

Reducing Laboratory Ventilation Air – Safely!

By:

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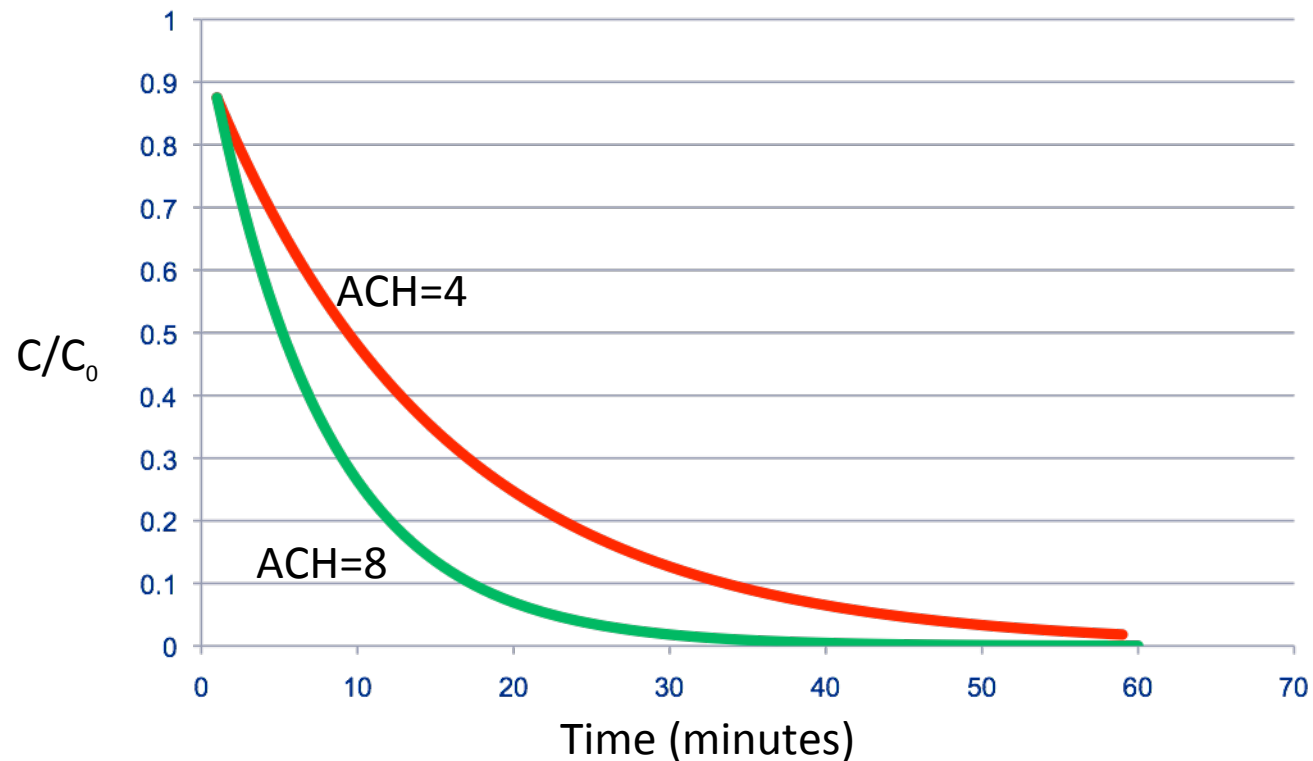
Canada | USA | UK | UAE | India | China

Reputation Resources Results

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- Maintain adequate air quality in laboratories
- Save energy in laboratories by reducing fresh air supply

- Airchange Rate - a simple measure of bulk air flow through a space. $C=C_0 \cdot e^{-t \cdot \text{ACH}}$



- Ventilation Strategy
 - Displacement
 - Induction
- Containment strategy
 - Fume Hood
 - Snorkel
 - Ventilated Bench

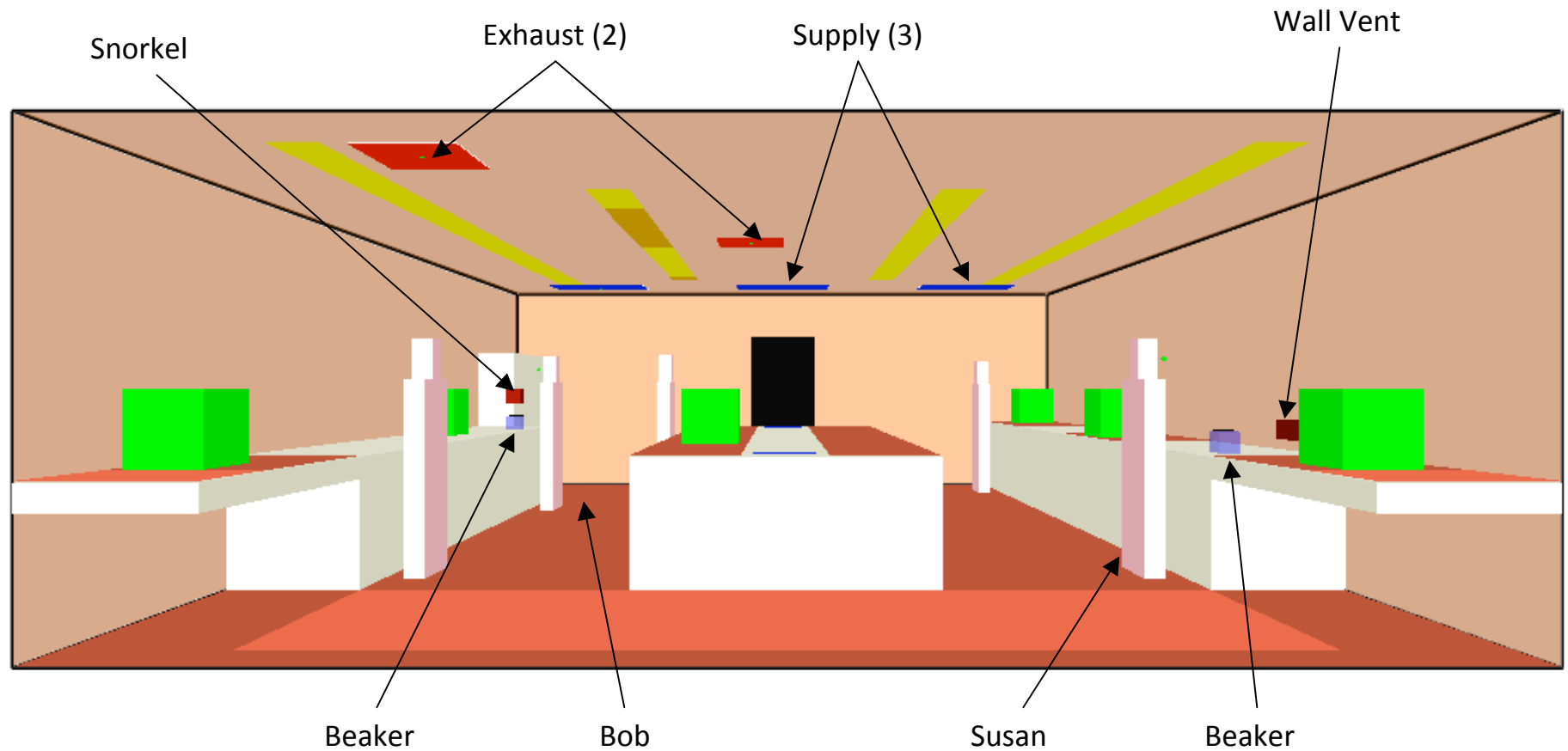
- The perceived need for high air change rates largely stems from a notion of providing a “safer” working environment.
- Obvious consequence is tremendous consumption of energy.
- Reluctance to reduce air flows because of perceived risk of creating “unsafe” conditions.

- The ability of air change rate to provide for, or even affect, the level of safety/exposure following a chemical release outside of a containment device is marginal at best.
- Air change rate is basically irrelevant to safety.

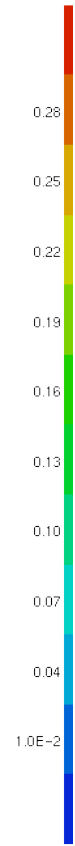
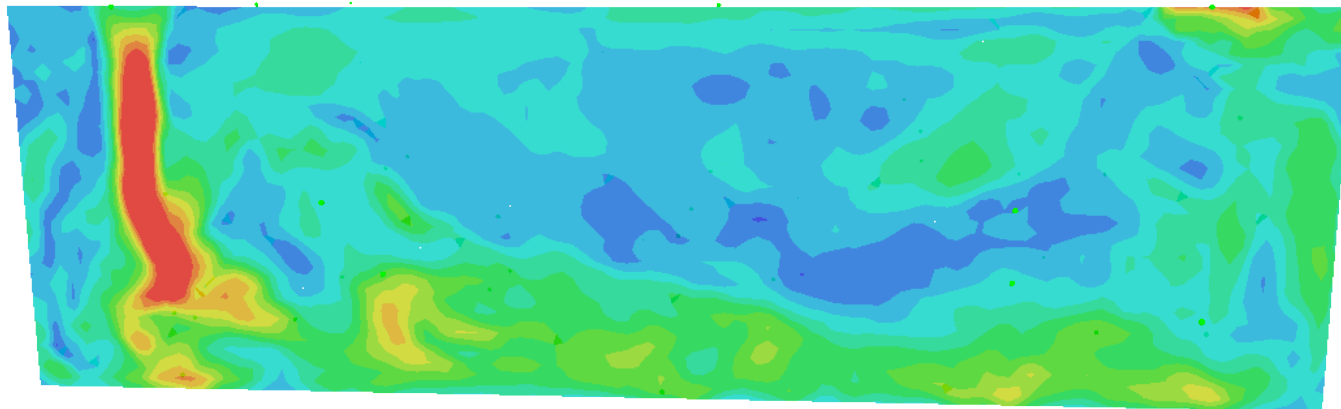
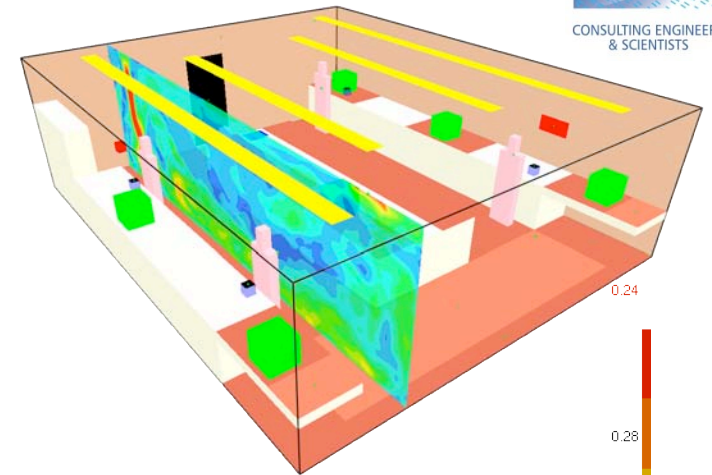
- Use local emission controls to manage contaminant sources, thereby eliminating safety and odour control as a requirement for airchange rate.
- Use local cooling to control temperature.
- Set airchange rate based on requirement for fresh air per occupant.

- ACH is a simple measure of bulk air flow through a space. It is not a measure of safety.
- The actual air flow patterns within the room dictate the transport of the emissions throughout the room and exposure levels to occupants.
- Air flow and emission transport are dependant on numerous factors such as number and location of supply and exhaust points, room obstructions, heat sources, and the location of the chemical release.

- With and without local extraction controls



- Flow Patterns

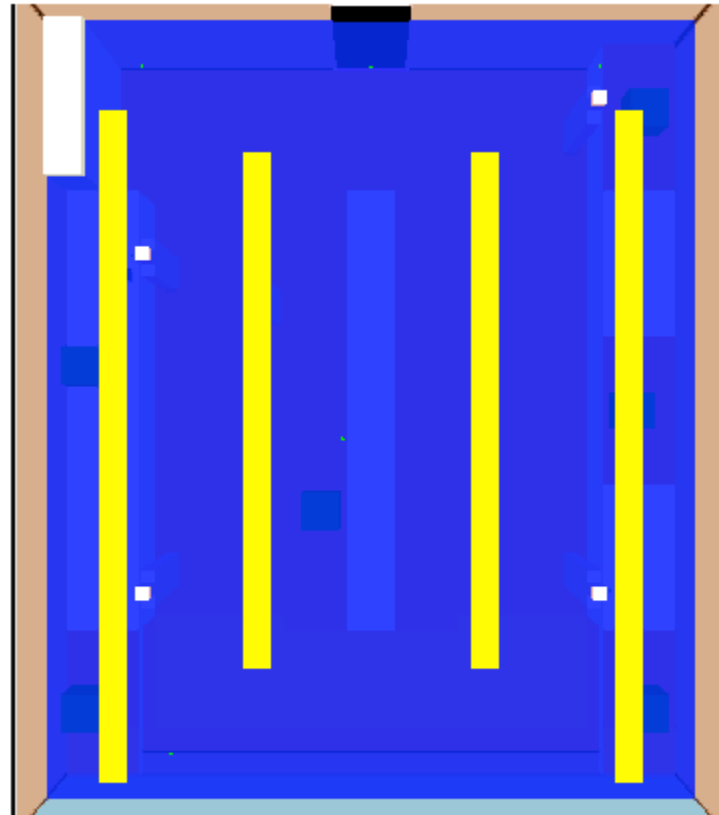


Acetone 12 ACH – no controls



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Smokeyview 5.0.7 - Dec 30 2007



Slice
spec_03
kg/kg
 $\times 10^{-5}$



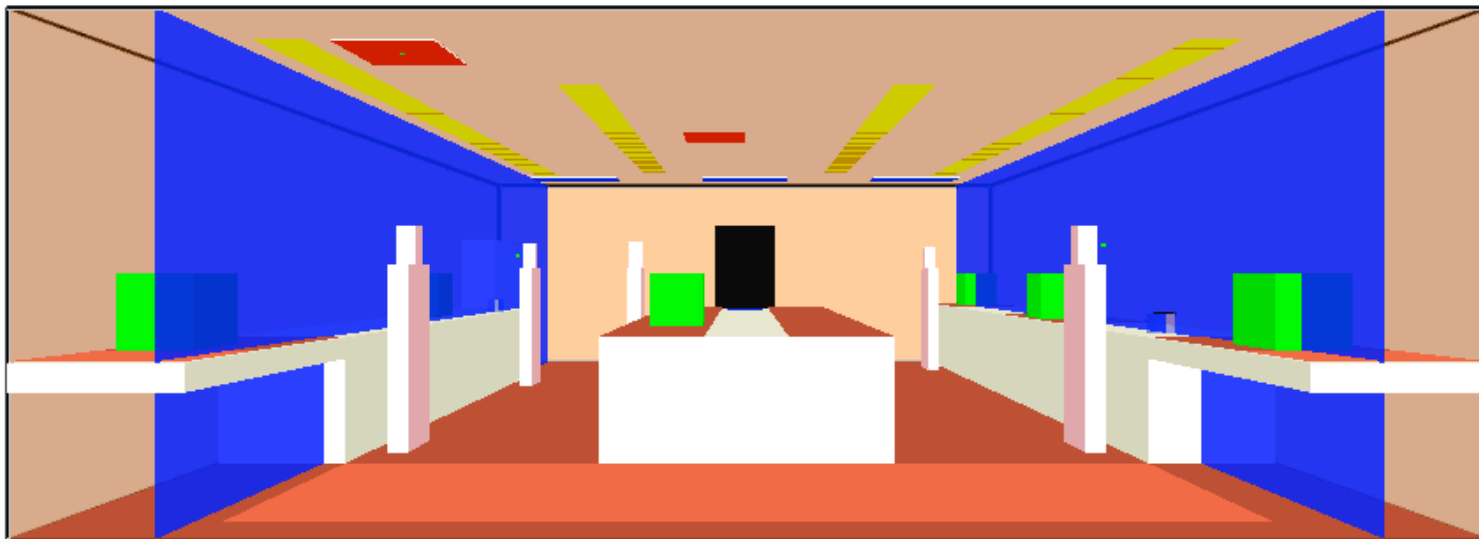
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Acetone 12 ACH – no controls

Smokeview 5.0.7 - Dec 30 2007



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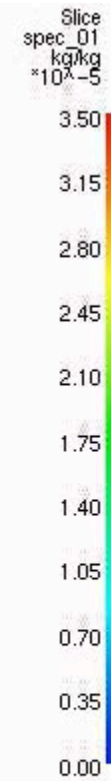
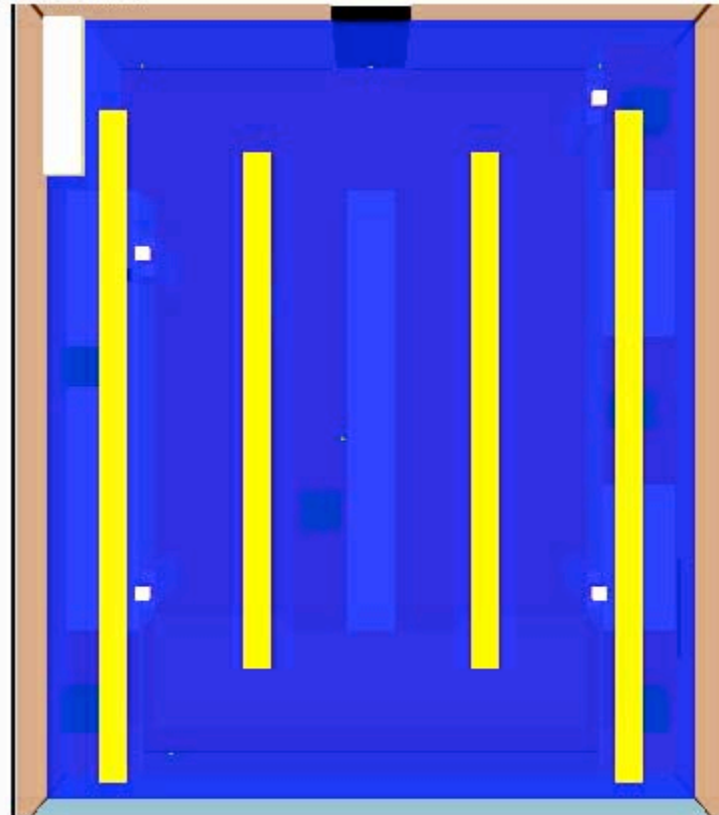


Acetone 4 ACH – with controls



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Time: 0.0

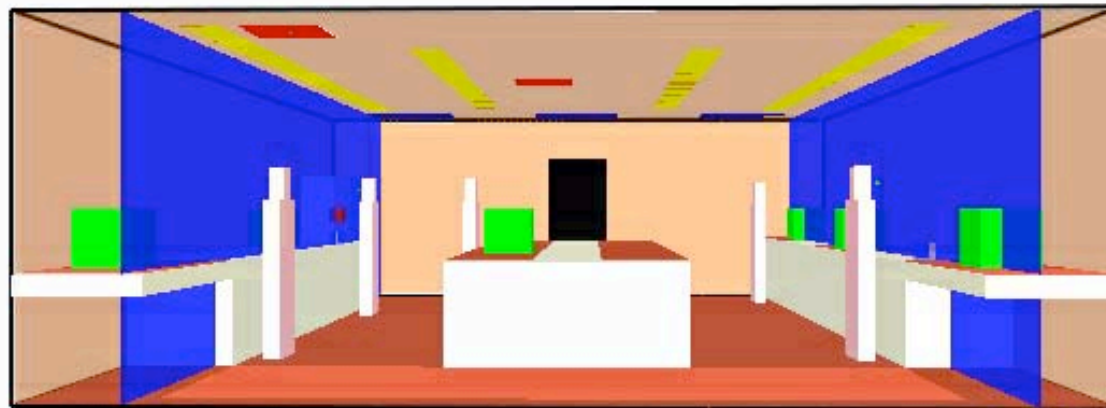


Acetone 4 ACH – with controls



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spec_01
kg/kg
 $\times 10^{-5}$



Frame: 1

Time: 2.0

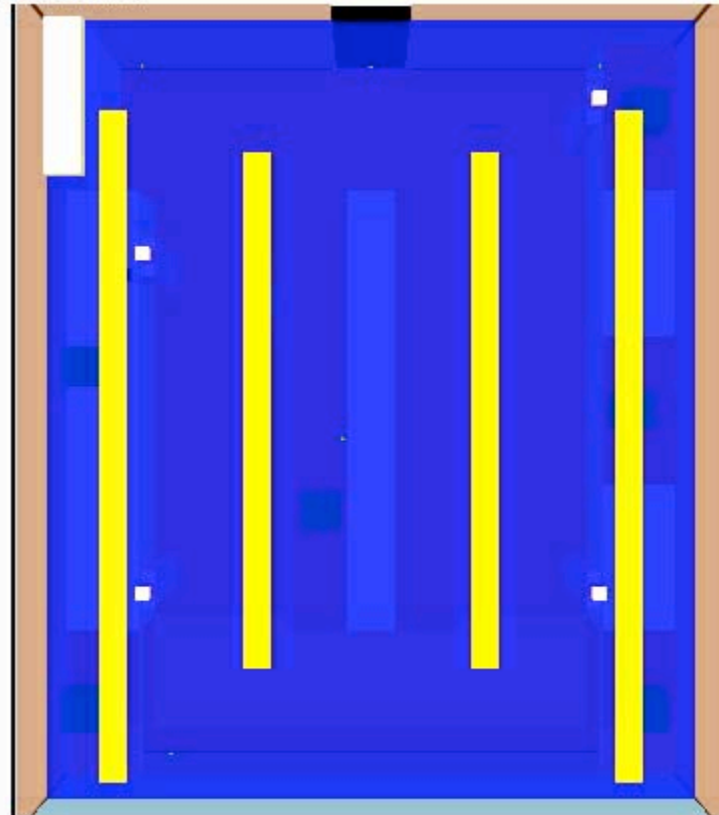


Ammonia 12 ACH – no controls

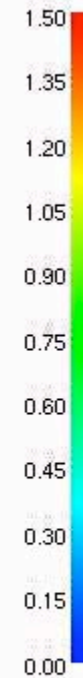


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Slice
spec_03
kg/kg
 $\times 10^{-5}$



Frame: 0

Time: 0.0

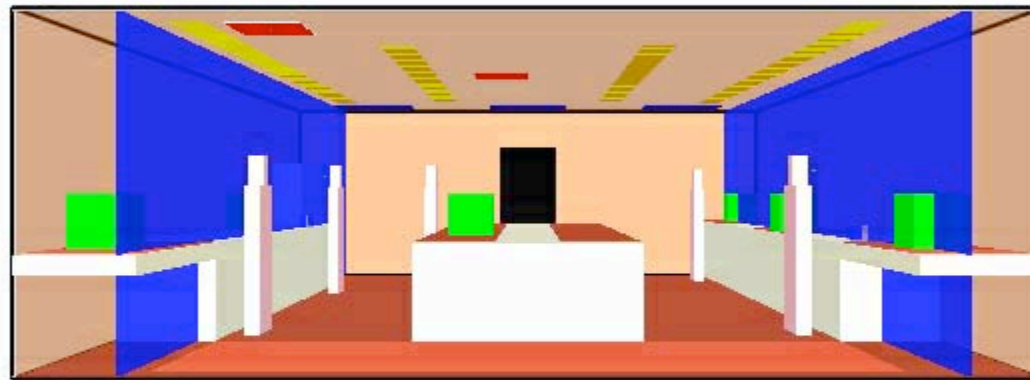


Ammonia 12 ACH – no controls

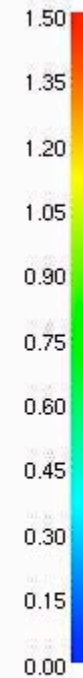


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Slice
spec_03
kg/kg
 $\times 10^{-5}$



Frame: 0

Time: 0.0

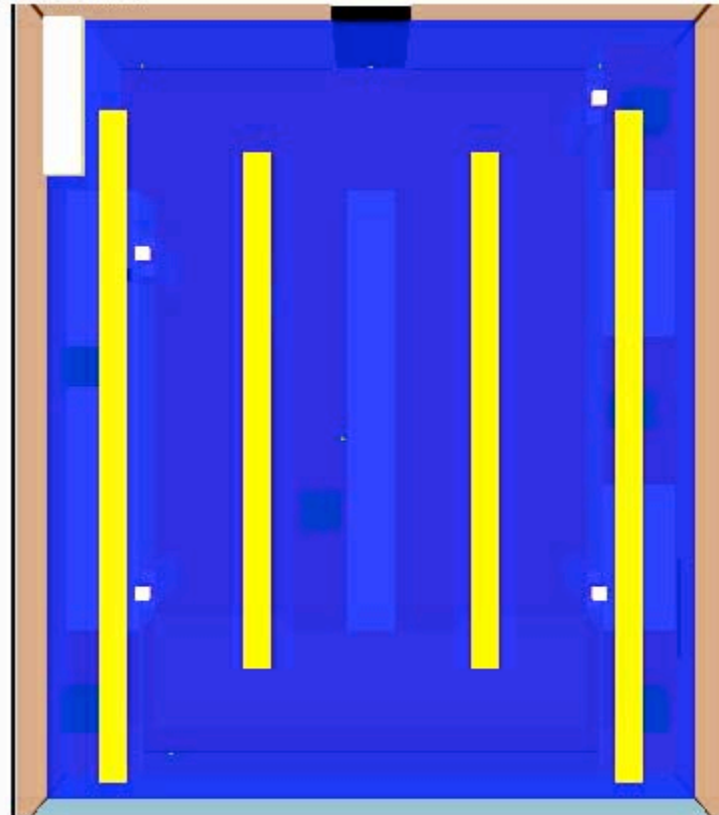


Ammonia 4 ACH – with controls

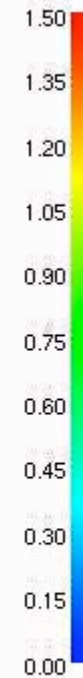


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Slice
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Frame: 0

Time: 0.0

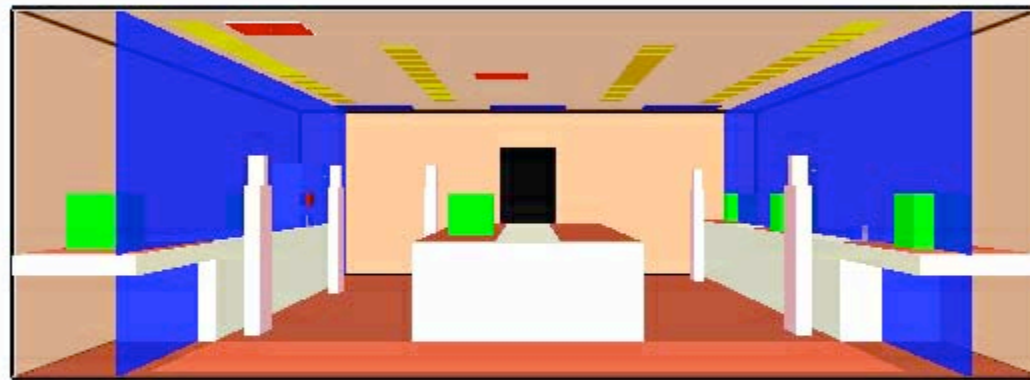


Ammonia 4 ACH – with controls



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Smokeview 5.0.7 - Dec 30 2007



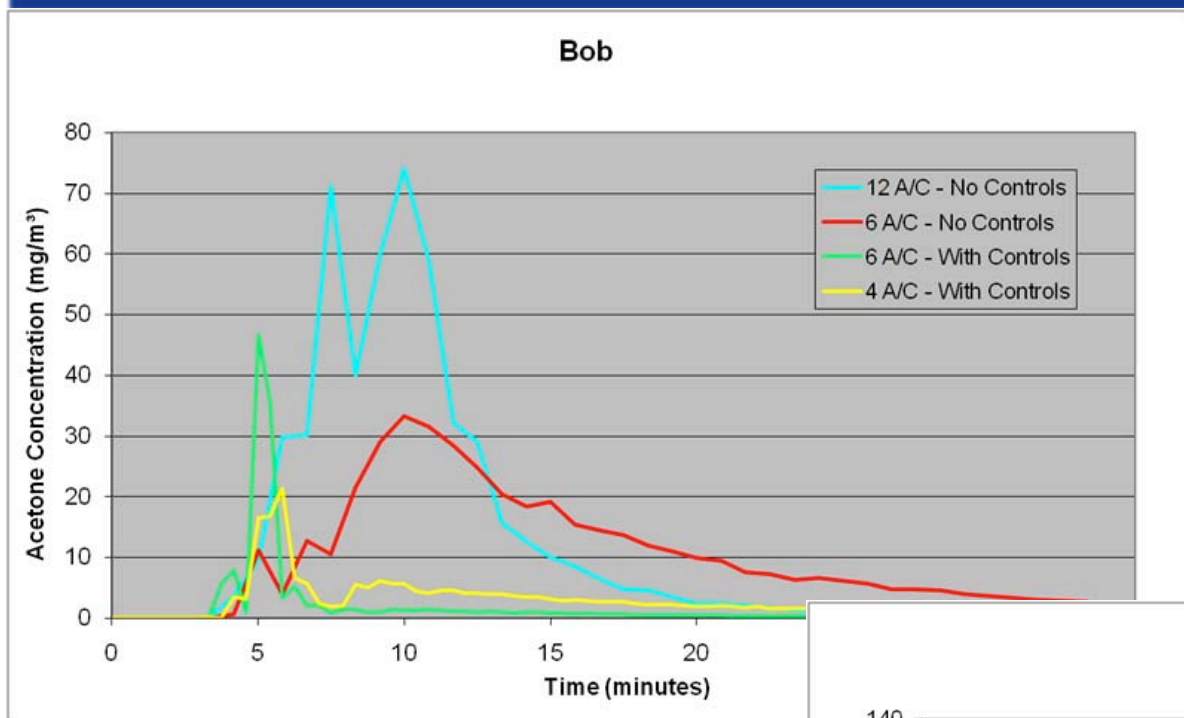
Slice
spec_01
kg/kg
 $\times 10^{-5}$



Frame: 0

Time: 0.0

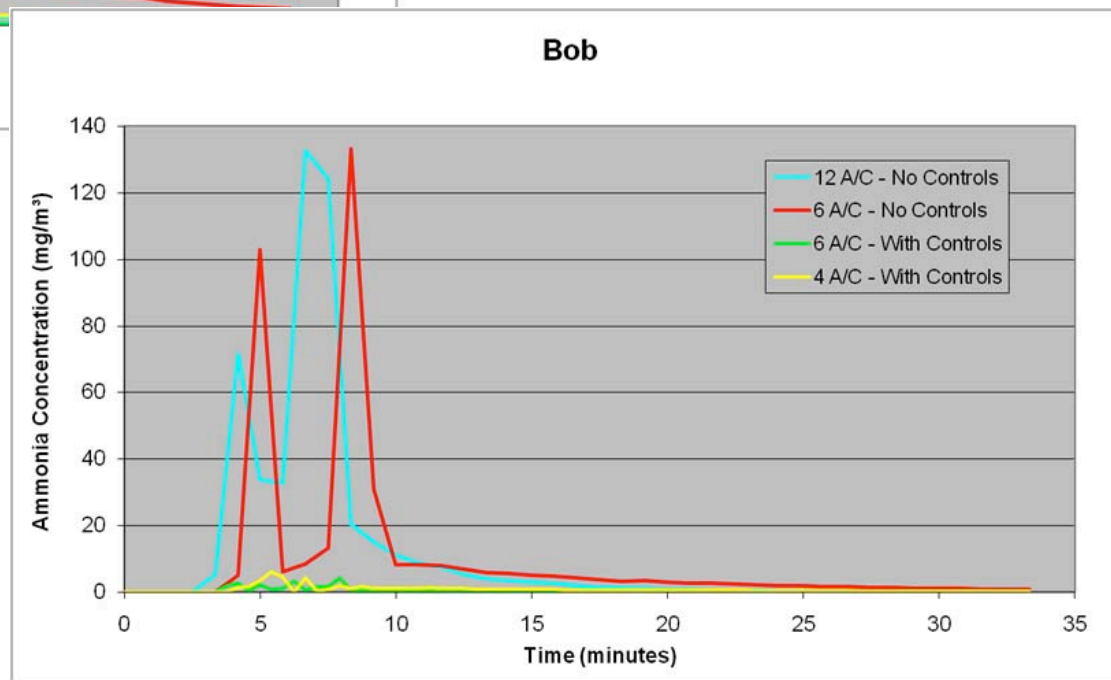


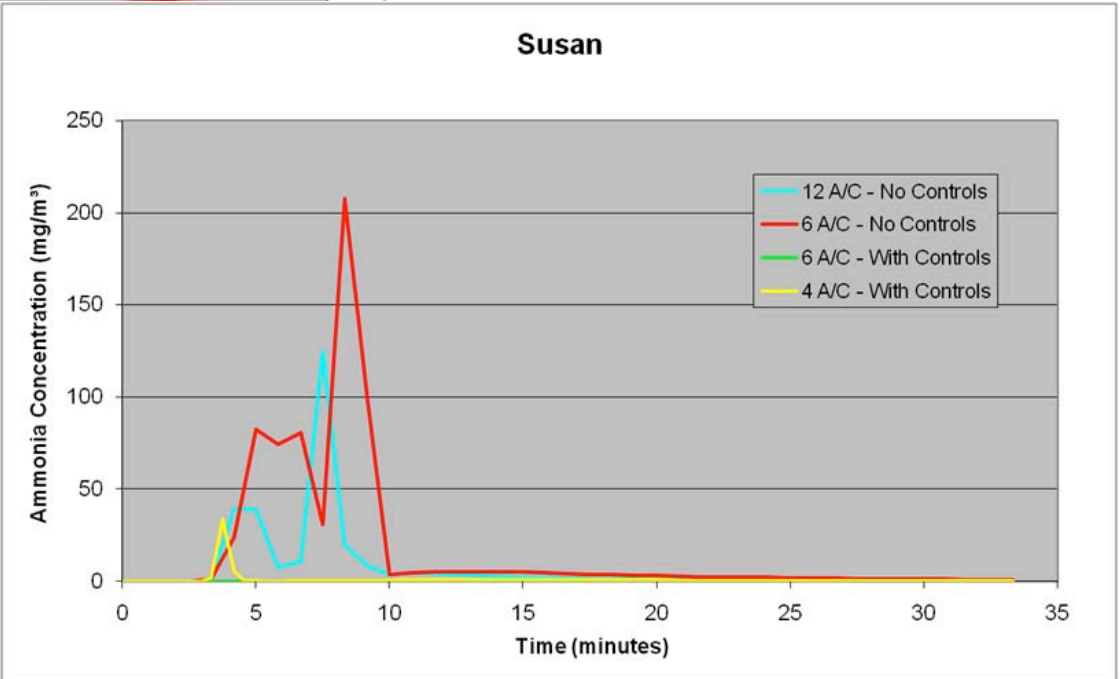
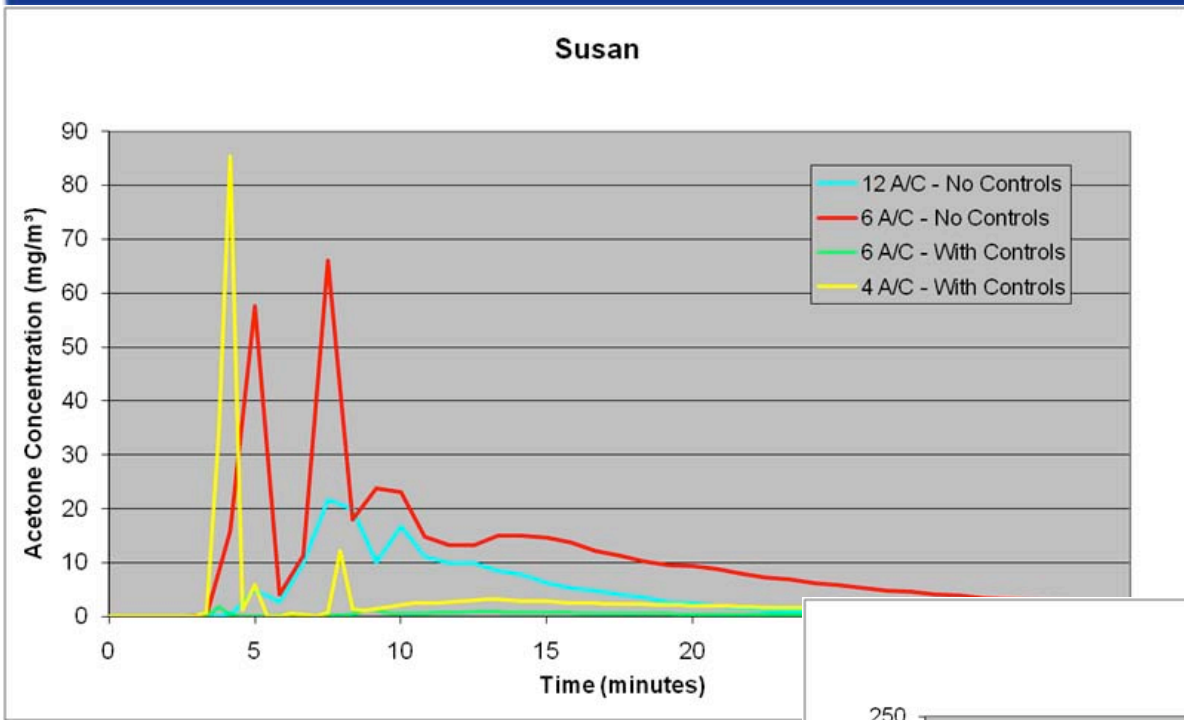


NIOSH R.E.L.

Acetone: 590 mg/m³

Ammonia: 18 mg/m³

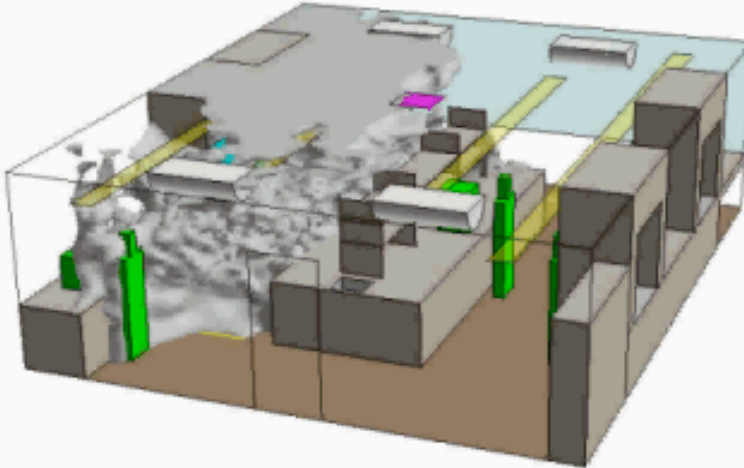




NIOSH R.E.L.
Acetone: 590 mg/m³
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Heavy Gas Spill

20 ACH, High Exhaust

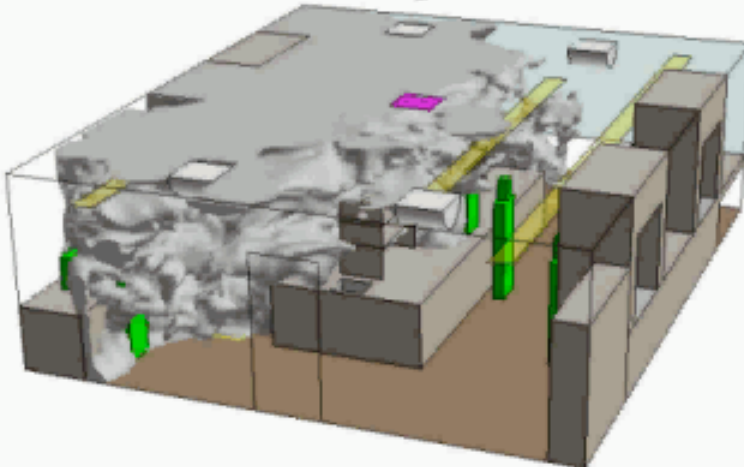


0.1 s after spill completely evaporated

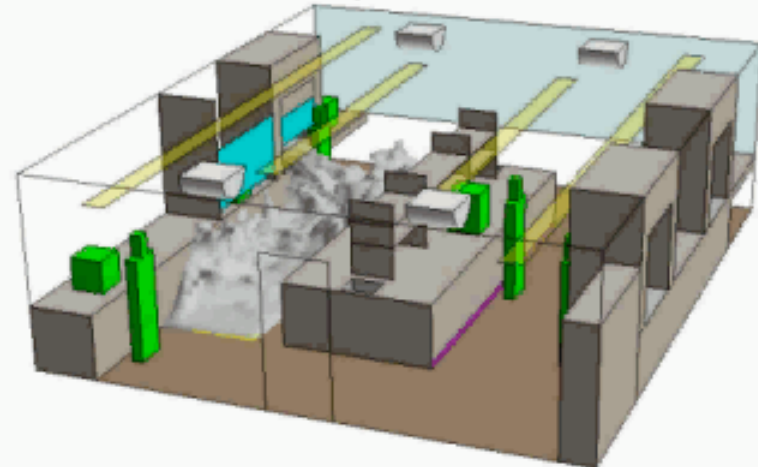
Concentration Plume

Defined by 403 ppm criterion (NOAEL)

10 ACH, High Exhaust



20 ACH, Low Exhaust



05-601-VCT-02-01+03+04

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- Air quality is affected by airchange rate when emissions are uncontrolled
- Moderate source control is more effective than airchange rate in controlling air quality
- Ventilation strategy and gas density are more important than airchange rate in exposure control

- Provide local control for all chemical use
- Provide local cooling for heat intensive labs
- Provide outside air to satisfy occupant need
- Provide “Emergency Flush” mode

Thank you for your time.

Questions?

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