**	**Equipment Subtotal Escalated**	**$103,116**

Artwork			
Artwork Subtotal	**$19,947**	**Artwork Subtotal Escalated**	**$19,947**

Agency Project Administration			
Agency Project Administration Subtotal	$181,390		
DES Additional Services Subtotal	$0		
Other Project Admin Costs	$0		
Project Administration Subtotal	**$181,390**	**Project Administation Subtotal Escalated**	**$190,315**

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

Project Cost Estimate			
Total Project	**$3,831,424**	Total Project Escalated	**$4,009,304**
		Rounded Escalated Total	**$4,009,000**

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				
Environmental Analysis				
Predesign Study				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0258**	**$0**	Escalated to Design Start
2) Construction Documents				
A/E Basic Design Services	$213,398			69% of A/E Basic Services
Other				
Insert Row Here				
Sub TOTAL	**$213,398**	**1.0338**	**$220,611**	Escalated to Mid-Design
3) Extra Services				
Civil Design (Above Basic Svcs)				
Geotechnical Investigation				
Commissioning	$135,000			
Site Survey				
Testing				
LEED Services				
Voice/Data Consultant				
Value Engineering	$23,999			
Constructability Review				
Environmental Mitigation (EIS)	$200,000			
Landscape Consultant				
Other	$54,317			
Insert Row Here				
Sub TOTAL	**$413,316**	**1.0338**	**$427,287**	Escalated to Mid-Design
4) Other Services				
Bid/Construction/Closeout	$95,874			31% of A/E Basic Services
HVAC Balancing	$30,000			
Staffing				
Other				
Insert Row Here				
Sub TOTAL	**$125,874**	**1.0492**	**$132,068**	Escalated to Mid-Const.
5) Design Services Contingency				
Design Services Contingency	$75,259			
Other				
Insert Row Here				
Sub TOTAL	**$75,259**	**1.0492**	**$78,962**	Escalated to Mid-Const.
CONSULTANT SERVICES TOTAL	**$827,847**		**$858,928**	

Green cells must be filled in by user

Cost Estimate Details

Construction Contracts				
Item	**Base Amount**	**Escalation Factor**	**Escalated Cost**	**Notes**
1) Site Work				
G10 - Site Preparation				
G20 - Site Improvements				
G30 - Site Mechanical Utilities				
G40 - Site Electrical Utilities				
G60 - Other Site Construction				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0461**	**$0**	
2) Related Project Costs				
Offsite Improvements				
City Utilities Relocation				
Parking Mitigation				
Stormwater Retention/Detention				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0461**	**$0**	
3) Facility Construction				
A10 - Foundations				
A20 - Basement Construction				
B10 - Superstructure				
B20 - Exterior Closure				
B30 - Roofing				
C10 - Interior Construction	$150,000			
C20 - Stairs				
C30 - Interior Finishes	$20,000			
D10 - Conveying				
D20 - Plumbing Systems				
D30 - HVAC Systems	$1,671,000			
D40 - Fire Protection Systems				
D50 - Electrical Systems				
F10 - Special Construction				
F20 - Selective Demolition	$55,050			
General Conditions	$135,000			
Other				
Integrated Automatic HVAC Controls	$220,000			
Sub TOTAL	**$2,251,050**	**1.0492**	**$2,361,802**	
4) Maximum Allowable Construction Cost				
MACC Sub TOTAL	**$2,251,050**		**$2,361,802**	

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7) Construction Contingency				
Allowance for Change Orders	$225,105			
Other				
Insert Row Here				
Sub TOTAL	**$225,105**	**1.0492**	**$236,181**	
8) Non-Taxable Items				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0492**	**$0**	
Sales Tax				
Sub TOTAL	**$227,806**		**$239,015**	
CONSTRUCTION CONTRACTS TOTAL	**$2,703,961**		**$2,836,998**	

Green cells must be filled in by user

Cost Estimate Details

Equipment				
Item	**Base Amount**	**Escalation Factor**	**Escalated Cost**	**Notes**
E10 - Equipment	$90,000			
E20 - Furnishings				
F10 - Special Construction				
Other				
Insert Row Here				
Sub TOTAL	**$90,000**	**1.0492**	**$94,428**	
1) Non Taxable Items				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0492**	**$0**	
Sales Tax				
Sub TOTAL	**$8,280**		**$8,688**	
EQUIPMENT TOTAL	**$98,280**		**$103,116**	

Green cells must be filled in by user

Cost Estimate Details

Artwork					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Project Artwork	$0				0.5% of total project cost for new construction
Higher Ed Artwork	$19,947				0.5% of total project cost for new and renewal construction
Other					
Insert Row Here					
ARTWORK TOTAL	**$19,947**		**NA**	**$19,947**	

Green cells must be filled in by user

Cost Estimate Details

Project Management					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Agency Project Management	$181,390				
Additional Services					
Other					
Insert Row Here					
PROJECT MANAGEMENT TOTAL	**$181,390**		**1.0492**	**$190,315**	

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**		**1.0461**	**$0**	

Green cells must be filled in by user

C-100(2020)
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

B

CBS 002

OFM

376 - The Evergreen State College
Capital Project Request
2021-23 Biennium
*

Version: P1 Working Draft

Report Number: CBS002
Date Run: 8/12/2020 11:02AM

Project Number: **40000047**
Project Title: **Lab II HVAC Upgrades**

Description

Starting Fiscal Year: 2022
Project Class: Preservation
Agency Priority: 1

Project Summary

This project will be the second phase to holistically address the HVAC issues in the Lab I/Lab II complex, with Lab II being the focus of the second phase following the successful completion of Phase I in Lab I. The project will also address technology upgrades to keep pace with the most recent developments in this area. This project will improve the energy efficiency of the building while acknowledging the need for properly functioning fume hoods in the science labs to eliminate persistent safety issues that constantly cause instructional interruptions. The project will also encompass any programmatic modifications that have occurred from emerging curriculum paths.

Project Description

Lab II was built in 1975 and the building systems (electrical, mechanical, roofs, specific building application equipment, finishes, life
safety codes, seismic, circulation, instructional technology, etc.) that have not been touched by one of the smaller remodels will be at
or beyond their practical life. Those that have been improved by the various floor renovations, such as the HVAC, need to be evaluated and commissioned on a building-wide level.
The modernization of the infrastructure will reduce the utility and maintenance costs to operate this facility similar to the lab I project
estimated at $75,000 annually and reduce the deferred maintenance backlog of the College, allow the staff to perform more effective
preventive/predictive maintenance, and make the facility's environment more conducive for teaching and learning.
Although the primary focus of this project is on building infrastructure, facility upgrade's will be made to ensure that the labs continue to support and be responsive to developments in the sciences and qualifications required for students to be successful in graduate programs or the job market.
Prior remodels met LEED Silver standards. This project will maintain LEED Silver in these areas and will bring sections of the building not yet impacted by previous remodels up to a minimum of LEED Silver.
This College is requesting funding from state general obligation bonds, fund 057.

Location
City: Olympia **County:** Thurston **Legislative District:** 022

Project Type
Intermediate

Growth Management impacts
As this project involves renovating an existing facility, there are no impacts to growth management.

Funding

			Expenditures		2021-23 Fiscal Period	
Acct Code	Account Title	Estimated Total	Prior Biennium	Current Biennium	Reapprops	New Approps
057-1	State Bldg Constr-State	4,000,000				4,000,000
	Total	**4,000,000**	**0**	**0**	**0**	**4,000,000**

Future Fiscal Periods

OFM

376 - The Evergreen State College
Capital Project Request
2021-23 Biennium
*

Version: P1 Working Draft

Report Number: CBS002
Date Run: 8/12/2020 11:02AM

Project Number: **40000047**
Project Title: **Lab II HVAC Upgrades**

Funding

	2023-25	2025-27	2027-29	2029-31
057-1 State Bldg Constr-State				
Total	**0**	**0**	**0**	**0**

Schedule and Statistics

	Start Date	End Date
Predesign		
Design	7/1/2021	3/1/2022
Construction	5/1/2022	8/1/2022

	Total
Gross Square Feet:	85,269
Usable Square Feet:	68,439
Efficiency:	80.3%
Escalated MACC Cost per Sq. Ft.:	28
Construction Type:	Laboratories
Is this a remodel?	Yes
A/E Fee Class:	A
A/E Fee Percentage:	13.93%

Cost Summary

		Escalated Cost	% of Project
Acquisition Costs Total		**0**	**0.0%**
Consultant Services			
Pre-Schematic Design Services		0	0.0%
Construction Documents		246,046	6.2%
Extra Services		371,134	9.3%
Other Services		112,189	2.8%
Design Services Contingency		73,856	1.9%
Consultant Services Total		**803,223**	**20.1%**
Maximum Allowable Construction Cost(MACC)	**2,361,802**		
Site work		0	0.0%
Related Project Costs		0	0.0%
Facility Construction		2,361,802	59.1%
GCCM Risk Contingency		0	0.0%
GCCM or Design Build Costs		0	0.0%
Construction Contingencies		236,180	5.9%
Non Taxable Items		0	0.0%
Sales Tax		239,015	6.0%

OFM

376 - The Evergreen State College
Capital Project Request
2021-23 Biennium
*

Version: P1 Working Draft

Report Number: CBS002
Date Run: 8/12/2020 11:02AM

Project Number: 40000047
Project Title: Lab II HVAC Upgrades

Cost Summary

	Escalated Cost	% of Project
Construction Contracts Total	**2,836,997**	**70.9%**
Equipment		
Equipment	94,428	2.4%
Non Taxable Items	0	0.0%
Sales Tax	8,687	0.2%
Equipment Total	**103,115**	**2.6%**
Art Work Total	**19,898**	**0.5%**
Other Costs Total	**0**	**0.0%**
Project Management Total	**236,341**	**5.9%**
Grand Total Escalated Costs	**3,999,574**	
Rounded Grand Total Escalated Costs	**4,000,000**	

Operating Impacts

No Operating Impact

Narrative

The modernization of the infratructure will reduce the utility cost to operate this facility, reduce the deferred maintenance backlog of the College, allow the staff to perform more effective preventive/predictive maintenance, and make the facility's environment more conducive for teaching and learning.

Parameter	Entered As	Interpreted As
Biennium	2021-23	2021-23
Agency	376	376
Version	P1-A	P1-A
Project Classification	*	All Project Classifications
Capital Project Number	40000047	40000047
Sort Order	Project Priority	Priority
Include Page Numbers	Y	Yes
For Word or Excel	Y	Y
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

C

CBS 003

OFM

376 - The Evergreen State College
Cost Estimate Summary
2021-23 Biennium

*

Cost Estimate Number: 91
Cost Estimate Title: Lab II HVAC Renovation
Report Number: CBS003
Date Run: 8/12/2020 11:05AM

Version: P1 Working Draft
Agency Preferred: Yes
Project Number: 40000047
Project Title: Lab II HVAC Upgrades
Project Phase Title:
Contact Info **Contact Name:** William Ward **Contact Number:**360.867.6115

Statistics

Gross Sq. Ft.:	85,269
Usable Sq. Ft.:	68,439
Space Efficiency:	80%
MACC Cost per Sq. Ft.:	26
Escalated MACC Cost per Sq. Ft.:	28
Remodel?	Yes
Construction Type:	Laboratories
A/E Fee Class:	A
A/E Fee Percentage:	13.93%

Schedule

	Start Date	End Date
Predesign:		
Design:	07-2021	03-2022
Construction:	05-2022	08-2022
Duration of Construction (Months):	3	

Cost Summary Escalated

Acquisition Costs Total			**0**
Pre-Schematic Design Services		0	
Construction Documents		246,046	
Extra Services		371,134	
Other Services		112,189	
Design Services Contingency		73,856	
Consultant Services Total			**803,223**
Site work		0	
Related Project Costs		0	
Facility Construction		2,361,802	
Construction Contingencies		236,180	
Non Taxable Items		0	
Sales Tax		239,015	
Construction Contracts Total			**2,836,997**
Maximum Allowable Construction Cost(MACC)	**2,361,802**		
Equipment		94,428	
Non Taxable Items		0	
Sales Tax		8,687	
Equipment Total			**103,115**
Art Work Total			**19,898**
Other Costs Total			**0**
Project Management Total			**236,341**
Grand Total Escalated Costs			**3,999,574**
Rounded Grand Total Escalated Costs			**4,000,000**

Additional Details

Alternative Public Works Project: No

Additional Details

State Construction Inflation Rate:	2.38%
Base Month and Year:	06-2020
Project Administration By:	AGY
Project Admin Impact to DES that is NOT Included in Project Total:	$0

OFM

376 - The Evergreen State College
Cost Estimate Detail

2021-23 Biennium

*

Analysis Date: August 11, 2020

Cost Estimate Number: 91
Cost Estimate Title: Lab II HVAC Renovation

Detail Title: Lab II
Project Number: 40000047
Project Title: Lab II HVAC Upgrades
Project Phase Title:
Location: Thurston County
Contact Info **Contact Name:** William Ward **Contact Number:**360.867.6115

Statistics

Gross Sq. Ft.:	85,269
Usable Sq. Ft.:	68,439
Rentable Sq. Ft.:	
Space Efficiency:	80%
Escalated MACC Cost per Sq. Ft.:	28
Escalated Cost per S. F. Explanation	

Construction Type:	Laboratories
Remodel?	Yes
A/E Fee Class:	A
A/E Fee Percentage:	13.93%
Contingency Rate:	10.00%
Contingency Explanation	

Projected Life of Asset (Years):	50
Location Used for Tax Rate:	Thurston County
Tax Rate:	9.20%
Art Requirement Applies:	Yes
Project Administration by:	AGY
Higher Education Institution?:	Yes
Alternative Public Works?:	No

Project Schedule

	Start Date	End Date
Predesign:		
Design:	07-2021	03-2022
Construction:	05-2022	08-2022
Duration of Construction (Months):	3	
State Construction Inflation Rate:	2.38%	
Base Month and Year:	6-2020	

Project Cost Summary

MACC:	$ 2,251,050
MACC (Escalated):	$ 2,361,802

Current Project Total:	$ 3,821,719
Rounded Current Project Total:	$ 3,822,000
Escalated Project Total:	$ 3,743,337
Rounded Escalated Project Total:	$ 3,743,000

CONSULTANT SERVICES				
Construction Documents				
A/E Basic Design Services				238,001
SubTotal: Construction Documents				**246,046**
Extra Services				
Commissioning (Systems Check)	135,000			
Value Engineering Participation & Implementation	23,999			
Environmental Mitigation Services (EIS)	200,000			
SubTotal: Extra Services		**358,999**	1.0338	**371,134**
Other Services				
Bid/Construction/Closeout				106,928
SubTotal: Other Services				**112,189**
Design Services Contingency				
Design Services Contingency	70,393			
SubTotal: Design Services Contingency		**70,393**	1.0492	**73,856**
Total: Consultant Services		**774,321**	1.0373	**803,223**
CONSTRUCTION CONTRACTS				
Facility Construction				
C10 - Interior Construction	150,000			
C30 - Interior Finishes	20,000			
D30 - HVAC Systems	1,671,000			
F20 - Selective Demolition	55,050			
General Conditions	135,000			
Integrated Automatic HVAC Controls	220,000			
SubTotal: Facility Construction		**2,251,050**	1.0492	**2,361,802**
Construction Contingencies				
Allowance for Change Orders	225,105			
SubTotal: Construction Contingencies		**225,105**	1.0492	**236,180**
Sales Tax		**227,807**	1.0492	**239,015**
Total: Construction Contracts		**2,703,962**	1.0492	**2,836,997**
Maximum Allowable Construction Cost (MACC)		**2,251,050**	1.0500	**2,361,802**
EQUIPMENT				
E10 - Equipment	90,000			
SubTotal:		**90,000**	1.0492	**94,428**
Sales Tax		**8,280**	1.0492	**8,687**
Total: Equipment		**98,280**	1.0492	**103,115**
ART WORK				
Total: Art Work		**19,898**	1.0000	**19,898**

PROJECT MANAGEMENT

PROJECT MANAGEMENT

Agency Project Management	225,258			
Total: Project Management		**225,258**	1.0492	**236,341**

OFM

Cost Estimate Summary and Detail

2021-23 Biennium

*

Cost Estimate Number: 91
Cost Estimate Title: Lab II HVAC Renovation

Report Number: CBS003
Date Run: 8/12/2020 11:05AM

Parameter	Entered As	Interpreted As
Associated or Unassociated	Associated	Associated
Biennium	2021-23	2021-23
Agency	376	376
Version	P1-A	P1-A
Project Classification	*	All Project Classifications
Capital Project Number	40000047	40000047
Cost Estimate Number	91	91
Sort Order	Cost Estimate Title	Title
Include Page Numbers	Y	Yes
For Word or Excel	Y	Y
User Group	Agency Budget	Agency Budget
User Id	*	All User Ids

D

Engineering Recommendation by FSi for HVAC system

The Evergreen State College

Lab I Ventilation System

Study and Report

08/15/18

FSi Project No. 17039.02

Corporate
506 Second Ave. Suite 700
Seattle, Washington 98104
206.622.3321

Baltimore
1014 West 36th St.
Baltimore, Maryland 21211
410.929.6894 or 206.300.7368

Spokane
304 West Pacific Ave. Suite 210
Spokane, Washington 99201
509.413.7320

FSi consulting engineers

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Purpose 1

Executive Summary 1

Observations, Findings, and Evaluation 2

- Lab I 2
  - Lab I Airflows 2
  - Lab I Controls 3

Recommendations 3

- General Lab I and II Supply and Exhaust Air Recommendations 3
  - Lab I Controls Recommendations 3
  - Lab I Air-Side Recommendations 3

Impact on Energy Consumption 4

Construction Cost Estimates 4

Construction Phasing Plan 5

- Phase 1 5
  - Lab I 5
- Phase 2 6
  - Lab I 6

Appendix A – Air Distribution Single Line Diagram A-1

Appendix B – Cost Estimates B-1

Purpose

Lab I and Lab II Buildings at The Evergreen State College (TESC) have building pressurization issues that cause problems including insufficient makeup air in the lab spaces and recurrent fume hood alarms. The purpose of this study is to assess the ventilation system, and to develop solutions to improve building performance. TESC is looking for a cost-effective solution to the pressurization problems that costs no more than $3.5 million to construct, excluding design costs, construction contingencies, project administration, and sales tax. TESC asked FSi to identify only solutions that could be completed with two biennia, to accommodate limited biannual budgets. This report summarizes the solution FSi identified for Lab I.

Executive Summary

FSi's scope of work includes field investigation, review all existing documentation, development of options for meeting project goals, and a cost estimate and phasing plan of the recommended system.

This study examines the ventilation systems of the Lab I building at TESC to determine the source and potential solutions to problems with building pressurization and is support by a similar study for Lab II building. The building includes a basement and three floors of laboratories with various types of fume hoods and airflow requirements. The building has an air handler located in the basement for supply, and general lab exhaust fans and fume hood exhaust fans located on the roof. Each floor of the building has been individually remodeled as a separate project, and the buildings now have an assortment of HVAC and control systems which are not working well together. The results are unbalanced rooms and floors, and recurrent fume hood alarms due to insufficient makeup air.

Based on our discussions with TESC and our investigation, we recommend the following improvements to the ventilation system for both buildings.

- Install a Niagara Tridium 4 Control System to communicate with all the existing control systems and incorporate them into a single control system.
- Install airflow measurement devices and pressure sensors in the main supply and exhaust ducts serving the floors to maintain the correct airflows on each floor.
- Install variable volume venturi air valve, fume hood monitor, and sash sensor on the fume hoods without one to provide individual hood control.
- Provide adequate makeup air to the fume hoods by installing transfer ducts where the existing supply to the room is not capable of providing required airflow.

- Reroute ductwork and install fume hood exhaust fans on the roof such that each fume hood exhaust fan serves one floor only.

TESC informed us the funding for this project will come in two phases.

Observations, Findings, and Evaluation

FSi met with Thomas Lindahl, TESC campus engineer, on April 19, 2018, to discuss the airflow issues in both Lab I and II. We discussed the multiple airflow issues and budget constraints. TESC is looking for a cost-effective and innovative solution to solve the airflow issues. The purpose of this study is to assess the ventilation system, and to develop solutions to improve building performance.

FSi performed pre-commissioning and took air measurements to determine the supply and exhaust of Lab I building and performed site visits. Our findings are described below.

Lab I

Lab I includes a basement and three floors of laboratories with various types of fume hoods and airflow requirements.

Lab I Airflows

The lab areas are served by an air handler located in the basement supplying 100% outside air to all lab spaces. This air handler has a variable frequency drive (VFD) but only operates in two airflow settings: 100% during the day and 30% as a nighttime setback. The general lab exhaust is provided by two exhaust fans (EF-1 and EF-2) located on the roof. These exhaust fans have VFDs and turn on or off based on occupancy schedules. Supply air and general exhaust air for Lab I are distributed to each floor from four mechanical shafts, one in each corner of the building, with no volume control dampers. Our pre-commissioning study found the existing air handler and general lab exhaust fans operate within ±10% of the total designed airflows.

The lab fume hoods are connected to two large exhaust fans (FEF-1 and FEF-2), which are on VFDs, and four smaller exhaust fans (FEF-4, FEF-2SE, FEF-5, and FEF-2NW). The fume hoods are constant volume. The fume hood exhaust fans run continuously. Exhaust airflow changes depending on the number of fume hoods that are open for use.

Each floor of the building was remodeled separately, and each has its own HVAC control system. The separate systems are not functioning well together. Every change in airflow on one floor affects the airflow on the other floors. This method of providing building ventilation in

laboratory setting is not generally recommended because it results in the kind of pressurization problems seen in the building.

The existing air handler is operating at its maximum capacity and may need to be replaced as part of this project. We will determine whether replacement is required during the design phase. The cost of replacement is included in our cost estimate.

Lab I Controls

We found the existing controls in Lab I to be a combination of Plexus controls, Niagara, and pneumatic controls. Each floor has a standalone control system and the systems do not communicate with one another. This results in the systems often fighting each other and accounts for most of the airflow issues in the building.

Recommendations

General Lab I Supply and Exhaust Air Recommendations

We recommend updating the controls and systems in Lab I to address the airflow issues. In order to accomplish this, the following would be needed.

Lab I Controls Recommendations

- Install a Niagara Tridium 4 Control System to communicate with all the existing control systems and incorporate them into one control system. The different controllers currently in use work on different control protocols (BACnet, LonWorks, etc.). The Tridium 4 system has the capability to communicate with all these different protocols which makes it ideal for this application. This will allow TESC to avoid the costly replacement of the control devices in the building and simply connect to the existing floors main controllers.

Lab I Air-Side Recommendations

- Install airflow measurement dampers in the general lab exhaust main ducts to each floor.
- Install airflow measurement stations in the supply main ducts to each floor and in each floor fume hood exhaust duct.
- Install a pressure sensor in the supply air ductwork to control the supply air handler variable frequency drive (VFD).

- Install variable volume venturi air valve, fume hood monitor, and sash sensor on each fume hood. This will be used in conjunction with the airflow measurement dampers and stations to maintain the correct airflows on each floor.
- Install VFDs on any exhaust fan missing a VFD.
- Provide adequate makeup air to the fume hoods by installing transfer ducts where the existing supply to the room is not capable of providing the required airflow.
- Balance each floor.

Lab I Fume Hood Exhaust Recommendations

We recommend rerouting ductwork and installing fume hood exhaust fans on the roof so each fume hood exhaust fan serves one floor only. In order to accomplish this, the following would be needed.

- Install four new fume hood exhaust fans on the roof to exhaust the fume hoods located on the basement and second floor. FEF-1 and FEF-2 will remain in place to exhaust the fume hoods located on the third floor.
- Reroute ductwork for FEF-1 and FEF-2 to serve the third floor only.
- Reroute ductwork to connect the four new fume hood exhaust fans to the fume hoods on the basement and second floor.

Impact on Energy Consumption

While it was not specifically a part of FSi's evaluation, it is very likely that the modifications will reduce the energy consumption of the building. Simple savings will exist when the controls are consolidated so the various systems are not fighting each other. It is also likely that the overall supply and exhaust airflows are reduced at times, based on the increased level of control. The reduced airflow will in turn, reduce both fan energy and the energy for heating and cooling the air.

Construction Cost Estimates

FSi has provided an opinion of rough construction costs as part of this report. This opinion has been developed mainly through the use of vendor interviews and examination of Means construction cost estimating guides, along with our understanding of the current construction climate. This cost is intended to include the following:

- Cost of the new mechanical equipment
- Cost of the new electrical work
- Contractor's supervision, overhead, profit, mobilization, bond, insurance, etc.

- General contractor's markup on subcontractor work
- 3% inflation per year

Estimated costs are not intended to cover:

- Design or other project soft costs
- Cost of any architectural or structural work (none anticipated)
- Hazardous material abatement
- Washington State sales tax

This opinion of construction cost carries a contingency to represent some of the miscellaneous costs not yet fully developed at this preliminary phase of the project. These contingencies are not intended to cover contractor's change order costs due to changed or unforeseen conditions, etc. We recommend TESC includes their estimate of this based on prior projects in the facility. FSi's opinion of rough construction cost for the system upgrades is summarized as follows:

Phase	Estimated Cost
Phase 1– Lab I (2019/2021 – includes 3% inflation per year for 2 years)	$746,000
Phase 2 – Lab I (2019/2021 – includes 3% inflation per year for 2 years)	$1,321,000
Grand Total	**$2,067,000**

Construction Phasing Plan

TESC indicated the funding for this project will come in two phases. We recommend the following phasing plan:

Phase 1

Phase 1 will consist of:

- Updating the main controller for both lab buildings with a Tridium 4 system. The Tridium 4 system can integrate the various control systems and incorporate them into a single control system that will communicate with and provide feedback to all control systems in the building.

Lab I

- Install a pressure sensor in supply air ductwork to control the supply air handler VFD.

- Install airflow measurement dampers in the general lab exhaust main ducts to each floor. Install airflow measurement stations in the supply main ducts to each floor and in each floor fume hood exhaust duct. These will be used to monitor and control the amount of air supplied to and exhausted from the floor.

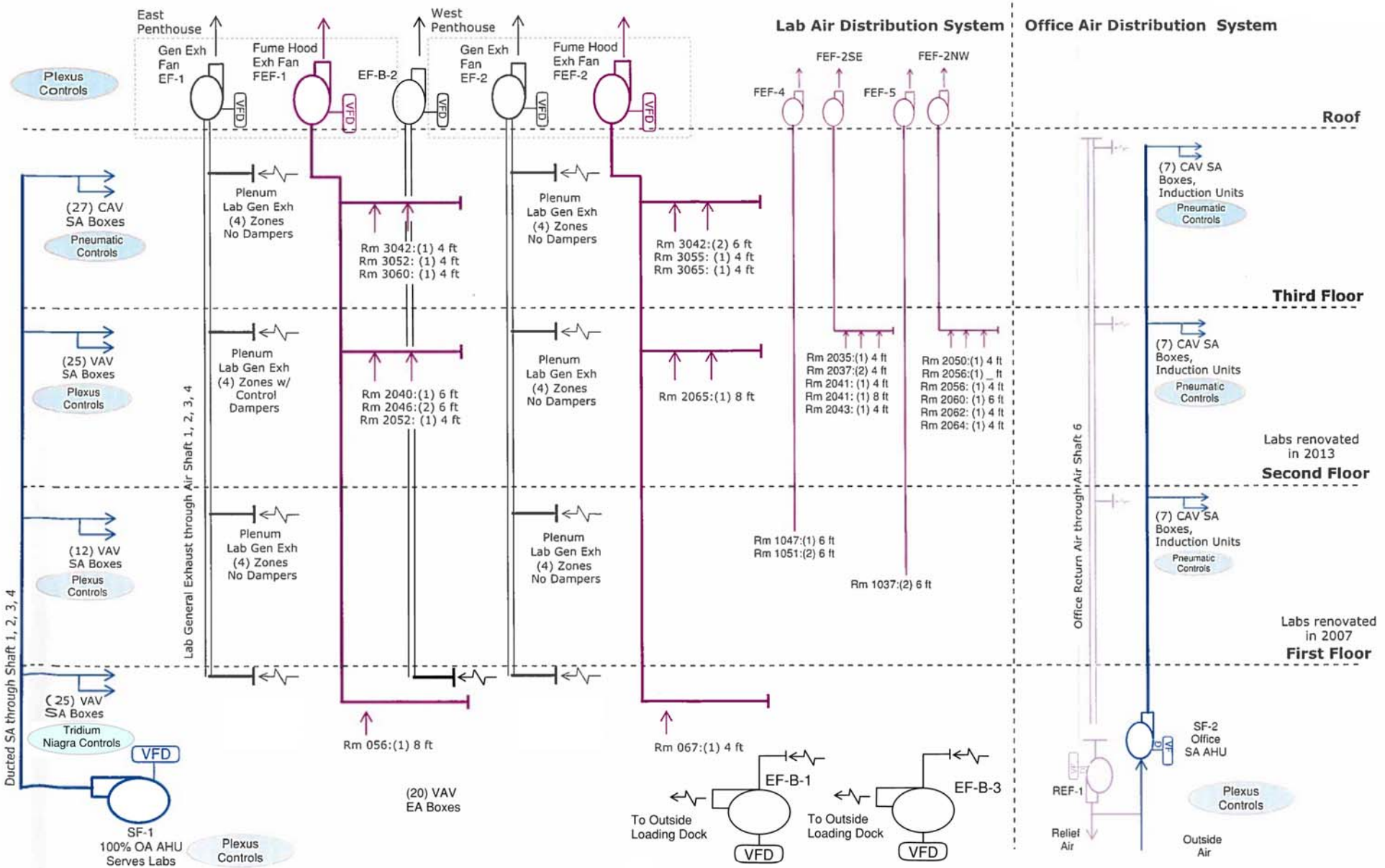
Phase 2

Lab I

- Provide adequate makeup air to the rooms with fume hoods by installing transfer ducts where needed.
- Install variable volume venturi air valve, fume hood monitor, and sash sensor on each fume hood. Install pressure sensors in each fume exhaust duct main to control the exhaust fan VFDs.
- Install four new fume hood exhaust fans on the roof to exhaust the fume hoods located on the basement and second floor. FEF-1 and FEF-2 will remain in place to exhaust the fume hoods located on the third floor.
- Reroute ductwork for FEF-1 and FEF-2 to serve the third floor only.
- Reroute ductwork to connect the four new fume hood exhaust fans to the fume hoods on the basement and second floor.

Appendix A – Air Distribution Single Line Diagram

LAB-I HVAC Air Distribution Single Line



Appendix B – Cost Estimates

FSi consulting engineers
506 Second Avenue, Suite 700
Seattle, WA 98104
206 622-3321 / fax 206 622-5804
www.fsi-engineers.com

Date: 8/15/2018 Est. by: BAJ/SJB
Project : TESC Lab I & Lab II Balancing
FSi # 17039.02

OPINION OF MECH CONSTRUCTION COSTS - Lab I Study LEVEL*

Item	Description	Qty	Unit	Material/Equip Unit	Material/Equip Total	Labor Unit	Labor Total	Eqpt + Labor/Mat'l	With OH&P and other Project Factors
LAB I - PHASE I									
	Demo								
	HVAC demolition	1	ls	$0	$0	$11,000	$11,000	$11,000	$17,375
	Misc (25%)	1	ls	$0	$0	$2,750	$2,750	$2,750	$4,344
	Subtotal							**$13,750**	**$21,719**
	Air-side Systems								
	Air Measuring Stations Floor Supply Ducts	16	ea	$4,000	$64,000	$900	$14,400	$78,400	$123,835
	Air Measuring Dampers Floor Building Exhaust Ducts	16	ea	$4,000	$64,000	$1,900	$30,400	$94,400	$149,108
	Air Measuring Stations in Floor Fume Hood Exhaust Ducts	10	ea	$1,500	$15,000	$900	$9,000	$24,000	$37,909
	Testing and balancing	1	ls	$1,300	$1,300	$23,400	$23,400	$24,700	$27,170
	Commissioning	1	ls	$600	$600	$9,500	$9,500	$10,100	$11,110
	Misc (25%)	1	ls	$36,075	$36,075	$19,300	$19,300	$55,375	$87,467
	Subtotal							**$286,975**	**$436,599**
	Controls								
	Tridium Niagra Controller (for Lab I & II) and Jace including AMS Supply, AMD Exhaust and AMS Fume Hood integration and commissioning	1	ls	$120,000	$120,000	$16,400	$16,400	$136,400	$150,040
	Misc (25%)	1	ls	$30,000	$30,000	$4,100	$4,100	$34,100	$37,510
	Subtotal							**$170,500**	**$187,550**
	Miscellaneous								
	Mobilize, demobilize	1	ls	$3,000	$3,000	$14,000	$14,000	$17,000	$26,852
	Bond & insurance	3	%				$18,724	$18,724	$29,576
	Subtotal							**$35,724**	**$56,428**
	TOTAL LAB I - PHASE 1								**$703,000**
	TOTAL LAB I - PHASE 1 w/ two years of escalation at 3%								**$746,000**
LAB I - PHASE 2									
	Demo								
	HVAC demolition including Fume Hood Duct Demo	1	ls	$0	$0	$17,000	$17,000	$17,000	$26,852
	Misc (25%)	1	ls	$0	$0	$4,250	$4,250	$4,250	$6,713
	Subtotal							**$21,250**	**$33,565**
	Air-side Systems								
	Fume hood Stainless Steel Ductwork w/o insulation	500	lf	$30	$15,000	$30	$15,000	$30,000	$47,386
	Fume hood exhaust fans (Utility Fans)	4	ea	$19,200	$76,800	$2,300	$9,200	$86,000	$135,840
	Replace Supply Fan SF-1	1	ea	$16,900	$16,900	$5,700	$5,700	$22,600	$35,697
	Ductwork transition for SF-1	125	lf	$20	$2,500	$30	$3,750	$6,250	$9,872
	Add Venturi controllers to all constant volume Fume Hoods	30	ea	$8,500	$255,000	$3,400	$102,000	$357,000	$563,894
	Transfer ducts	450	lf	$20	$9,000	$30	$13,500	$22,500	$35,540
	Testing and balancing	1	ls	$1,400	$1,400	$25,000	$25,000	$26,400	$29,040
	Commissioning	1	ls	$600	$600	$10,000	$10,000	$10,600	$11,660
	Misc (25%)	1	ls	$94,150	$94,150	$43,538	$43,538	$137,688	$217,482
	Subtotal							**$699,038**	**$1,086,411**
	Controls								
	Fume Hood Exhaust Fan Integration	4	ea	$600	$2,400	$5,200	$20,800	$23,200	$25,520
	Misc (25%)	1	ls	$600	$600	$5,200	$5,200	$5,800	$6,380
	Subtotal							**$29,000**	**$31,900**
	Miscellaneous								
	Mobilize, demobilize	1	ls	$3,000	$3,000	$14,500	$14,500	$17,500	$27,642
	Patch, Paint, Drywall	1	ls	$1,500	$1,500	$6,000	$6,000	$7,500	$11,847
	Bond & insurance	3	%				$33,549	$33,549	$52,992
	Subtotal							**$58,549**	**$92,481**
	TOTAL LAB I - PHASE 2								**$1,245,000**
	TOTAL LAB I - PHASE 2 w/ two years of escalation at 3%								**$1,321,000**
MECHANICAL GRAND TOTAL									**$2,067,000**