#### Covid 19 Aerosols: Investigation & Utilization of Ventilation to Improve Safety Indoors



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# Improve Safety, Minimize Waste and Achieve Better Outcomes in Critical Workplace Environments



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# 3Flow - 25 years of working with clients committed to safe, efficient and sustainable facilities



Labs and critical workspaces are specially designed to protect people working with airborne hazards



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# Commercial HVAC Systems are not intended to protect people from exposure to aerosolized pathogens

"Poor ventilation imperils the lives of people" This fact is well-documented!

# Is the ventilation okay?

# How do you know?



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#### Infected People are Mobile Emission Sources Healthy People are Potential Receptors



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# How do we safely occupy indoor spaces?



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#### HVAC systems condition and move air through the building

Infections occur primarily within the communal air space (below the ceiling)



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#### Numerous Factors Influence Risk of Covid-19 Transmission



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#### Covid 19 Aerosols: Investigation & Utilization of Ventilation to Improve Safety Indoors

#### We are committed to safe, healthy and sustainable facilities. But ... is my office safe?



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#### Drawing from on our experience in labs, we conducted a Covid-19 Risk of Transmission Investigation

#### The Investigation included:

- Part 1 Evaluate Risk and Demand for Ventilation
  - Survey and Identify Spaces of Concern
  - Document HVAC and Other Safety Measures
- Part 2 Inspect and Measure HVAC Operation
  - Air Handling and Return Air Units Operational
  - Measure Flow and Calculate Air Change Rates
- Part 3 Conduct Airflow Visualization Tests
  - Generate visible smoke
  - Observe airflow patterns note areas of accumulation and stagnation
- Part 4 Conduct Aerosol Tracer Tests
  - Generate air tracer to simulate contaminant release
  - Measure concentration accumulation, dispersion and decay
  - Determine Ventilation Effectiveness

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#### A Risk Assessment was developed to identify spaces of concern and help prioritize our efforts

Risk Band	Description	Attributes	$\frown$
0	Negligible	Vacant Space ≤ 1 Occupant Very Limited Access Proper HVAC Operation	Spectrum
1	Low		Risk
2	Moderate	Known Occupants Limited Visitors w/Short Duration Adequate Spacing Proper HVAC Operation	
3	High	Known Occupants Limited Visitors w/ Extended Duration Mixed Social Space and Close Contact Ventilation Issues	
4	Extreme (Special)	Known Occupants Numerous, Frequent Visitors w/Extended Duration Close Personal Contact Aerosol Generating Procedures Ventilation Issues	

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### We evaluated space occupancy and where people congregate



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#### Risk Profiles helped identify areas that may require greater scrutiny and possible application of special safety measures



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# We documented the type and location of air supply and exhaust device in each space



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#### We documented the type and configuration of HVAC systems to focus on the Areas of Concern First

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# Investigation Part 2 – We Inspected and Measured HVAC Operation



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#### Investigation Part 3 – Airflow Visualization Tests



# \*\*\* WARNING \*\*\*

The following may be disturbing to some Viewers.

**Viewer Discretion is Advised!** 

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#### Investigation Part 3 – Airflow Visualization Tests

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# Investigation Part 3 – Airflow Visualization Tests

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## Investigation Part 3 – Airflow Visualization Tests





### **Investigation Part 3 – Airflow Visualization Tests**

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### Investigation Part 3 – Airflow Visualization Tests

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#### **Investigation Part 4 – Quantitative Air Tracer Tests**

#### **VEFF Test - Aerosol Emission Challenge**

- Generation Rate: 2 to 4 lpm
- Record Concentration and Particulate Data (60 minute Cycles)



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# Investigation Part 4 – Quantitative Air Tracer Tests



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# Investigation Part 4 – Quantitative Air Tracer Tests



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#### Investigation Part 4 – Quantitative Air Tracer Tests



VEFF Test – Generation at Center of Room

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# **Topics for Session 2**

- Conducting a proper site investigation
- Methods to identify spaces of concern
- Evaluating Airflow Patterns and Air Change Rates
- Evaluation of Ventilation Effectiveness
- Diagnostics and Troubleshooting
- Methods and Measures to Improve Performance

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