DEFINING THE DESIGN OF YOUR LABORATORY: THE POSSIBILITIES THROUGH FILTRATION

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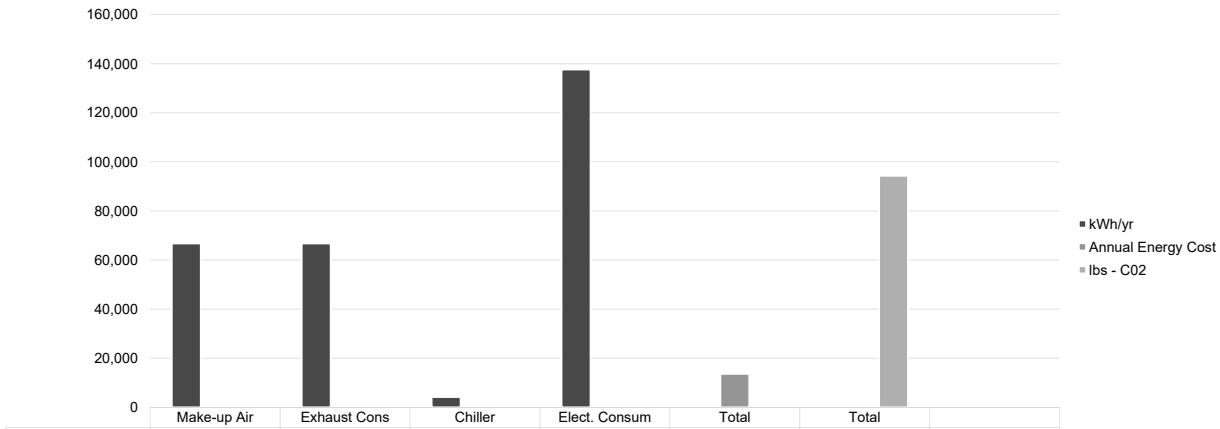
ISPE Product Show
Track 3, Session 1
September 26, 2018

What we will cover today:

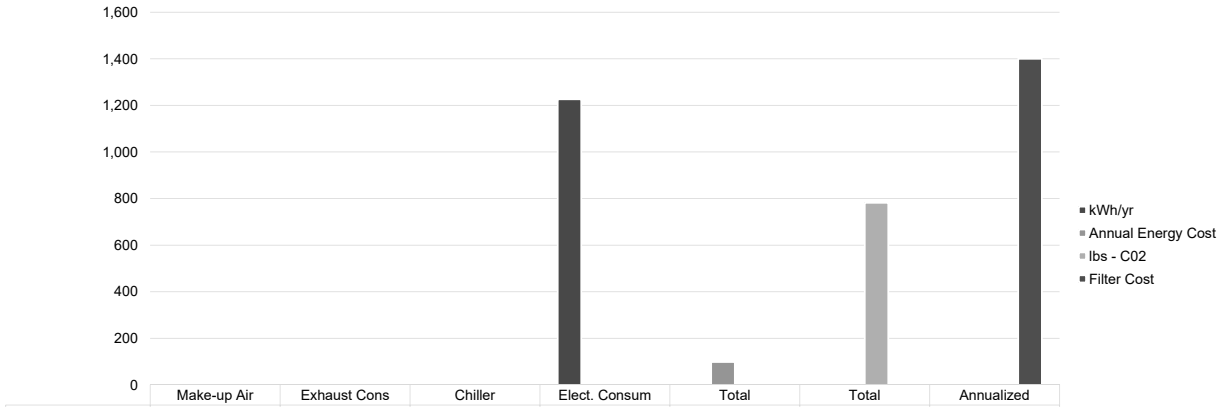
- How Expensive is your air?
- The cascade effect of filtration
- Carbon footprint reduction
- Let's talk ZNE
- Tradition vs. Change
- How to create safety through an ecosystem of filtration
- SAFETY

How Expensive is Your Air



	Make-up Air	Exhaust Cons	Chiller	Elect. Consum	Total	Total
kWh/yr	66,751	66,751	4,149	137,651		
Annual Energy Cost					13,590	
lbs - C02						94,325

How Expensive is Your Air



	Make-up Air	Exhaust Cons	Chiller	Elect. Consum	Total	Total	Annualized
kWh/yr	0	0	0	1,226			
Annual Energy Cost					98		
lbs - C02						782	
Filter Cost							1,400

The Cascading Effect of Filtration

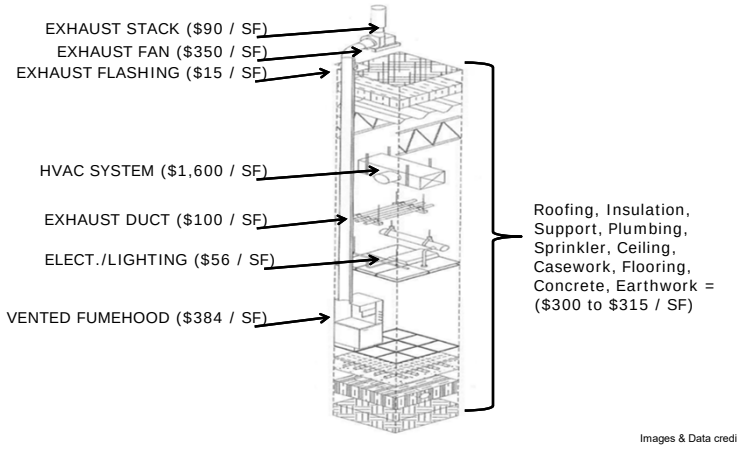
- Reduction of required HVAC
- Reduction or elimination of Venturi Valves
- Chillers reduced or removed
- Increase the GSF, or reduce the Floor to Floor space required
- Significantly reduce the AHU's required

The Cascading Effect of Filtration

Cost per Sq.Ft. Section w/DUCTED Hood

TOTAL COST PER SQUARE FOOT: $2,907.75

6-FOOT HOOD: 15 SQFT= $39,225!



Images & Data credit: Brewer Construction, Houston, TX

The Cascading Effect of Filtration

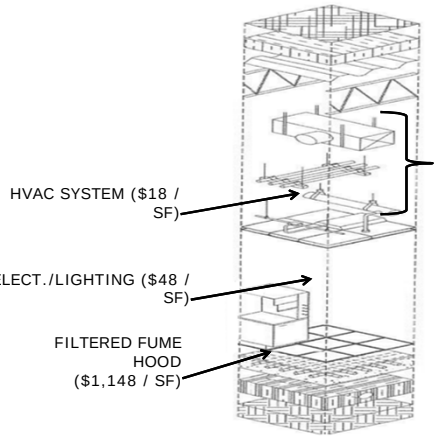
Cost per Sq.Ft. Section w/FILTERED Hood

TOTAL COST PER SQUARE FOOT: $1,148

6-FOOT HOOD: 15 SQFT= $22,710

SAVINGS: $1,759/SqFt Hood $16,515/6-ft Hood

42% Reduction



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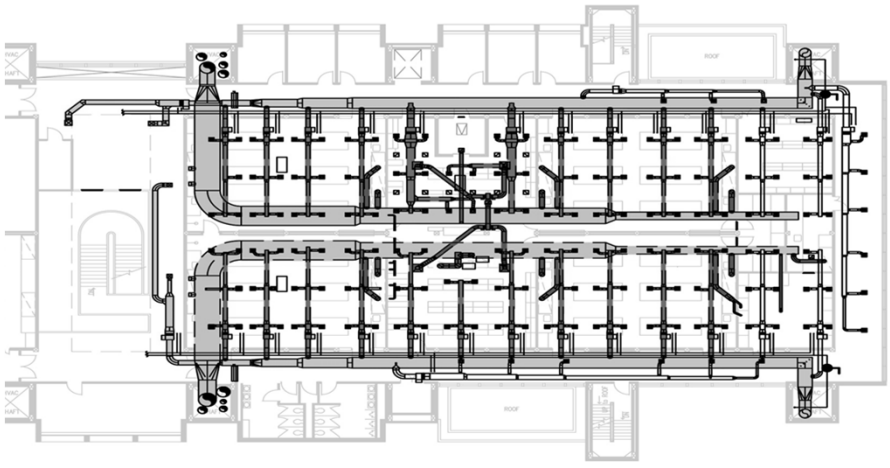
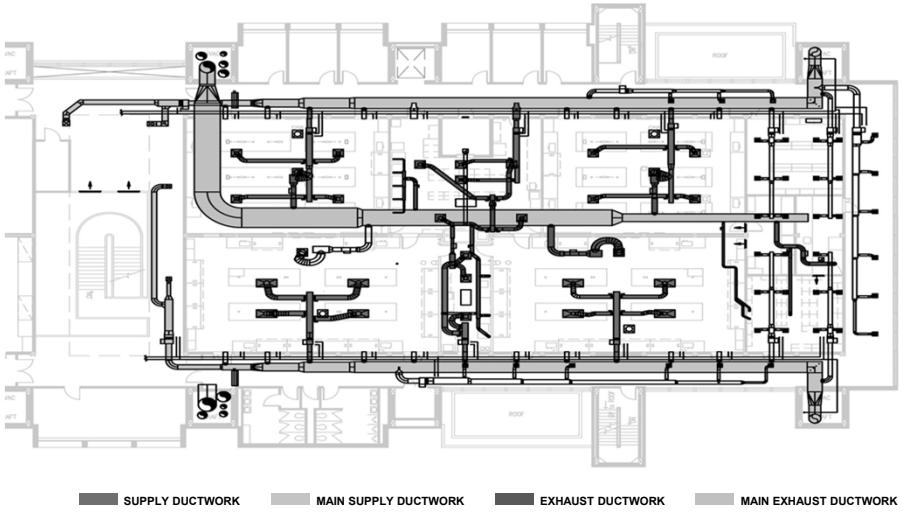
The Cascading Effect of Filtration



SUPPLY DUCTWORK | MAIN SUPPLY DUCTWORK | EXHAUST DUCTWORK | MAIN EXHAUST DUCTWORK

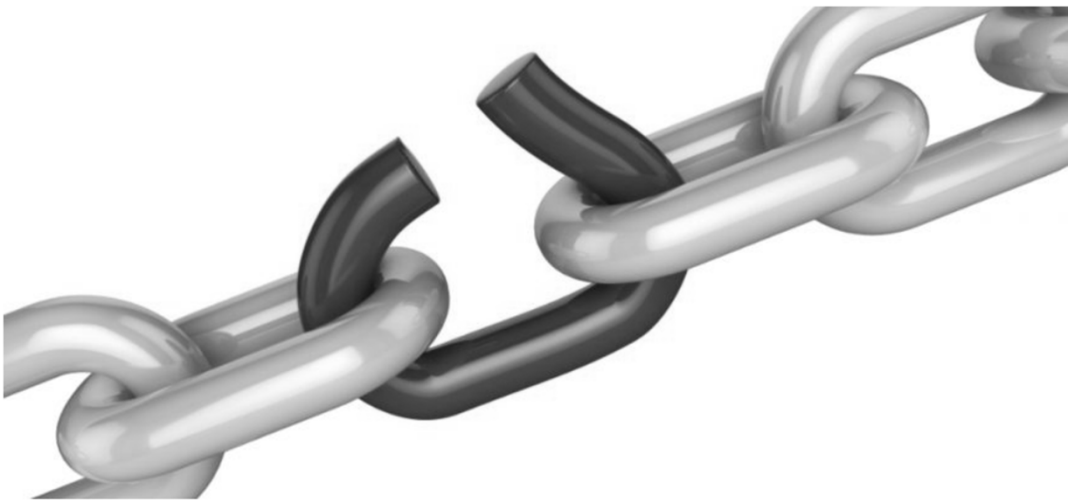
The Cascading Effect of Filtration

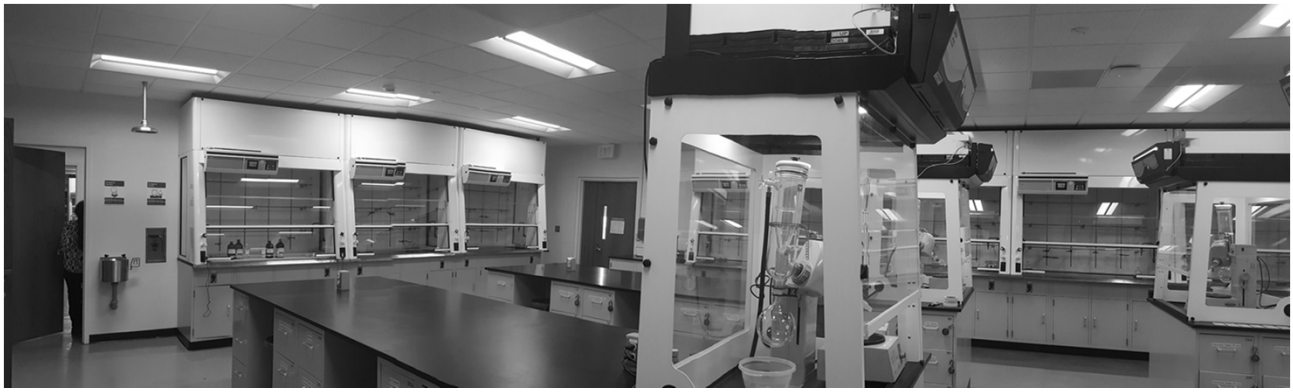


The Cascading Effect of Filtration

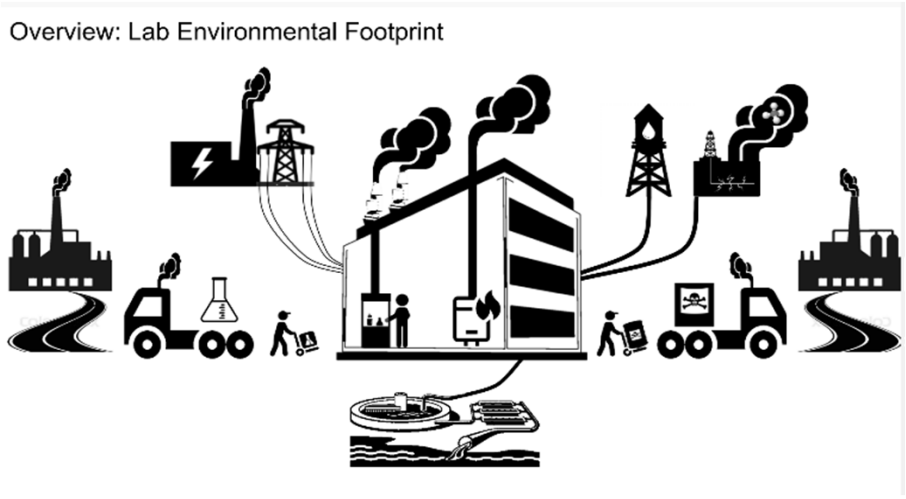
- Define the design of your lab with flexibility
- Reduction in infrastructure cost
- Solution to help achieve LEED
- Or even better, the cornerstone to achieve ZNE


PERIODIC CHART OF THE ELEMENTS
HNO3





Carbon footprint reduction



THE FUME HOOD: Where does it go??

WWW.PHDCOMICS.COM
JORGE CHAM © 2008

Intended use: containment and extraction of hazardous fumes
Actual use: a really expensive storage closet

Ever wonder where it all goes?

(What is this anyway? A trap door?)

Ramblings of a mad man

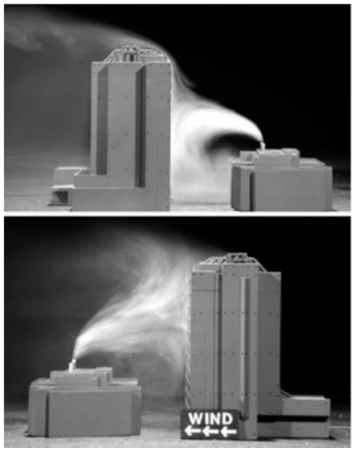
Layers of ~~crud~~ "research"

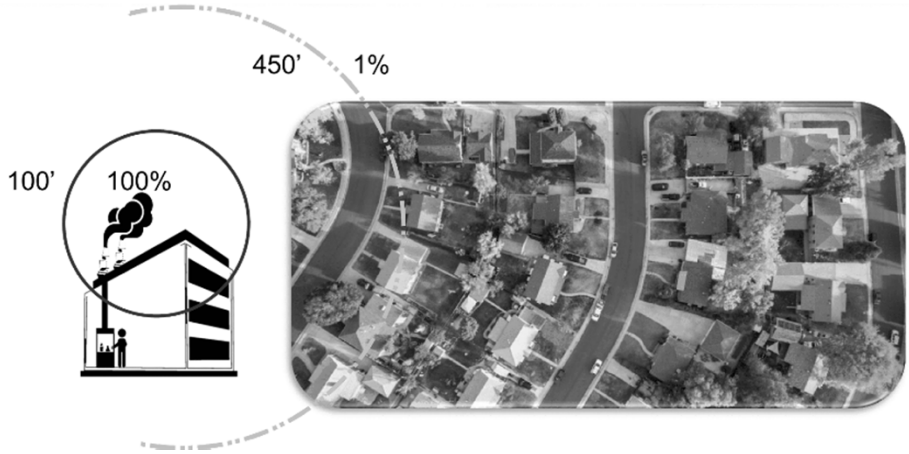
It spins by itself! Magic!

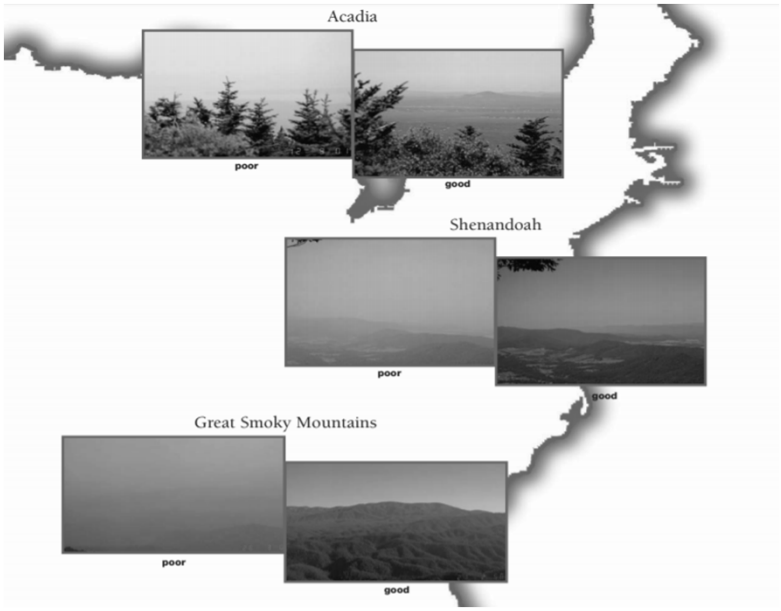
The hot plate/stirrer: abused more than the undergrad interns.

Chemicals casually laying about:

- Will kill you instantly
- Slow and agonizing death
- Two chemicals that should *never ever* be that close together
- No idea.
- Something you should probably avoid if you plan on reproducing one day.





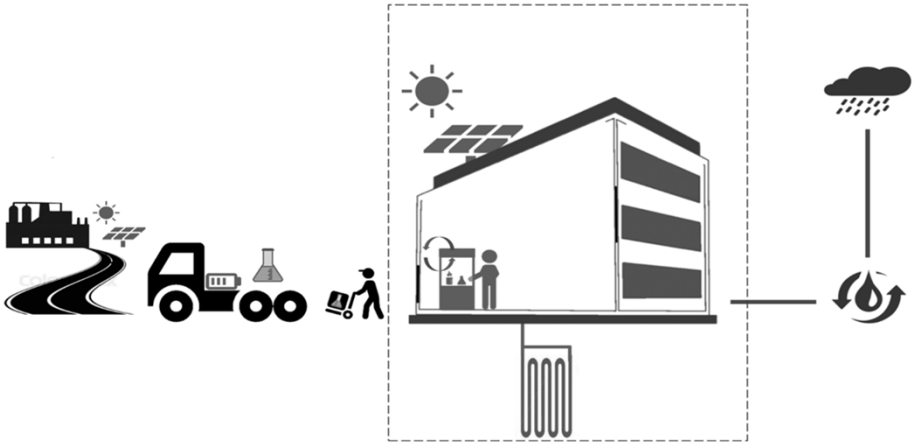


Air Pollution Travels Long Distances

- Toxaphene, a pesticide used in the U. S. corn belt has been found in fatty tissues of polar bears and other Arctic animals – thousands of miles from any possible source.
- Nitrogen oxides deposited from the air have contributed to fish kills by increasing the growth of oxygen-depleting algae in the Chesapeake Bay. Over a quarter of the nitrogen in the Bay and its tidal rivers and streams is estimated to come from air pollution carried by the wind from power plants and industrial sources far away.
- Emissions of sulfur oxides from power plants in the Midwest contribute to acid rain, haze and particle pollution problems in the eastern United States hundreds of miles away.

https://www.epa.gov/sites/production/files/2015-08/documents/peg.pdf

Carbon footprint reduction



Let's talk ZNE

Case Study: Bristol Community College

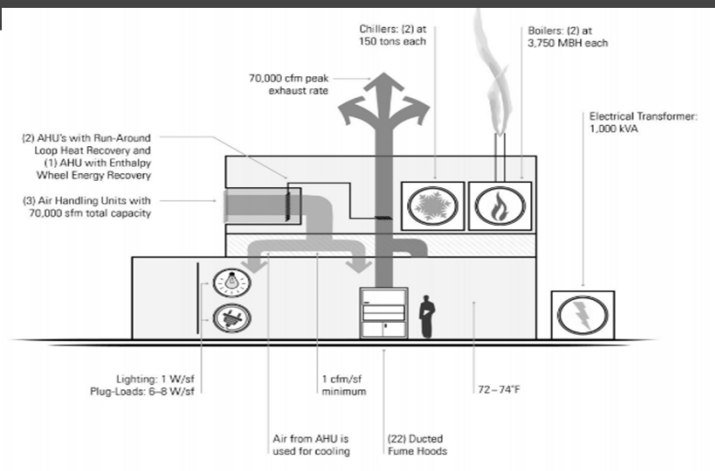
Challenge
- Trying to achieve ZNE in the Northeast climate (Zone 5)
- Ducted Fume Hoods would have consumed over half of the PV arrays.
- LEED Silver Plus design proven to be inadequate

The Solution
- (13) filter fume hoods

The Results
- Reduction of the facilities make-up air requirements from 70,000cfm to 24,000 cfm
- MEP equipment reduction down to 14% of the GSF
- ZNE for $0 additional cost
- EUI of just 51 kBtu/sf-yr
- More usable square footage

Let's talk ZNE

High Performance Design – does this get us to ZNE?



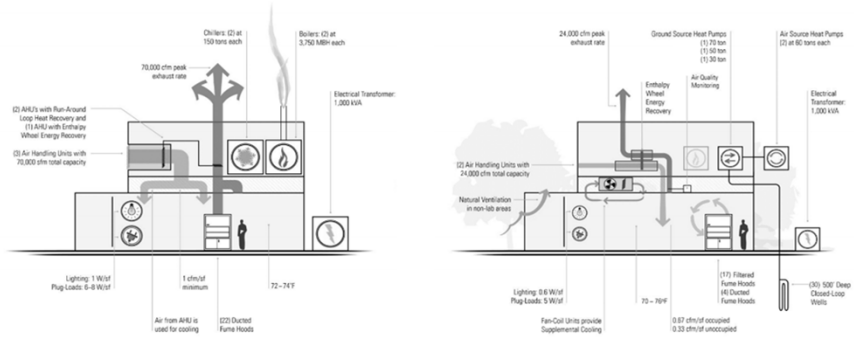
Let's take ZNE

Case Study: Bristol Community College

Let's talk ZNE

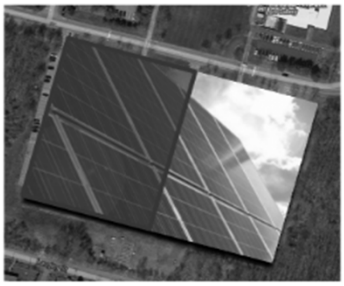
This is how ZNE is achieved

High Performance **Zero Net Energy**

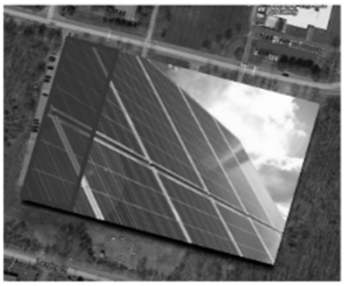


Modeled Energy Performance

High Performance



Zero Net Energy



If we continue to design labs with the traditional mind set, we will have no one to blame but ourselves

Let's not fear change, but rather tradition.

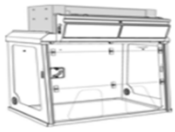
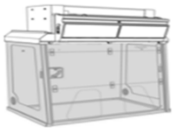
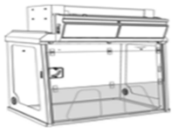
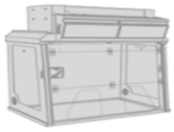
Creating safety through an ecosystem of filtration

Your Safety Our Priority

Strict Safety Standards

Your safety is our priority

Our ductless fume hoods comply with the following standards:

Filtration	Containment	Face velocity	The product in its entirety
			
AFNOR NF-X 15-211: 2009 BS 7989 EN 1822-1 ASTM 2862-82 ASTM D2854–83 ASTM D2867–83 ASTM D5742-95	AFNOR NF-X 15-211: 2009 EN 14175 ASHRAE 110:1995	AFNOR NF-X 15-211: 2009 EN 14175	AFNOR NF-X 15-211: 2009 ANSI Z9.5-2012 DIN 12927

AFNOR NFX 15:211 (101)

Containment

- The fume hood must maintain any chemical vapors or particles within the enclosure without any propagation in the lab environment

Test protocol supplied upon request

AFNOR NFX 15:211 (101)

Air Face Velocity

- Represents the fume capacity to crate a barrier between the operator and the handling
- Face velocity must be between 0.4 & 0.6 m/s

AFNOR NFX 15:211 (101)

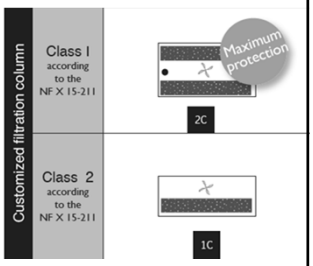
Documentation

- Must have documentation providing a list of chemicals which can be retained by the filtration. This should indicate the CAS number, boiling point, breakthrough point, vapor pressure AND the filters retention capacity for each chemical during the normal operating phase, before there is detectable release no greater than 1% of the TLV.
- Provide a certificate of validation of the handlings within the enclosure, with guaranteed life cycle of the filters performance
- Third party validation of the test data

AFNOR NFX 15:211 (101)

Filtration Efficiency

- Normal operating phase - Emissions at the filters exhaust must be lower than 1% of the TLV
- Detection Phase - The concentration at the filters exhaust must be lower than 1% of the TLV (Class 1), or 50% of the TLV (Class 2) and the automatic detection sensor must warn of breakthrough past the primary level of filtration
- Safety Phase – The concentration at the filter exhaust must be lower than 50% of the TLV



ISPE.

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Simpler Safer

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