## **AIM Report**

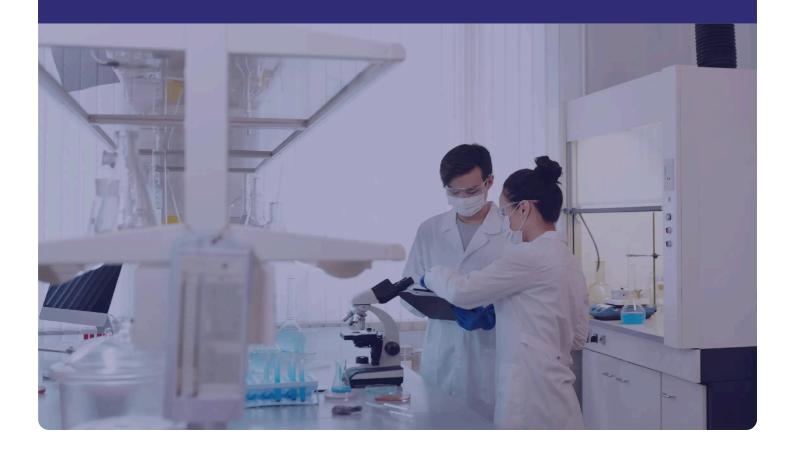
### Actionable Insights and Measures

Thu, August 28, 2025

#### 2025 Improvements V1

Super Test Facility

120 Kingston St, Boston, MA, USA





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- Unoccupied Room Airflow Setback
- Setting Ultra-Low Temperature Freezers to -70Cs

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### **About Us**

#### 12SL

The International Institute for Sustainable Laboratories, a non-profit organization founded in 2006, is the world's leading organization for laboratory sustainability, efficiency, and decarbonization. For more information www.i2sl.org





#### Labs2Zero™

Launched in 2022, Labs2Zero™ is I2SL's flagship program to advance the decarbonization of lab buildings globally. The program includes a scorecard for lab building energy and emissions, plus certifications, training, and lab-specific tools to help facilities embark on their decarbonization journeys. Many of these tools, including the AIM Report, are now available via I2SL's Laboratory Benchmarking Tool website (lbt.i2sl.org). For more information on the program, see also i2sl.org/labs2zero.

#### The AIM Report™

The AIM Report™ is an automated energy and emissions audit specifically for laboratory buildings. Using a library of energy savings measures, along with implementation costs, savings calculations, and case studies sourced from I2SL's extensive network of experts, AIM provides objective and quantitative building-specific reports to reveal potential opportunities to reduce emissions and to kick-start the project development process.



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The identified measures, savings and cost estimates, and all other information in this report are provided for guidance purposes only. The results of this report are based on limited information that may not be reflective of actual site conditions. Although providing more accurate information will increase accuracy, there will always be a significant uncertainty and potential error in the savings, costs and recommendations. The contents of this report should not be used for investment decisions or in place of an engineering design. While the AIM Report results are intended to be useful indicators of opportunities, the actual feasibility, savings, and costs will vary based on many factors. I2SL is not responsible for the outcomes of any project implemented based on the information in this report. These results are intended to guide the user to identify opportunities for further investigation or analysis by a qualified professional. It is, as always, the responsibility of facility staff to comply with all applicable safety and engineering standards.

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### Acknowledgements

I2SL is grateful to our Labs2Zero sponsors, development partners, and to all members of our Technical Advisory Councils (TACs) for their support of the Labs2Zero program.

Full List of TAC Members

### **Executive Summary**

Laboratory facilities often present significant opportunities for energy savings and emissions reductions. This report reveals the potential energy cost savings and implementation costs of a package of energy-saving measures applicable to Super Test Facility

Annual Energy Cost Savings

Package Implementation Cost

Simple Payback

\$202,174

\$729,195

3.6 years

#### **Building Performance (2024 data)**

Existing Building Building With Package

Annual Energy Cost \$1,393,000 → \$1,190,826

Labs2Zero Energy Score 53 → 69

Site EUI 245.5 kBtu/ft² → 188.3 kBtu/ft²

The report was created using I2SL's Labs2Zero AIM Report software. The quantitative results presented here are the output of objective, automated custom calculations that were based on the properties of this building as provided by the AIM Report user. The package of energy-saving measures was assembled by the user, who selected the component measures from lists of applicable options generated by the software.

#### Measures Included in the Package

- # Measure Name # Measure Name
- 1 Variable Air Volume Controls for Fume Hoods 🔗 3 Unoccupied Room Airflow Setback 🔗
- 2 Shut-the-Sash Program for Fume Hoods 🚱 4 Setting Ultra-Low Temperature Freezers to -70C 🔗

#### **How to Use These Results**

The costs and savings shown here represent high-level estimates for potential projects that may be considered for implementation in this facility. The savings are based on the building information provided by the user and will vary based on the accuracy and completeness of this information.

Cost estimates are also approximate and can vary due to many factors. These estimates are intended to provide useful guidance on the financial impacts of likely opportunities. Next steps before implementation should include full project development and engagement of all relevant stakeholders and vendors, as well as investigating any applicable utility incentives. More information about the calculations and recommended next steps for development of each measure are contained within the body of this report.

### Introduction

#### What Is the AIM Report?

The Actionable Insights and Measures (AIM) Report is an automated energy and emissions audit designed specifically for lab buildings. The goal of the AIM Report is to advance laboratory decarbonization by revealing opportunities for specific lab buildings to reduce their energy usage and emissions.

The AIM Report aims to achieve its goals in an objective, easy-to-use, quick, and quantitative way.

AIM performs its audits at the screening level, roughly equivalent to ASHRAE Level 1. The opportunities identified are presented alongside estimated financial impacts and other actionable information including next steps and case studies.

#### **How Does the AIM Report work?**

The AIM Report performs custom savings calculations for each building. The software uses the building's data record from the I2SL Laboratory Benchmarking Tool (LBT) along with a set of assumptions in order to configure an "energy model" of the facility and its operations. Many of the assumptions can be fine-tuned by the tool user as needed.

AIM contains a library of lab-specific energy saving measures, and the tool screens the building against each of the measures in the library to identify available measures for the facility, i.e., projects that could be implemented in this particular facility given its properties and current operations.

The energy model is then used along with typical weather data for the building's location to calculate the estimated energy savings associated with all

applicable measures. These are combined with estimated project implementation costs and displayed to the user.

The user then begins to assemble a "package" of measures to be implemented together. The AIM software takes into account any interactions between measures on the list and always presents the incremental savings and costs of each measure to be added to the package so that the user can make informed decisions in constructing a synergistic package for implementation.

AIM also contains a database of case studies of labspecific energy and emissions reduction projects. For each package of measures, AIM uses a ranking system to select and display the case studies that are most relevant to the building and its selected measures.

#### **How the AIM Report Was Developed**

The AIM Report was developed by I2SL with guidance from four volunteer Labs2Zero Technical Advisory Councils (TACs) composed of subject matter experts from across the laboratory industry. These TACs provided expert input on the measures to include, measure narratives, savings calculations, assumptions made by the software, installed costs and their dependence on building properties and locations, and the case study ranking methodology. TAC members also sourced many case studies for inclusion in the database.

#### What's Next for the AIM Report?

The current version of the AIM Report focuses on energy savings and on retrofit projects for existing facilities in the U.S. The measure library contains 26 measures in this first version; the full list is included in the Appendix. Later versions will include operational emissions calculations, international compatibility, and a more extensive measure library. Additional planned upgrades include accommodating new construction facilities (the Design2Zero Report), and adding embodied carbon impacts of measures.

# The Package of Measures: 2025 Improvements v1

The package of measures was assembled by the user of the AIM Tool from lists of applicable measures generated by the software. This section provides detailed information on the estimated costs and savings of the overall package and its component measures. It also lists the case studies that have been identified as being most relevant to this building and the selected measures. Further details on the individual measures and the case studies are provided in subsequent sections of the report.

#### **Financial Impacts**

Annual Energy Cost Savings

\$202,174

Simple Payback

3.6 years

Financial Analysis Period

15 Yrs

Implementation Cost

**\$729,195** 

NΡV

**\$1,319,917** 

**Annual Maintenance Cost** 

**\$943** 

**IRR** 

**29.8%** 

#### **Energy Impacts**

	Existing Building		Building With Package
Energy Score	53	$\rightarrow$	<b>69 1</b> 16
Site EUI	<b>245.5</b> kBtu/ft²	$\rightarrow$	188.3 kBtu/ft² ↓ 57.2
Electricity	<b>5,000,000</b> kWh	$\rightarrow$	<b>4,490,012</b> kWh <b>↓</b> 509,988
Chilled Water	450,000 ton-hour	$\rightarrow$	270,065 ton- hour
District Hot Water	<b>7,000</b> MMBtu	$\rightarrow$	<b>4,039</b> MMBtu <b>↓</b> 2,961

#### **Case Studies List**

- University of Chicago Retro-Commissioning Reduces EUI Through a Variety of Measures
- McGill University Improves Safety and Energy Efficiency in Montreal
- · Fume Hood Retrofits at Stanford University
- Simon Fraser University Fume Hood VAV Upgrade in British Columbia
- Vivarium Retrocommissioning at University of California San Francisco

- · Colorado School of Mines Shut the Sash Program
- Demand Control Ventilation, Shut the Sash at Georgetown University
- Michigan's Oakland University Demonstrates Efficiency Through Technology
- · Air Optimization in a Cambridge, Massachusetts, Biolab
- Multiple Sustainability Measures and Retrocommissioning at the University of Kentucky

### Measures in Package

The following energy-saving measures were included in the package. The savings and costs for each measure are incremental, i.e., they take into account all previous measures added to the package. Incremental measure savings may vary depending on their order in a given package.

#	Measure Name	<ul><li>Energy Cost Savings</li></ul>	<ul><li>Incremental Cost</li></ul>	Simple Payback
1	Variable Air Volume Controls for Fume Hoods &	\$143,161	\$693,000	4.8 years
2	Shut-the-Sash Program for Fume Hoods&	\$12,992	\$3,840	0.3 years
3	Unoccupied Room Airflow Setback &	\$40,102	\$31,569	0.8 years
4	Setting Ultra-Low Temperature Freezers to -70C&	\$5,919	\$786	0.1 years

### **Existing Building Summary**

Performance (2024)

Total Energy Cost

\$1,393,000

**Energy Score** 

53

Site EUI

245.5 kBtu/ft<sup>2</sup>

**Building Information** 

Predominant Lab Use:

Combination (Bio/Chem)

Percent Lab Area:

40 %

Organization Name:

**Building Gross Area:** 

120,000 ft<sup>2</sup>

Organization Type:

Academic: Higher Ed

Year Built:

2000

Predominant Lab Type:

R&D: Basic Research

Number of Ducted Fume Hoods:

Location:

120 Kingston St, Boston, MA, USA

Occupied Hours per Week:

80

#### Lab Area Breakdown

• Biology: 28,000 ft<sup>2</sup>

Chemistry: 20,000 ft²

• Physics/Engineering: 0 ft2

Vivarium: 0 ft2

Maker/Workshop: 0 ft2

• Other: 0 ft2

#### **Implemented Measures**

Automatically Detected by AIM

- 1 Staged Control for Constant Volume Exhaust Fans
- 2 Exhaust Air Energy Recovery: Sensible Heat Systems
- 3 Variable Air Volume Controls for HVAC Systems
- 4 Unoccupied Room Temperature Setback
- 5 Supply Duct Static Pressure Setpoint Reset

#### Site Energy Use Intensity Breakdown

• Imported Electric EUI: 41.7 kWh/ft²

• District Hot Water EUI: 58.3 kBtu/ft2

District Chilled Water EUI: 45.0 kBtu/ft2

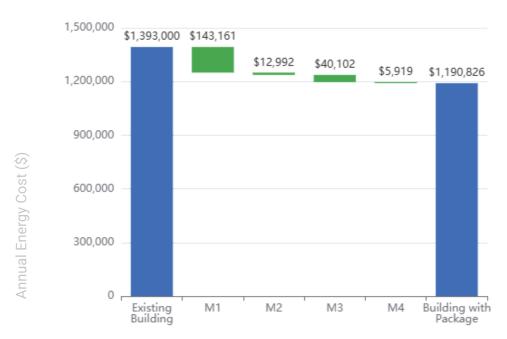
Note: A full list of the parameters used in the AIM calculations is provided in the Building Parameters list.

### Package Metrics and Charts

These charts provide additional information on the breakdown of energy savings provided by the selected package.

#### **Energy Cost Savings by Measure**

This chart illustrates the impact of each measure on the total annual energy cost of the building. The current total annual cost is shown in the leftmost column and the projected total cost with the package fully implemented is shown in the rightmost column.



#### Measures in Package:

Measure 1: Variable Air Volume Controls for Fume Hoods

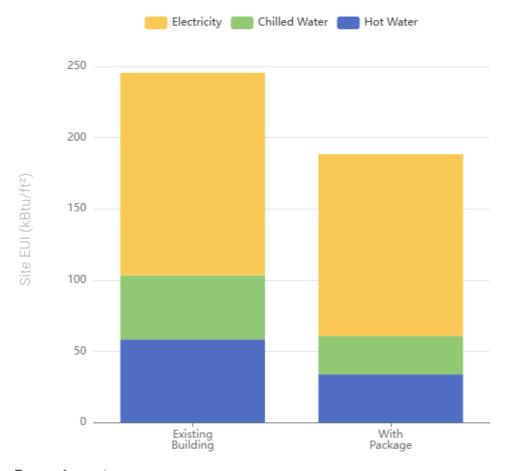
Measure 2: Shut-the-Sash Program for Fume Hoods

Measure 3: Unoccupied Room Airflow Setback

Measure 4: Setting Ultra-Low Temperature Freezers to -70C

#### **Site EUI Reductions by Utility**

This chart shows the total site EUI (with breakdown by fuel type) before and after the package of measures is applied.

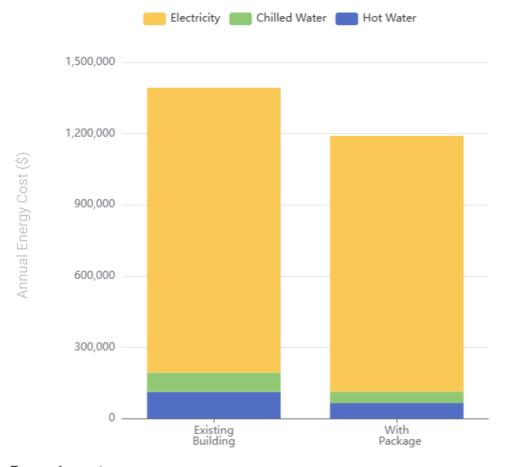


#### **Energy Impacts**

	Existing Building		Building With This Package
Hot Water	58.33 kBtu/ft²	$\rightarrow$	33.66 kBtu/ft²
Chilled Water	45.00 kBtu/ft²	$\rightarrow$	<b>27.04</b> kBtu/ft²
Electricity	<b>142.17</b> kBtu/ft²	$\rightarrow$	127.67 kBtu/ft²

#### **Energy Cost Savings by Utility**

This chart shows the breakdown of annual energy cost by fuel type, before and after application of the package of measures.



#### **Energy Impacts**

	Existing Building		Building With This Package
Hot Water	\$112,000 USD	$\rightarrow$	<b>\$64,611</b> USD
Chilled Water	\$81,000 USD	$\rightarrow$	\$48,612 USD
Electricity	\$1,200,000 USD	$\rightarrow$	\$1,077,603 USD

### The Measures in the Package

This section shows costs and savings details for the individual measures in the package, along with a detailed measure description and information on project development and implementation planning.





#### **Variable Air Volume Controls for Fume Hoods**

ECM095

#### **Financial Impacts**

Annual Energy Savings Incremental Cost Annual Maintenance Cost Simple Payback

\$143,161

\$693,000

● \$0 ● 4.8 years

#### **Energy Impacts**

	<b>Existing Building</b>	Building With This Measure
Energy Score	53 →	64 🛧 11
Site EUI	245.5 kBtu/ft² →	207.1 kBtu/ft² 👃 38.4
Electricity	5,000,000 kWh →	<b>4,617,705</b> kWh <b>↓</b> 382,295
Chilled Water	450,000 ton-hour →	335,083 ton- hour
District Hot Water	<b>7,000</b> MMBtu →	<b>5,080</b> MMBtu <b>↓</b> 1,920

#### **Description**

This measure involves converting fume hoods that are currently operating at constant air volume (CAV) to operate with variable air volume (VAV) control, potentially resulting in energy savings through airflow reductions.

Fume hoods that operate at CAV exhaust the same amount of air regardless of sash position. The hood exhaust airflow is typically set to achieve the face velocity setpoint at the design sash height (often 18 inches). For hoods that operate with VAV control, the exhaust airflow is reduced when the sash is lowered or closed. This reduction in exhaust airflow will result in energy savings if it leads to a reduction of overall exhaust and makeup airflows in the space, which typically occurs where hood densities are high.

Converting a CAV hood to VAV involves adding a method of tracking the sash position or the face velocity. For the first method, a sash position sensor is attached to the sash or to the sash cable. Knowing the height of the sash allows the control system to calculate the current area of the sash opening and then adjust the exhaust airflow (by sending a signal to the associated terminal unit/exhaust fan) to maintain the face velocity at setpoint. The second method involves installing a sensor through the wall of the hood to measure the speed of air flowing through the cabinet as a proxy for face velocity. The controls then adjust the exhaust airflow to maintain this measured velocity at setpoint.

The air terminal unit serving the hood may need to be retrofitted to include a fast-acting actuator to allow the system to respond to rapid sash movements. The fume hood cabinet itself will likely require modifications, because CAV hoods have bypass openings (above the sash opening) that are larger than required for VAV use. The method of bypass and the modifications required vary between hood manufacturers. In newer fume hoods, this conversion can often be easily achieved in the field.

The measure cost and savings calculations assume that the lab room airflow controls (supply and general

exhaust) and the building's air handling and exhaust systems are already operating as VAV systems, including dynamic tracking of supply and exhaust airflow within each lab space. The achievable energy savings depend on both how often the hoods operate at a reduced sash position and how often the fume hoods "drive" the airflow in their parent lab spaces. Laboratory spaces with high hood density will see the greatest energy savings potential. Laboratories where the airflow is driven by cooling load or minimum ventilation requirements may not see savings from fume hood exhaust airflow reductions.

When hood sashes are lowered and the hood exhaust flow is reduced, the lab occupants may experience a reduction in noise from the HVAC system. Reduced airflow rates may also allow the building air handling and exhaust systems to operate more efficiently.

Stakeholders to engage when considering converting fume hoods to VAV control include facilities engineering teams and EH&S. Not all hoods are appropriate for VAV conversion, and the decision should be based on a risk assessment involving the relevant stakeholders. This assessment should consider the operations being performed within the hood (this typically involves engaging the researchers) and should determine the appropriate face velocity and minimum airflow setpoints for each hood. Following implementation, the researchers should be informed and trained on the new hood controls.

The savings calculations for this measure are based on reducing the effective average sash positions of the fume hoods from 100% at all times to 68% during occupied hours and 33% at other times. The default fume hood minimum and maximum airflow rates are set to 200 cfm and 900 cfm respectively. Note that the values of all of these parameters are affected by other fume hood-related measures and AIM parameter settings. The AIM parameters whose values most significantly affect the savings estimates for this measure are the Occupied and Unoccupied Lab Minimum Ventilation Rates and the total number of ducted fume hoods. The Fume Hood Density parameters, which represent the extent to which the hoods are grouped together within the building, also affect the savings of all fume hood-related measures.

The measure cost estimate includes the cost of adding a fast-acting fume hood exhaust terminal device as well as the corresponding fume hood controls and hood monitor. It also includes fume hood testing, TAB work, BAS integration as needed, commissioning, and project management. It does not include the cost of any VAV room controls, as those are assumed to be in place along with VAV building-level airflow control on the supply and exhaust systems. The number of ducted fume hoods in the building was used to scale the estimate. The costs for a particular building can easily differ from the displayed value by 40% or more. The cost of removing and installing new fume hood exhaust air terminal units can vary considerably based on the local site conditions. The VAV fume hood controls may not integrate simply with the existing lab room VAV controls and may require extra integration effort and programming, adding to the installation cost. Physical changes required of the fume hood to adapt it to VAV operation (such as changes to the bypass) are not covered in this cost estimate.



#### **Shut-the-Sash Program for Fume Hoods**

FCM184

#### **Financial Impacts**

Annual Energy Savings Incremental Cost Annual Maintenance Cost Simple Payback

\$12,992\$3,840\$9430.3 years

#### **Energy Impacts**

	Package Through Measure 1	Building With This Measure
Energy Score	64 →	65 🛧 1
Site EUI	207.1 kBtu/ft² →	202.9 kBtu/ft² 👃 4.3
Electricity	<b>4,617,705</b> kWh →	<b>4,590,887</b> kWh <b>\</b> 26,818
Chilled Water	335,083 ton-hour →	320,409 ton- hour 14,674
District Hot Water	5,080 MMBtu →	<b>4,836</b> MMBtu <b>↓</b> 245

#### **Description**

This measure involves implementing an ongoing program to encourage and motivate lab users to close their fume hood sashes whenever possible. Reduced average sash opening can lead to reduced space airflow requirements and thus to energy savings.

Lab occupants are typically engaged in a shut-the-sash initiative via an organizational green labs program. Shut-the-sash programs often encourage competition between labs and may include rewards such as pizza parties for groups achieving the best results. Some organizations apply stickers to fume hoods to serve as reminders, while others use tie-ins to building automation systems to provide live displays of total hood airflow to encourage users to shut their sashes. Displays can also be configured to translate airflow savings into energy, cost, and greenhouse gas emissions savings to provide occupants with more familiar metrics.

Reduced room airflow rates result in HVAC system energy savings through reductions in fan power and in heating and cooling energy used to condition the air flowing through the room. In order for a shut-the-sash program to result in energy savings, the building's air handling systems must be variable air volume and the fume hoods must also have VAV controls, i.e. the hood exhaust airflow must change as the sash is moved. An additional requirement for energy savings is that the hood exhaust airflow is responsible for driving the overall room airflow at least some of the time. This typically occurs in spaces where fume hood densities are high and cooling loads are low.

The measure savings and cost calculations assume that the lab airflow controls, fume hoods, and main HVAC systems are already VAV. The extent of the savings depends on how much time the hood can operate at a reduced sash position compared to pre-program levels; this is impacted by occupancy patterns, user operating procedures, and pre-program user behavior. Laboratory spaces that are fume-hood driven will see the greatest

energy savings potential. Laboratories that are cooling-load or ventilation driven may not see savings from reducing the hood exhaust airflow rates. In facilities where most fume hoods are already equipped with automatic sash closers or face velocity setback controls, potential energy savings will be limited.

This measure includes benefits beyond energy savings. Fume hood sashes are primarily provided for safety, and so closing the sash helps protect users from splashes or other hazards in their hoods. With sashes lowered and room airflows correspondingly reduced, users may also experience a reduction in noise levels in the laboratory space. Reducing the airflow rates of the exhaust and makeup air systems will also allow the systems to operate more efficiently, and may extend the life of this equipment.

When considering a shut-the-sash program, stakeholders to engage include the laboratory users, research leads, and any lab green team coordinators. Facilities teams and EH&S personnel should also be informed as the program is being planned and executed. Facilities and/or building automation system staff can assist in determining current fume hood control methods and in estimating the extent to which hood exhaust drives the space airflow in the proposed lab spaces. Coordination with building automation system personnel is needed if the proposed program includes the display of live hood airflow rates or of other data indicating achieved savings.

The savings calculations for this measure are based on reducing the fume hood effective average sash positions. It is assumed that all hoods in the building are involved in the initiative. The default reduction for occupied periods is from 68% to 53% average sash opening, and for unoccupied periods from 33% to 25%; the values of these parameters are also affected by other fume hood parameters and measures. The AIM parameters whose values most significantly affect the savings estimates for this measure are the Occupied and Unoccupied Lab Minimum Ventilation Rates, the Number of Ducted Fume Hoods, and Fume Hood Automatic Sash Closers. The Fume Hood Density parameters, which represent the extent to which the hoods are grouped together within the building, also affect the savings of all fume hood-related measures.

The cost estimate includes some promotional costs for the program (fliers, signs, pizza parties, rewards, etc.), along with some time for a green lab coordinator to help with program coordination and management. The total amount of lab space in the building was used to scale the cost estimate, and it was assumed that all researchers are engaged in the shut-the-sash program. The costs for a particular building can easily differ from the displayed value by 25% or more.



#### **Financial Impacts**

Annual Energy Savings Incremental Cost Annu

Annual Maintenance Cost

Simple Payback

**\$40,102** 

**\$31,569** 

• \$0

0.8 years

#### **Energy Impacts**

	Package Through Measure 2	Building With This Measure
Energy Score	65 →	69 🛧 4
Site EUI	202.9 kBtu/ft² →	<b>188.7</b> kBtu/ft² ↓ 14.2
Electricity	<b>4,590,887</b> kWh →	<b>4,518,193</b> kWh <b>↓</b> 72,694
Chilled Water	320,409 ton-hour →	270,818 ton- hour \$\infty\$ 49,591
District Hot Water	<b>4,836</b> MMBtu →	<b>3,978</b> MMBtu <b>↓</b> 858

#### **Description**

This measure involves reducing laboratory room minimum airflow setpoints during unoccupied periods, such as nights and weekends.

Laboratory spaces typically have minimum required ventilation rates which determine the minimum exhaust and supply air requirements for the space. During periods in which the laboratory spaces are unoccupied, significant energy savings may be achieved by lowering the room minimum ventilation rate. This delivers energy savings because the HVAC systems then need to deliver reduced quantities of conditioned air to the spaces.

Implementing unoccupied room airflow setbacks requires modifying the room minimum airflow control strategy in the BAS, to add a schedule and/or control based on the output of occupancy sensors.

Occupancy schedules should be programmed based on the times when building is expected to be unoccupied, such as nights and weekends. Occupancy sensor readings may also be used to identify or confirm unoccupied periods. Occupancy sensors are often ceiling- or wall-mounted to maximize coverage of the space. In laboratory spaces with visual obstructions, the quantity and locations of occupancy sensors should be carefully selected to ensure complete coverage. The type of occupancy sensor should be chosen based on the expected operations. For example, in spaces where users are working at a fume hood or BSC for extended periods without significant movements, a simple motion sensor could fail to detect the occupant.

The level of energy savings from implementing unoccupied airflow setback will depend on occupancy patterns, the room airflow driver, and the size of the airflow reduction between occupied and unoccupied levels. Facilities with extended occupancy hours will see reduced savings compared to facilities that are unoccupied outside of standard office hours. Laboratory spaces where the airflow rates are driven by ventilation requirements (rather than cooling loads or exhaust device requirements) will see the greatest savings from this measure. Note that

the air terminal units may limit the amount of airflow reduction possible using existing equipment; minimum airflow rates are typically available from the manufacturer.

Occupied and unoccupied setpoint adjustments should be implemented by a BAS controls contractor or facilities personnel. The facility's EH&S team should be consulted on allowable minimum airflow settings for each laboratory space, and a risk assessment may be required to determine which laboratory spaces may be included from a safety perspective. Once the airflow setpoints are changed, TAB and commissioning are recommended to ensure the systems are operating properly and maximizing turndown when the laboratories are unoccupied. Laboratory users will require training on occupancy sensing devices and overrides.

The measure cost estimate includes labor for BAS controls programming and verification, plus a risk assessment, TAB work, commissioning, and project management. The material and installation costs of occupancy sensors are also included. The number of lab rooms and the total amount of lab space in the building were used to scale the cost estimate. The costs for a particular building can easily differ from the displayed value by 35% or more. This measure assumes that the VAV terminal devices are capable of turning down to the desired minimum flows during unoccupied times. If these devices need to be replaced or upgraded to achieve the desired flow turndown, the costs could increase significantly.



#### **Setting Ultra-Low Temperature Freezers to -70C**

FCM181

#### **Financial Impacts**

Incremental Cost **Annual Energy Savings Annual Maintenance Cost** Simple Payback

0.1 years

\$5,919

\$786

\$0

#### **Energy Impacts**

	Package Through Measure 3	Building With This Measure
Energy Score	69 →	69
Site EUI	188.7 kBtu/ft² →	188.3 kBtu/ft² ↓ 0.4
Electricity	<b>4,518,193</b> kWh →	<b>4,490,012</b> kWh <b>\</b> 28,181
Chilled Water	270,818 ton-hour ->	270,065 ton- hour <b>\</b> 754
District Hot Water	3,978 MMBtu →	<b>4,039</b> MMBtu 🛧 61

#### **Description**

This measure raises the temperature setpoints of the facility's ultra-low temperature (ULT) freezers from -80°C to -70°C to achieve energy savings.

ULT freezers are common in biology, biochemistry, and life sciences laboratories, and are designed to preserve biological samples like DNA, RNA, proteins, bacteria, viruses, tissues, and cell lines at stable temperatures, often -80°C to -86°C. ULTs have significant operating costs, and are often the most energy-intensive type of plug-load equipment in laboratory environments. Raising the freezer setpoint temperature by 10°C has been shown to save 10-15% of a freezer's electricity costs, and possibly up to 30% for some older models.

Many organizations now encourage labs to raise the temperature of their ULT freezers by 10°C to save energy without compromising the sample quality. The International Freezer Challenge, co-hosted by I2SL and My Green Lab (https://www.freezerchallenge.org/) includes links to studies that have demonstrated that many types of biological samples remain stable when stored at temperatures as high as -20°C over 24 months.

The quantity of ULTs in the building is the largest factor affecting the amount of energy saved by raising the ULTs' setpoint temperatures to -70°C. The actual savings from an individual ULT will vary based on the current condition and temperature setpoint of the freezer, as well as its usage patterns.

In addition to saving energy, raising the temperature setpoint can prolong the life of the cold storage equipment because it allows the equipment to operate at reduced loading.

Stakeholders to engage when considering this measure include the laboratory users, research directors, and green labs professionals. Lab staff should assess the appropriateness of the setpoint change, based on the

contents of the freezers and available resources (<a href="https://www.freezerchallenge.org/sample-storage-temp-info.html">https://www.freezerchallenge.org/sample-storage-temp-info.html</a>) on cold storage at -70°C. Operating and monitoring protocols may also need to be adjusted based on the new setpoint temperature. When changing the setpoint, it is usually necessary to adjust the alarm setpoint for ULTs that are provided with local or central monitoring and alarm systems.

The savings calculations for this measure are based on reducing the plug loads in the laboratory spaces by an amount corresponding to 300 W per ULT freezer (or 200 W if the ULT freezers are high-efficiency). For academic facilities it is assumed that 40% of the freezers in the facility are involved in this measure; for other types of facility it is assumed that all of the freezers are involved. The AIM parameters whose values most significantly affect the savings estimates for this measure are the Number of ULT Freezers and High Efficiency ULT Freezers.

The measure cost estimate includes the labor cost for lab staff to evaluate the setpoint change for each freezer, plus follow-up to validate that the change is not affecting the laboratory workflow. The fraction of lab groups participating in the effort will significantly affect both the savings and costs. The measure cost estimates are based in part on the number of ULTs in the building and on the adoption patterns seen in different types of facility (40% adoption in academic facilities and 100% elsewhere, as described above). The costs for a particular building can easily differ from the displayed value by 30% or more.

### **Relevant Case Studies**

This section contains additional details on the AIM Case Studies identified as being most relevant to your building and your selected package of measures. Each case study has been assigned a Match Score, a 1-100 score that quantifies the similarity of the case study building and measures to your building and package. Only the top matches from the AIM database are included. A narrative summary of each best match case study (up to five) is included in this report, along with links to the detailed PDF reports; up to five more case studies are included as links only.

#### Case Studies List

- University of Chicago Retro-Commissioning Reduces EUI Through a Variety of Measures
- McGill University Improves Safety and Energy Efficiency in Montreal
- Fume Hood Retrofits at Stanford University
- Simon Fraser University Fume Hood VAV Upgrade in British Columbia
- Vivarium Retrocommissioning at University of California San Francisco
- Colorado School of Mines Shut the Sash Program &
- Demand Control Ventilation, Shut the Sash at Georgetown University &
- Michigan's Oakland University Demonstrates Efficiency Through Technology
- Air Optimization in a Cambridge, Massachusetts, Biolab&
- Multiple Sustainability Measures and Retrocommissioning at the University of Kentucky



### University of Chicago Retro-Commissioning Reduces EUI Through a Variety of Measures



Match Score: 71.8

In 2018-19, the Searle Chemistry Laboratory at the University of Chicago was retro-commissioned by Grumman Butkus Associates (GBA) as part of a campus-wide energy efficiency initiative. Built in 1968 and extensively renovated in 2009 to earn LEED Gold, the 86,500 SF facility includes chemistry labs, offices, a data center, and mechanical spaces across five floors. The baseline annual energy usage was 43,138,313 kBtu, yielding a baseline EUI) of 499.2 kBtu/SF. This project aimed to identify and implement measures to reduce energy consumption and improve operational efficiency.

GBA developed two sets of recommendations: eight facility improvement measures to address system issues, and 16 energy conservation measures (ECMs) focused on energy efficiency. Implemented ECMs included reducing fume hood face velocity from 100 feet per minute (fpm) to 80 fpm, lowering minimum fume hood airflow per ANSI Z9.5 standards, and implementing a sash management initiative with user training and automatic closer reactivation. Other measures involved removing redundant AHU pre-filters; resetting AHU supply air temperature and nighttime space temperature; re-implementing static pressure reset; adjusting cleanroom and lobby terminal unit controls; revising mechanical room fan coil unit controls; adjusting humidifier control for AHU-3; and replacing incandescent lobby lamps.

The implemented measures resulted in a verified total of 202,500 kWh in electricity savings, 2,750 klbs in steam savings, and 73,800 ton-hours of chilled water savings. The total implemented measures resulted in 3,090 MMBtu electrical savings, 1,070 MMBtu chilled water savings, and 3,550 MMBtu steam savings. With regards to specific savings, fume hood face velocity reduction saved 44,000 kWh/year, 14,000 ton-hours of chilled water, and 400 klbs of steam, with a 2.4-year simple payback. Fume hood minimum airflow reduction saved 110,000 kWh/year, 39,000 ton-hours of chilled water, and 1,200 klbs of steam, with a 1.0-year simple payback. The total implemented energy savings compared to prior annual consumption was 11.3%, and the facility EUI was reduced to 394.7 kBtu/SF. The overall simple payback for all implemented measures was 1.4 years, including potential incentives.

Detailed data analysis and trend reporting in the building automation system help monitor fume hood performance and disseminate information to occupants. Addressing specific issues such as damper/ductwork problems was crucial for the successful re-implementation of static pressure reset. Identifying and rectifying instances of simultaneous heating and cooling in various spaces also contributed to significant energy savings. Some more capital-intensive measures, such as replacing fume hood exhaust actuators, modulating fume hood exhaust fan speed, and installing fume hood zone presence sensors, were held for future consideration due to longer payback periods. The project was recognized with an Excellence in Engineering Award by the Illinois Chapter of ASHRAE and a First Place Technology Award by ASHRAE Region VI.

- 1. AHU Discharge Air Temperature Reset (ECM071)
- 2. Unoccupied Room Temperature Setback (ECM201)
- 3. Shut-the-Sash Program for Fume Hoods (ECM184)
- 4. Reduced Fume Hood Minimum Airflow (ECM104)
- 5. Reduced Fume Hood Face Velocity (ECM097)

#### McGill University Improves Safety and Energy Efficiency in Montreal



Match Score: 66.1

The Otto Maass Laboratory Building, owned by McGill University, is located in Montreal, Quebec, and was originally built in 1966. Primarily used for education and research in chemistry, the building includes teaching and research laboratories, classrooms, a lounge, and a large lecture hall. The renovation project was led by NFOE Architects with engineering by Pageau Morel. The building has a gross area of 140,000 SF, with 125,000 SF of conditioned space. The renovation completed in 2011, focused on heat recovery and airflow control based on user needs, which significantly reduced energy consumption.

The renovation project aimed to improve safety and comfort for users, increase energy efficiency, and maintain operations during the retrofit. Key energy efficiency measures included the installation of a runaround glycol heat recovery loop, low-temperature terminal reheat, low-velocity displacement ventilation systems, and the reuse of office air for minimum air changes required in lab spaces. Additionally, the project implemented precooling of exhaust air and heat recovery from a major server room in an adjacent building. Temporary HVAC systems were installed to ensure continuous air quality during the renovation. The existing fume hoods were replaced by VAV hoods that modulate flow in response to sash position, and were also provided with occupancy sensors to reduce exhaust when unattended.

The renovation resulted in a 59% reduction in annual energy consumption. The project costs related to energy efficiency were CDN \$9.573 million, and total energy savings exceeded initial estimates, coming out to CDN \$1.323 million saved annually.

Lessons learned from the project include the importance of maintaining a safe and healthy environment for users during renovations and the benefits of phased work to ensure continuous laboratory operations. The use of temporary ventilation systems was crucial in maintaining air quality, and the integration of heat recovery systems proved highly effective. Challenges included managing the logistics of temporary systems and ensuring minimal disruption to ongoing research activities. The unique characteristics of the Otto Maass Building, such as its high fume hood density and the need for continuous ventilation, influenced the design and implementation of the energy efficiency measures.

- 1. Exhaust Air Energy Recovery: Sensible Systems (ECM072A)
- 2. Variable Air Volume Controls for HVAC Systems (ECM076)
- 3. Unoccupied Room Airflow Setback (ECM085)
- 4. Fume Hood Unattended Face Velocity Reduction (ECM107)
- 5. Variable Air Volume Controls for Fume Hoods (ECM095)

#### **Fume Hood Retrofits at Stanford University**



Match Score: 63

The Stauffer I Laboratory Building at Stanford University is primarily used for chemical research; it was constructed in 1959-60 and has a gross area of 28,000 GSF with 22,000 SF of conditioned space. A fume hood retrofit project, completed in 2007, was led by CAS Architects with engineering by Taylor Engineers. The building features three stories and includes both wet and dry laboratories, as well as support spaces for researchers and administrators. The HVAC system consists of three central 100% outdoor air constant volume air-handling units and three exhaust fans. The building contains multiple fume hoods.

The project aimed to improve energy efficiency and reduce emissions through several measures. These included replacing pneumatic zone controls with a direct digital control system, converting constant volume zones to VAV zones, and installing occupancy sensors at fume hoods to adjust face velocity based on occupancy. Additionally, the project involved reducing the total exhaust air quantity, adding differential pressure sensors for dynamic reset of supply fan duct pressure, and installing intake bypass dampers and barometric makeup air dampers. Acoustical treatments were also added to the supply and exhaust ductwork in non-laboratory spaces.

The retrofit resulted in significant energy savings, with a more than 60% reduction in building energy consumption. Chilled water and steam use decreased by 70%, and electricity use dropped by 40%. The project cost was \$850,000, with a utility rebate of \$181,000. The annual cost savings were \$228,000 in fiscal year 2009. Assuming \$200,000 annual average cost savings, the payback period was estimated to be 4 years. The estimated cumulative net present value over 10 years exceeded \$800,000.

Lessons learned from the project highlighted the importance of early collaboration among contractors, engineers, owners, and occupants to minimize disruption. The use of a design-assist procurement process and pre-engineered systems helped reduce construction time and costs. The retrofit also provided better indoor air quality, thermal comfort, and acoustical control. The success of this project has led to similar retrofits in other buildings on Stanford's campus.

- 1. Supply Duct Static Pressure Setpoint Reset (ECM203)
- 2. AHU Discharge Air Temperature Reset (ECM071)
- 3. Variable Air Volume Controls for HVAC Systems (ECM076)
- 4. Fume Hood Unattended Face Velocity Reduction (ECM107)
- 5. Variable Air Volume Controls for Fume Hoods (ECM095)

#### Simon Fraser University Fume Hood VAV Upgrade in British Columbia



Match Score: 62

The Shrum Science Chemistry Building at Simon Fraser University in Burnaby, British Columbia, underwent a fume hood upgrade project to improve energy efficiency and reduce GHG emissions. The 9,706-square-meter (104,434 SF) building, originally built in the mid-1960s with a major renovation in 2011, houses wet lab spaces and operates 24/7. This case study outlines the retrofitting of 53 fume hoods and the subsequent energy and cost savings.

The project focused on upgrading the existing two-position fume hoods to a VAV system, allowing for better control of exhaust airflow based on sash position and usage. This involved modifying the fume hood controls, integrating them with the building's direct digital controls system, and ensuring optimal face velocity and airflow rates. The project also involved reducing the minimum fume hood flow of the VAV hoods to 150 hood air changes per hour (ACH). Note that the exhaust system consisted of four variable speed, wind-responsive, high plume exhaust fans.

The VAV fume hood retrofit resulted in substantial energy savings, with a reduction of 365,000 kWh/year in electricity and 300 GJ/year in district heating. This translated to an annual GHG emissions reduction of 34.6 tons of CO2e and cost savings of CDN \$32,870. The total project cost was CDN \$293,400, with a simple payback period of 8.9 years, a net present value (NPV) of CDN \$160,000. And a lifecycle summary internal rate of return was 12.5%.

Key takeaways from the project highlighted the importance of understanding the existing fume hood and building systems, as well as engaging users throughout the process. Proper documentation of fume hood contents and procedures, removal of redundant equipment, and consideration of fume hood density were also emphasized as crucial factors for successful implementation and maximizing energy benefits.

- 1. Reduced Fume Hood Minimum Airflow (ECM104)
- 2. Variable Air Volume Controls for Fume Hoods (ECM095)

#### Vivarium Retrocommissioning at University of California San Francisco



Match Score: 58.3

The University of California San Francisco Vivarium Building serves as a specialized animal lab for basic research and includes animal housing, procedure and support rooms, staff rooms, and cage washing and processing areas. The building, completed in 2005, has a gross area of 191,000 SF and a conditioned space of 189,000 SF. The facility operates with a continuous 100% outdoor air ventilation requirement, supported by four rooftop air handlers and exhaust fans. A number of energy and operational improvements were achieved through monitoring-based retro-commissioning undertaken in 2013 by Sherrill Engineering, resulting in significant annual savings for the university.

The project aimed to enhance energy efficiency and operational performance through meticulous retro-commissioning. Key measures included eliminating bypass flow, optimizing static pressure setpoints, and revising HVAC and lighting designs to match actual usage. The building's sophisticated building management system played a crucial role in implementing these changes. The project also involved training users to cap unused cage rack connections and configure controls for consistent ventilation rates. These efforts ensured that the building met the unique needs of its animal and human occupants while achieving substantial energy savings.

The retro-commissioning project led to impressive energy savings and cost reductions. The building's EUI improved from 328 kBtu/SF/year to 234 kBtu/SF/year, with electrical EUI dropping from 118 kBtu/SF/year to 62 kBtu/SF/year. The total project cost was \$525,367, with annual energy savings of over \$200,000, resulting in a simple payback period of less than one year after accounting for the incentive payment of \$393,895. The reduction in energy use also translated to an estimated 500 tons of CO2 emissions avoided annually.

Lessons learned from the project highlighted the importance of detailed planning, trust-building with users, and thorough training. The unique characteristics of the vivarium, such as its stringent ventilation and pressurization requirements, posed challenges that required creative solutions. The project underscored the value of retaining experienced commissioning personnel familiar with the building's specialized systems. Additionally, the success of the project was attributed to the collaborative efforts of the project team, building engineers, and users, ensuring that the implemented measures were effective and sustainable.

- 1. Exhaust Duct Static Pressure Setpoint Reset (ECM204)
- 2. Supply Duct Static Pressure Setpoint Reset (ECM203)
- 3. Unoccupied Room Temperature Setback (ECM201)
- 4. Unoccupied Room Airflow Setback (ECM085)
- 5. Risk-Based Airflow Optimization (ECM083)

### **Building Parameters**

This page lists the values of the parameters used to represent the existing building within the AIM Report software. These are a mixture of user input, assumed, and calculated values. The list is presented for reference. Some are internal parameters used by the software. If you have questions about the AIM Report results for a particular building, please make sure to include this list in communications with I2SL. Further details on how these values are used in the calculations are included in the detailed documentation on the AIM website.

Value

**Building Information** 

Building Address 120 Kingston St, Boston, MA, USA

State MA

Country United States

Floor Area 120,000 ft<sup>2</sup>
Average Ceiling Height in Labs 10 ft

Number of Lab Zones Used in AIM Calculation 73.8

Average Zone Area Used in AIM Calculation 650 ft²

Total Lab Area 48,000 ft<sup>2</sup>
Total Building Net to Gross Factor 0.65

Control Strategies Value

Supply Air Temperature Setpoint Reset
Supply Static Pressure Setpoint Reset
Exhaust Static Pressure Setpoint Reset
No
Exhaust System Wind Speed Response
No

Lab Unoccupied Temperature SetbackYesOccupied Room Cooling Setpoint73.0 degFUnoccupied Room Cooling Setpoint76.0 degF

Occupied Room Heating Setpoint
71.0 degF
Unoccupied Room Heating Setpoint
68.0 degF

Exhaust Fan Control Strategy CV Fans with Bypass Damper, Staged

Energy Recovery Capacity Control Type

Variable Speed

Energy Recovery Bypass Dampers Yes

Supply Air Temperature Setpoint 55.0 degF
Energy Recovery Average Exhaust Supply Airflow Ratio 100%

Energy Recovery Dry Bulb Changeover Temperature 75.0 degF

Energy Recovery Lockout Control Type

Energy Recovery Low Range Engage Temperature

55.0 degF

**Building Systems** 

Cooling System Type Heating System Type

**HVAC System Type HVAC Control Type** 

Exhaust Air Energy Recovery Air Side Low Pressure Drop Design

**Humidification System** Humidification %RH Setpoint

Cooling Method

COP Of Refrigeration System Exhaust Fan Efficiency Heating Method

COP Of Heating System

Exhaust Energy Recovery System Type

Supply Fan Efficiency

Exhaust Energy Recovery Effectiveness

Number Of Exhaust Fans

Additional Static Pressure From Energy Recovery System

Energy Recovery Glycol Pump Power (if Present)

Exhaust Fan Full Load Motor Efficiency Exhaust Fan Full Load VFD Efficiency Exhaust Fan Motor Oversize Factor

Exhaust Fan Total Static Pressure (Not Including Energy Recovery)

Average Lab Room Flow Tracking Offset

Return Air Temperature Rise Room Cooling Method

Sensible-Only Energy Recovery Type

Supply Fan Energy Transfer to Airstream Supply Fan Full Load Motor Efficiency Supply Fan Full Load VFD Efficiency Supply Fan Motor Oversize Factor

Supply Fan Total Static Pressure (Not including Energy Recovery)

**Financial** 

**Annual Inflation Rate** 

**Energy Cost Inflation Rate** Hurdle Rate

Financial Analysis Period

**Electricity Cost** 

District Chilled Water Cost Natural Gas/Oil/Other Fuel Cost District Hot Water/Steam Cost

Value

Chiller Plant in Building: Water Cooled Boiler Plant in Building: Non-Condensing

**HW Boilers** 

Variable Volume with Reheat

**Direct Digital Control** Glycol Run-Around

No None 30%

Chilled Water

1.00 60%

Steam from Gas

1.00

Sensible Only

70% 50%

4

0.6 in.wc

0.15 hp/1000 cfm

0.90

0.97 10%

4.5 in.wc 10%

3.0 degF

VAV Air System Glycol Coils

67% 0.90 0.97

10%

5.8 in.wc

Value

3%

3% 8%

15 Yrs

0.24 \$/kWh

0.18 \$/ton-hour 1.25 \$/therm

16.00 \$/MMbtu

**Ventilation** Value

Lab Unoccupied Airflow Setback

Lab Chemical Sensing and Airflow Response

No

Source of Ventilation Requirements Organizational Policy

12.0 ACH

Occupied Minimum Ventilation Rate in Labs

6.0 ACH
Unoccupied Minimum Ventilation Rate in Labs

6.0 ACH
Probability of Purge Airflow (if Chemical Sensing Used)

Design Lab Minimum Ventilation Rate (Day)

8.0 ACH

Design Lab Minimum Ventilation Rate (Night)

8.0 ACH

Occupancy and Plug Loads

High Vent Max/Purge Supply (if using Chemical Sensing)

High-Efficiency ULT Freezers

Fume Hood Shut-the-Sash Program

No

Number of ULT Freezers in Building

Occupied Hours per Week

80

Occupancy Schedule Standard Occ Hours

Fume Hoods Value

Fume Hood Face Velocity 100 ft/min

Predominant Fume Hood Control Type Constant Volume

Fume Hood Automatic Sash Closers

Fume Hood Unattended Airflow Setback

% of Fume Hoods in High Hood Density Zones

% of Lab Zones with High Fume Hood Density

10%

Total Number of Ducted Fume Hoods in Building

Average Fume Hood Maximum Airflow

Average Fume Hood Minimum Airflow

Average Fume Hood Sash Opening (Day)

Average Fume Hood Sash Opening (Night)

75

900 cfm

900 cfm

Average Fume Hood Sash Opening (Day)

33%

Average High Hood Density Zone Area as % of Average Zone 100%

Lab Space Loads Value

% of Lab Zones with Low Cooling Load

Average Peak Cooling Load (Day) for Low Load Zones

4.0 W/ft²

Average Peak Cooling Load (Night) for Low Load Zones

2.0 W/ft²

Average Cooling Load (Day) for Low Load Zones

3.0 W/ft²

Average Cooling Load (Night) for Low Load Zones

1.5 W/ft²

Room Peak Cooling Load (Day) for Low Load Zones 6.0 W/ft²

% of Lab Zones with Moderate Cooling Load

20%

Average Peak Cooling Load (Day) for Moderate Load Zones 8.0 W/ft<sup>2</sup>

Average Peak Cooling Load (Night) for Moderate Load Zones

4.0 W/ft²

Average Cooling Load (Day) for Moderate Load Zones

6.0 W/ft²

Average Cooling Load (Night) for Moderate Load Zones

Room Peak Cooling Load (Day) for Moderate Load Zones

3.0 W/ft²

10.0 W/ft²

% of Lab Zones with High Cooling Load 20%

Average Peak Cooling Load (Day) for High Load Zones 12.0 W/ft²

Average Peak Cooling Load (Night) for High Load Zones

Average Cooling Load (Day) for High Load Zones

4. Average Cooling Load (Night) for High Load Zones

5. W/ft²

6.0 W/ft²

Room Peak Cooling Load (Day) for High Load Zones 12.0 W/ft²

Non-Lab Areas	Value
Peak Cooling Load (Day) in Non-Lab Zones on Same AHU	4.5 W/ft <sup>2</sup>
Average Peak Cooling Load (Day) in Non-Lab Zones on Same AHU	3.0 W/ft <sup>2</sup>
Average Cooling Load (Day) in Non-Lab Zones on Same AHU	2.3 W/ft <sup>2</sup>
Average Cooling Load (Night) in Non-Lab Zones on Same AHU	3.0 W/ft <sup>2</sup>
Average Ventilation Rate (Day) in Non-Lab Zones on Same AHU	3.0 ACH
Average Ventilation Rate (Night) in Non-Lab Zones on Same AHU	2.0 ACH
Total Area of Non-Lab Zones	38,400 ft <sup>2</sup>

### **Appendix**

This section contains general reference information on the AIM Report. Additional pages will be added in future versions.



### Full List of Measures Considered

The full library of measures for the current version of the AIM Report is shown below. Available measures for a given building are sourced from this set of measures.

ECM045	Enhanced Exhaust Fan System Controls	ECM048	Staged Control for Constant Volume Exhaust Fans
ECM059A	Frequent Filter Replacement for Air Handlers	ECM059B	Low Pressure-Drop Filters for Air Handlers
ECM071	AHU Discharge Air Temperature Reset	ECM072A	Exhaust Air Energy Recovery: Sensible Heat Systems
ECM072B	Exhaust Air Energy Recovery: Enthalpy Wheels	ECM076	Variable Air Volume Controls for HVAC Systems
ECM083	Risk-Based Airflow Optimization	ECM084	Demand Based Control of Ventilation Using IEQ Sensors
ECM085	Unoccupied Room Airflow Setback	ECM095	Variable Air Volume Controls for Fume Hoods
ECM096	Hibernation or Decommissioning of Unused Hoods	ECM097	Reduced Fume Hood Face Velocity
ECM098	Upgraded Fume Hood Performance	ECM100	Fume Hood Automatic Sash Closers
ECM104	Reduced Fume Hood Minimum Airflow	ECM107	Fume Hood Unattended Face Velocity Reduction
ECM137	High-Efficiency Ultra-Low Temperature Freezers	ECM181	Setting Ultra-Low Temperature Freezers to -70C
ECM182	Participating in the Freezer Challenge	ECM184	Shut-the-Sash Program for Fume Hoods
ECM191	Obtaining a My Green Lab Certification	ECM201	Unoccupied Room Temperature Setback
ECM203	Supply Duct Static Pressure Setpoint Reset	ECM204	Exhaust Duct Static Pressure Setpoint Reset

# Current and Recent Members of Labs2Zero Technical Advisory Councils as of December 2024

2021			
Name	Organization/Affiliation	Name	Organization/Affiliation
Alicia Pandimos Maurer	Cannon Design	Don Posson	SmithGroup
Alison Farmer	I2SL	Dru Larson	Mayo Clinic
Allen Doyle	3Flow	Eleanor Riley	Laboratories Canada (SPIE
Anne Whitsel	HDR		PSPC)
Anthony Michetti	Cell Signaling Technology	Elisabeth Girgis	Public Services and Procurement Canada
Ari Greenberg	BR+A Consulting Engineers	Elisabeth Mikula	Perkins & Will
Arlen Li	HGA Architects and Engineers	Emily English	BNBuilders
Aurora Jensen	Brightworks Sustainability	George Karidis	SmithGroup
Austin Barolin	Mazzetti	Greg Smithmeyer	Affiliated Engineers, Inc.
Bo Jiang	Natural Resources Canada	Heather Hayne	Laboratories Canada (SPIE PSPC)
Bob Senior	KJ Tait	Hunyum Murya	Ramboll
Brad Cochran	CPP	Irmak Turan	Thornton Tomasetti
Brandon Fortier	IMEG Corp.	Isuru Hettiarachchi	Jacobs
Brendan Fox	Wood Australia	Jacob Werner	Ellenzweig
Brian Smiley	HOK	Jake Williams	Buro Happold
Brooks Stout	Affiliated Engineers, Inc.	James Connelly	My Green Lab
Chad House	Siemens	James Donson	NREL
Chris Lewis	GreenerU, Inc.	Jeff Wegner	CRB
Colette Baker	Harvard Medical School	Jenifer Ballew	City of Cambridge
Conor McGuire	Columbia Construction	Jesce Walz	Perkins&Will
Curt Elliott	JE Dunn Construction	Jim Ormond	LGC
Dan Diehl	Aircuity	Joe Ross	tk1sc
Dan Doyle	Grumman Butkus Associates	Joel Good	RWDI
Dan Seng	НОК	Joey Shea	Interface
David Golden	UC Berkeley	John Alberico	SLCan
Debjani Sarkar	Jacobs	John McDonald	SmithGroup
Deepa Kundadka	DKK Safety	John Swift	Buro Happold
Deirdre Carter	Lawrence Berkeley Nat'l Lab	Jon Flynn	Alexandria Real Estate
Desmond Greene	WB Engineers + Consultants	Josh Hatch	Brightworks Sustainability
Devin Kleiner	Perkins&Will	Josh Kace	LBNL
Dirk von Below	Flad Architects/retired	Kanika Sharma	Introba

Name	Organization/Affiliation	Name	Organization/Affiliation
Kashyap Desai	Laboratories Canada (SPIB,	Rebekah Gandy	Gensler
Kathleen Brady	PSPC)	Richard Malmstrom	Alexandria Real Estate Equities
Kevin Belusa	Airgenuity, Inc.	Robert Thompson	SmithGroup
Kevin Brettmann	JE Dunn Construction	Russell Knudson	HGA Architects and
Kevin Ricart	SmithGroup	ridoscii riildascii	Engineers
Kevin Shea	Introba	Sam Huber	Eurofins
Kimberly Reddin	Flad	Samy Ponnusamy	Millipore Sigma
Kristen Brozowski	Buro Happold	Sarah Callahan	Aircuity
Landry Watson	Alexandria Real Estate	Sarah Grady	Siemens
Laura Carmona	HHMI	Scott Weitze	My Green Lab
Linda Morrison	Denver Community Planning	Sean Convery	Cator, Ruma & Associates
	and Development	Shane Day	Affiliated Engineers, Inc.
Lisa Cassedy	HOK	Shannon Horn	University of Colorado at
Malcolm Tait	KJ Tait		Boulder Facilities Engineering
Marcus Hazelwood	WB Engineers + Consultants	Shea Jameel	Marsh McLennan
Maria Perez	Gensler	Skye Smith	Kirksey Architecture
Mark Stewart	McMaster Innovation Park	Solomon Degu	University of California San Francisco
Matt Tefft	Dynamic Air Corp	Sophia Lee	Jacobs
Matt Williamson	HOK	Suzanne Belmont	National Renewable Energy
Matthew Severson	ACCO Engineered Systems	Suzanne Dennont	Lab
Maura Kohl	Cushman + Wakefield	Taryn Green	RWDI
Michael Gryniuk	Cora Structural	Thea Rozenbergs	Alliiance
Mike Dymarski	Retired, University of Toronto	Thomas Vu	Affiliated Engineers, Inc.
Natasha Dunwoody	Jacobs	Tina Binazir	Ellenzweig
Nathan Gauthier	Takeda	Todd Gottshall	Western Allied Mechanical
Nick Rados	WB Engineers + Consultants	Tom McGee	Konvekta
Otto VanGeet	NREL	Tom Smith	3Flow
Patrick Carpenter	Facility Performance	Urwa Irfan	SmithGroup
	Engineers	Vladimir Lazov	Sustainable Labs
Paul Mathew	On Sabbatical, formerly LBNL		Canada/WSP
Penny Avery	Sandia National Laboratories	Walt King	Aircuity
Quentin Gilly	Indiana University	Yukari Kubo	DKK Safety and Environmental
		Yvon Lachance	SLCan & YLA Architecture
		Zachary Heaps	Flad Architects

