

Clearing the Air in Virginia Schools

What We're Learning, What's Required, and
Where Decisions Deliver the Most Value



MBP

Presenters



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Effects of Air Quality on Students



**Average time a student will spend in a
school in their lifetime?**



13,000 hours

Statistics

Attendance & Absenteeism

14
Million

Missed school days due to
asthma-related
complications

Focus & Cognitive Performance

15%

Increase in cognitive
performance with improved
ventilation

Asthma & Chronic Illness

15%

Increase in asthma related
doctor visits





COVID-19 Created Urgency to Act

- Fundamentally changed building operations
- Airborne transmission dynamics put ventilation front and center
- Air Quality no longer a comfort issue, but safety



Ventilation Rates



Air Filtration



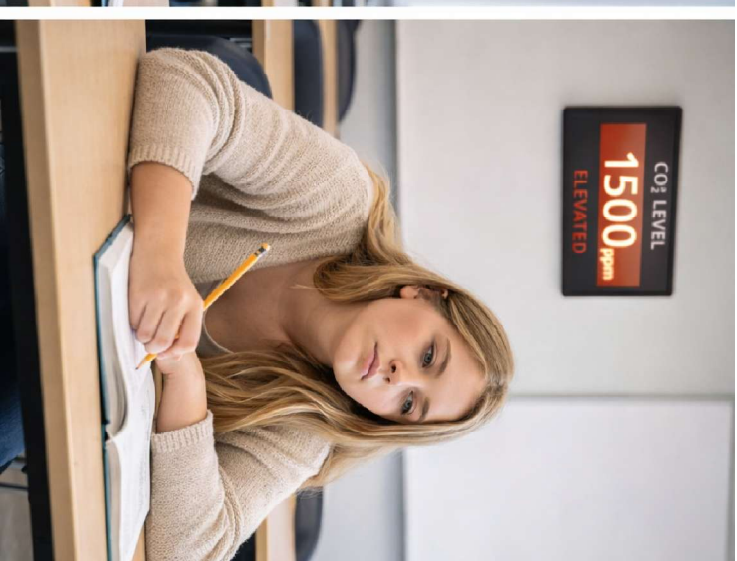
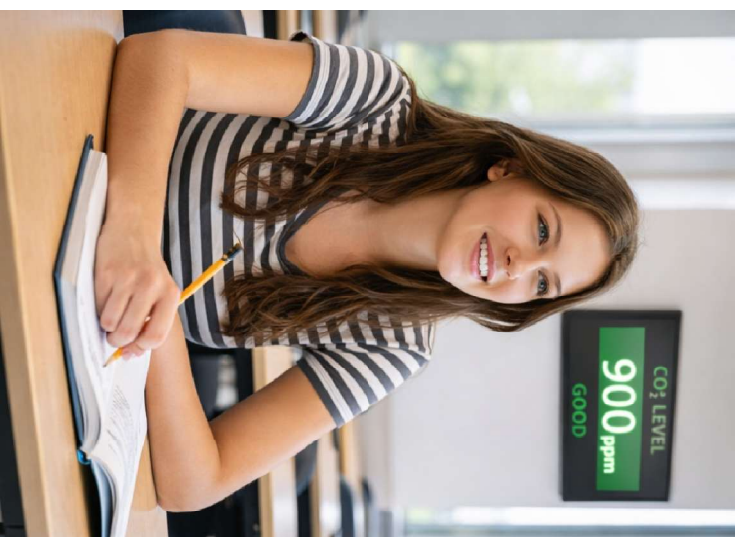
Formalized Standards





CO₂ as a Ventilation Indicator

- What CO₂ levels tell us
- What “acceptable” means
- Why it varies



Students may not experience the same learning environment, even in the same school.



Understanding IAQ & Field Insights



What Schools Are Learning

- **Systems don't perform as originally intended**
- **Performance can vary classroom to classroom**
- **Filtration alone doesn't solve IAQ**
- **CO2 data is underutilized or unmonitored**

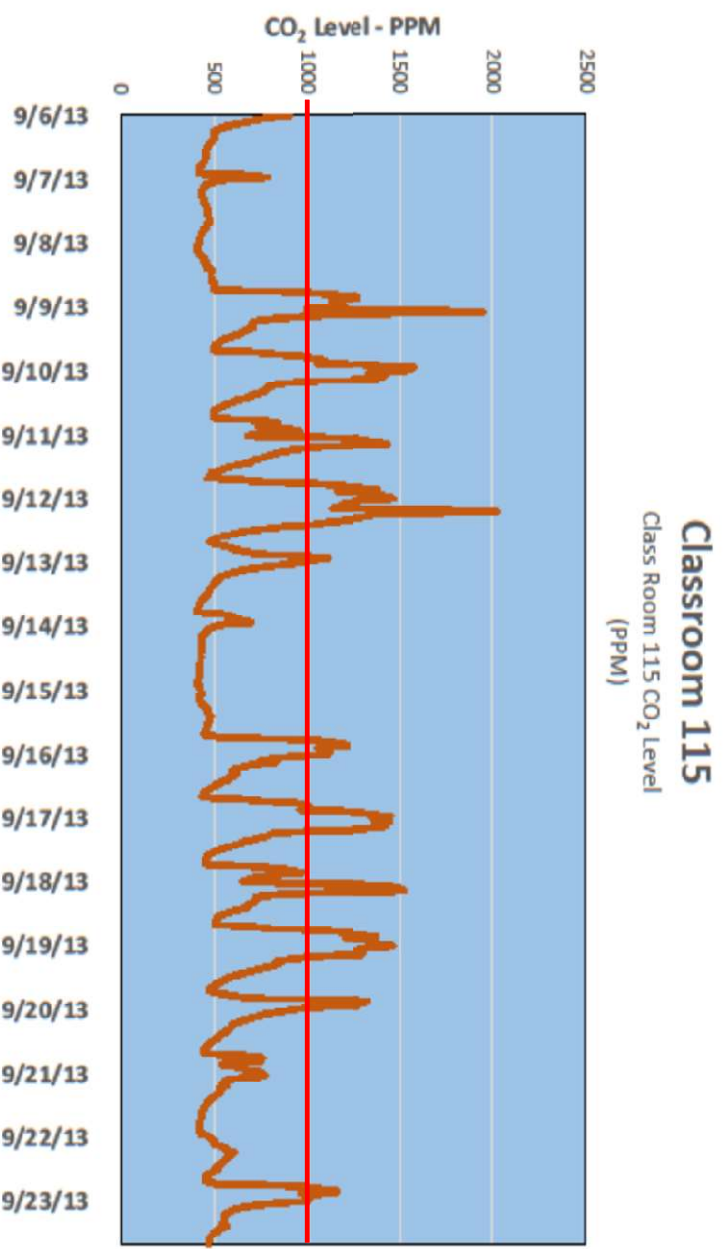


Sample Findings: University Classroom Building

- CO2 > 1000 ppm during classes

- CO2 peaks of 1500 & 2000 ppm

- BAS indicates systems are performing as intended



Sample Findings: University Classroom Building

- Outside air damper actuator is rotating
- Actuator rotates around the damper shaft, but the shaft does not move
- Outside air damper is closed





Sample Findings: University Classroom Building



Why These Problems Exist

- Limited staff and budget
- Deferred maintenance
- Complex systems
- Limited monitoring capability



Dirty Coils

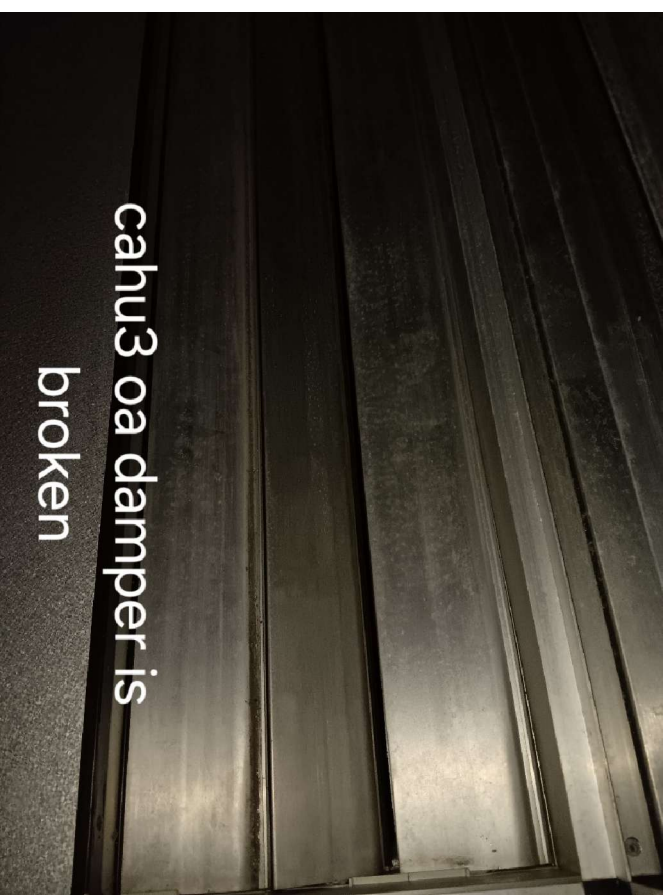


Fan Failures



System Performance Drivers

- Airflow balance
- Filtration
- Condition of control system components and sequences of operation



Failed Outside Air Dampers





What School Divisions are Saying Right Now





“We Know It’s Required... But Where Do We Start.”

- Large portfolios
- No clear roadmap
- Unclear scope

School Division	Number of Schools
Fairfax County Public Schools	>220
Prince William County Public Schools	>100
Loudoun County Public Schools	100
Virginia Beach City Public Schools	86
Chesterfield County Public Schools	67

The scale of the challenge ahead of some of Virginia’s largest school divisions



“Is this Just TAB... or Something Bigger?”

- Air flow measurement vs. rebalancing systems
- Reporting issues vs repairing issues
- Current ventilation vs calculating the code required ventilation rates





“How Are We Supposed To Pay For This?”

- Required by the State
- No direct funding by the State
- Competing priorities





“What If We Find Problems We Can’t Afford To Fix?”

- Fear of exposure
- Public reporting pressure
- Internal accountability





“When We Get The Data... Then What?”

- Who interprets it?
- How does it drive decisions?
- How does it tie to budgets?





This Isn't a Testing Problem



It's a Planning Problem





VA Code + Requirements



Transparency & Accountability



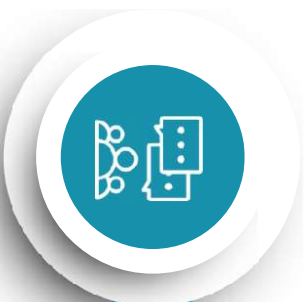
Documented Results



Facility Performance

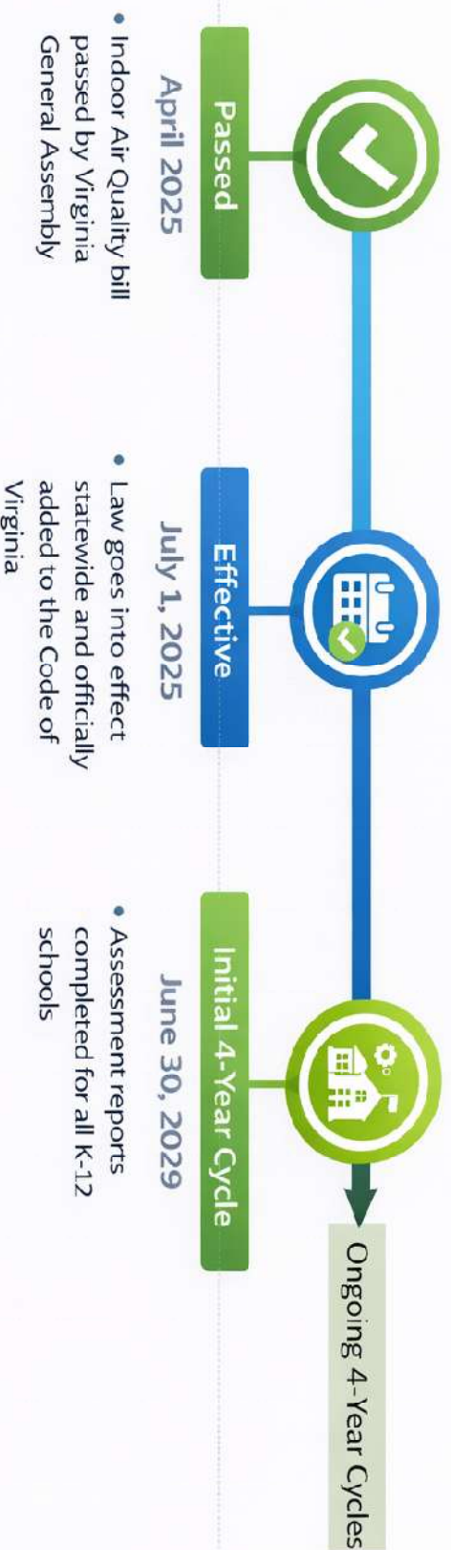


Trust in Communities



Data-Driven

Virginia Indoor Air Quality Mandate



Who Can Perform Inspections?

Qualified Third-Party Professionals



Licensed Mechanical Engineers (PE)

- Professional Engineer (PE) License
- Expertise in HVAC design and performance
- Verify ASHRAE ventilation compliance
- Identify upgrade needs and deficiencies



Certified Testing, Adjusting, and Balancing (TAB) Technicians

- Certified by NEBB or AABC
- Measure supply, return, and outside airflow
- Balance HVAC system airflow and pressures
- Verify air filter efficiency and CO₂ levels



Certified Industrial Hygienists (CIH)

- Certified Industrial Hygienist (CIH) credential
- Perform indoor air quality assessments
- Identify contaminants and safety risks
- Monitor health hazards like CO₂ and VOCs



Master HVAC Technicians (DPOR)

- Virginia DPOR Master HVAC license
- Conduct in-depth equipment inspections
- Identify maintenance and repair needs
- Recommend equipment testing and replacements



What Gets Assessed?

- **Maximum filter efficiencies**
- **Measurements of outside air delivery rate**
- **Verification condition and operation of ventilation components**
- **Measurement of outside air, return air, and supply air, and static pressure profiles of all air handling units**
- **Verification that required maintenance has been performed**
- **CO2 sensor calibrations, and measure CO2 levels**
- **Field data for installation of ventilation if none exists**





Implementation + Budget Strategy





Key Considerations

- Funding source
- Phased approach
- Budget for critical repairs before submitting report to the school board



IAQ Readiness Strategy

Proactive Approach to Minimize Costs & Surprises

YEAR 1 (Immediate / Year 1)	YEARS 1-2	YEARS 2-3	YEAR 4
 <p>Newly Constructed / Renovated Schools (TAB Verified) (Lowest Risk – Start Here)</p> <ul style="list-style-type: none"> • Review TAB reports and commissioned systems • Establish baseline IAQ performance • Validate OA flow, controls, and system operation 	 <p>O&M Staff Training + Internal Assessments (Build Internal Capability)</p> <ul style="list-style-type: none"> • Train O&M teams to identify failed OA dampers and issues • Conduct internal checks with targeted repairs • Begin fixing obvious issues in-house 	 <p>Targeted Repairs + System Optimization (Reduce Risk Before Public Exposure)</p> <ul style="list-style-type: none"> • Fix deficiencies and optimize before 3rd Party testing • Align repairs with CIP* <p>* CIP = Capital Improvement Plan</p>	 <p>3rd Party Verification (Controlled, Confident Compliance)</p> <ul style="list-style-type: none"> • Conduct IAQ assessments after improvements • Limit surprises in external reports • Prove readiness to our community

Alignment with
Capital Plan

Facility
Condition & Age

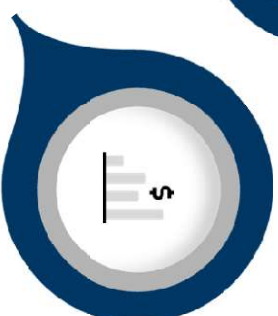
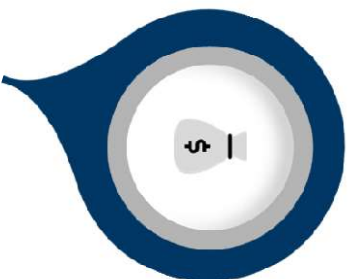
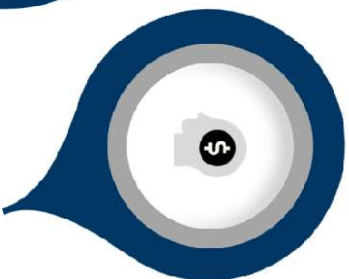
Budget &
Funding
Flexibility

Operational
Impact

Procurement
& Staffing

Risk &
Compliance
Prioritization

KEY
CONSIDERATIONS
FOR IAQ
COMPLIANCE
PLANNING





Moving Forward

We can be confident that Virginia schools are providing better learning environments for their students.





Data Sources

1 EPA

[How Does Indoor Air Quality Impact Student Health and Academic Performance? | US EPA.](#)

2 NIH

[Air Quality Monitoring in Schools: Evaluating the Effects of Ventilation Improvements on Cognitive Performance and Childhood Asthma - PMC](#)

3 Science Direct

[A comprehensive analysis of the intervention of a fresh air ventilation system on indoor air quality in classrooms - ScienceDirect](#)

4 University of Colorado

[How to Improve Indoor Air Quality in K-12 Classrooms: CU Researchers Join Federal Initiative](#)

5 Berkeley Lab

[Associations between classroom CO2 concentrations and student attendance | Energy Analysis Division](#)

6 Harvard

[Healthy Schools Need Healthy Air | Harvard Graduate School of Education.](#)



Thank you for your time

Questions?



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