IECM-11 – Shut the Sash (STS) Laboratory Hood Program

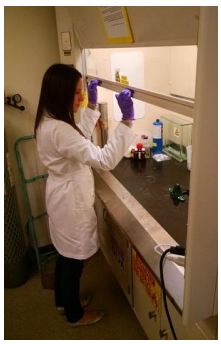
Energy Opportunity Area: HVAC, Special Systems (Laboratory Hoods)

Building(s) Affected: BSC Science and Mathematics Complex (SAMC)

Measure Status: Recommended – In Progress (I)

IECM-11 Summary

Description	Values	Units
Annual Electrical Energy Savings	415,800	kWh/year
Annual Electrical Energy Cost Savings	$22,495	$/year
Annual Natural Gas Energy Saving	50,639	therm/year
Annual Natural Gas Energy Cost Savings	$15,024	$/year
Total Annual Energy Cost Savings	**$37,519**	**$/year**
Total Project Cost	**$0**	**$**
Simple Payback Period (SPP)	**0.0**	**years**
Electrical Cost Basis (2016 $/kWh):	**$0.0541**	
Natural Gas Cost Basis (2016 $/therm):	**$0.2967**	



Existing Conditions/Baseline: Chemical fume hoods are safety devices that protect the operator's breathing zone from hazardous vapors and pollutants released during experimental procedures by removing those vapors and exhausting them outside. Because there is a large volume of air being exhausted into the atmosphere, *a single fume hood can use as much energy as three to four residential homes in a single day*. Fume hoods are designed so that when they are not in use the sash should be shut. There is an airfoil sill at the bottom of the sash in all modern fume hoods so that even when the sash is shut, air will still be pulled from the room to exhaust any hazardous vapors. The following represents the quantity of fume hoods, exhaust air flows and annual energy costs for SAMC using a calculated annual cost of $2.53/CFM-year based on 8,760 hour per year of hood operation.

	Fume Hood Quantity	Total Fume Hood Exhaust (CFM)	Average Fume Hood Exhaust (CFM/hood)	Annual Energy Cost ($/yr.)	Average Annual Energy Cost per Hood ($/yr.-hood)
SAMC Phase I	40	45,200	1,130	$114,356	$2,859
SAMC Phase II	8	4,300	538	$10,879	$1,360
TOTAL	**48**	**49,500**	**1,031**	**$125,235**	**$2,609**

Recommended Actions: The goal of this measure is to raise awareness in the SAMC laboratories about the importance of closing the sash when a fume hood is not in use. Shutting the sash will not only improve the energy efficiency in SAMC but is also an important safety measure. The sash should always be pulled down in front of the face to protect the breathing zone. The lower the sash, the safer the conditions.

Estimated Savings: Energy savings for measures that reduce lab hood average annual air flow rates in cubic feet per minute (CFM) were estimated using tabulated values for building hood air flow annual energy consumption using the web-based Laboratory Fume Hood Energy Model developed by Lawrence Berkeley National Laboratories.

Description	Total Fume Hood Exhaust (CFM)	Estimated STS Reduction (%)	STS Average Exhaust Reduction (CFM)	Electrical Savings (kWh/yr.)	Natural Gas Savings (therm/yr.)	Total Cost Savings ($/yr.)
SAMC Phase I	45,200	30%	13,560	379,680	46,240	$34,260
SAMC Phase II	4,300	30%	1,290	36,120	4,399	$3,259
TOTAL	**49,500**		**14,850**	**415,800**	**50,639**	**$37,519**

Estimated Cost: Implementing a Shut the Sash (STS) program involves behavior changes by faculty, students, laboratory technicians and assistants and does not require an additional expenditure of capital or labor costs.

Implementation Considerations: There are a variety of case study examples and resources available to colleges and universities interested in developing their own STS programs. Shut-the-sash campaigns use various educational methods, posted materials, and rewards to encourage lab users to lower fume hood sashes when not in use. An example of potential laboratory hood signage is provided at right.

Environmental Benefits: Successful implementation of the STS program results in significant reductions to BSC campus greenhouse gas (GHG) emissions by lowering campus annual electrical and natural gas consumption. The impact of these reductions can be expressed in other ways such as:

- Annual greenhouse gas reduction equivalent ($MTCO_2e$) — 577 metric tons of CO2
- Annual passenger vehicle equivalent — 124 automobiles
- Residential home energy consumption — 62 homes
- Tree seedlings grown for 10 years — 15,000 trees
- US forest equivalent — 1,000 acres

Fume Hood Myth Busters: There are many misconceptions regarding the design and operation of laboratory fume hoods. The following addresses several of these myths with facts based on current laboratory best practices.

Myth: A fume hood can be used for storage of volatile, flammable, or odiferous materials when an appropriate storage cabinet is not available.
Fact: It is okay to keep chemicals in a fume hood that are being used during a procedure, but fume hoods are not designed for permanent chemical storage. Items placed in the hood can interfere with the air flow, causing turbulence which will allow contaminants to be drawn out of the hood into the room. Fume hoods are not flammables cabinets. They offer no protection from a fire occurring outside the hood in the laboratory.

Myth: A fume hood can be used as a waste disposal mechanism (e.g., for evaporation of chemicals).
Fact: Fume hoods exhaust vapors into the atmosphere untreated, so it is not appropriate to use a fume hood for waste disposal. Evaporation is considered treatment of hazardous materials and is not allowed by the EPA without a permit.

Myth: Fume hood sashes should not be shut all the way even when no one is using the hoods.
Fact: Fume hoods are designed for their sashes to be shut all the way. The airfoil sill at the base of the hood will still allow for air to be pulled into the fume hood even with the sash fully closed.

Myth: When working with highly dangerous materials, the higher the face velocity the better.
Fact: While it is important to have a face velocity between 80 fpm and 120 fpm, a higher face velocity will make the fume hood less efficient. High face velocities can create eddy (turbulent) currents that will allow for contaminants to be drawn out of the hood into the room and increase the worker's exposure.

Additional Resources:

Laboratory Fume Hood Energy Model developed by Lawrence Berkeley National Laboratories (http://fumehoodcalculator.lbl.gov/index.php).

Laboratory Chemical Safety at Indiana University (http://www.ehs.iu.edu/topics/laboratory-chemical-safety/fume-hood-shut-sash.shtml)

UC Berkeley and UCLA Case HVAC Study (https://wcec.ucdavis.edu/wp-content/uploads/2014/06/Case-Study-SASH_Final.pdf).

Harvard University Shut the Sash Program White Paper (https://green.harvard.edu/sites/green.harvard.edu/files/FumeHoodWhitePaper.pdf)

EPA Greenhouse Gas Equivalencies Calculator
https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator