

Indoor Air Quality to Reduce Illness- Related Absences

November 2023



SafeTraces Overview

High Performance Buildings Leader & Pioneer

Patented Tracer Technology

- Aerosol tracers safely “challenge” HVAC systems
- Test results visualize airflow & air exchange

Safety

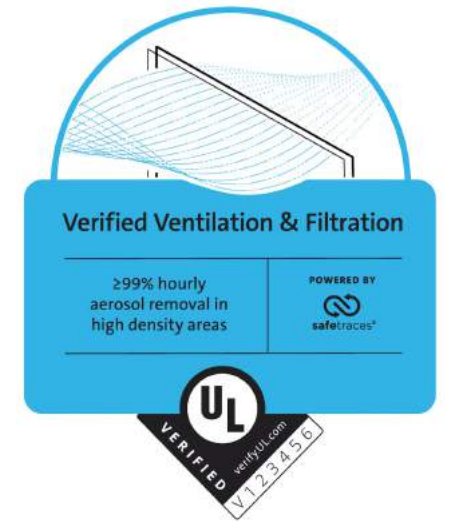
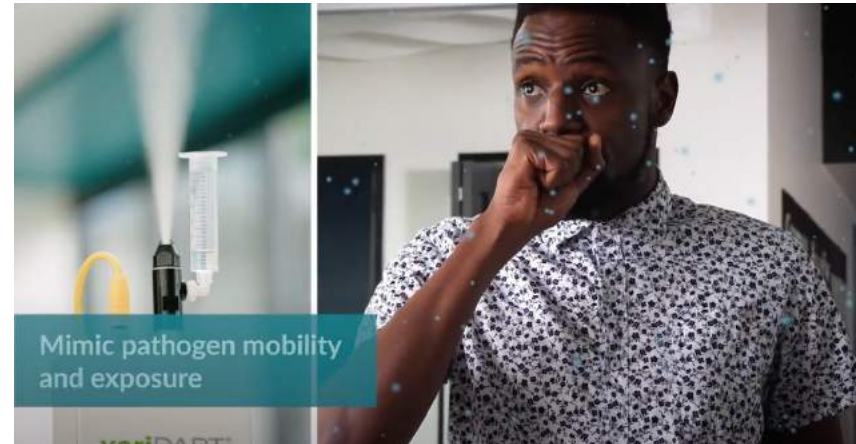
- Testing, verification & Cx platform for buildings
- UL verification mark tracks to compliance req’s

Savings

- Capital: Defines priorities; validate improvements
- M&O: Optimizes cost- and energy-efficiencies



Fast Company World's Top 10 Most Innovative Biotech Company



Fundamental R&D funded and supported by global science leaders:



National Science Foundation
WHERE DISCOVERIES BEGIN



K-12 Clients & Partners

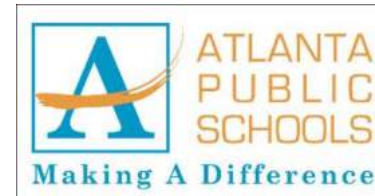
Supporting Public School Districts Nationally

“SafeTraces’ data-driven commissioning program has been and will continue to be invaluable to our long-term planning and performance management for capital improvements, maintenance, and operations, and to enhancing public trust and confidence in our school facilities.”

*Daniel Drake
Executive Director of Facility Services
Atlanta Public Schools*



Client Snapshot



Partner Snapshot



The Challenge

Chronic Student Absenteeism

≥ 40%

NM's chronic absenteeism rate 2021-2022

≥ 2x

Increase in NM's chronic absenteeism rate 2018-2022

#2

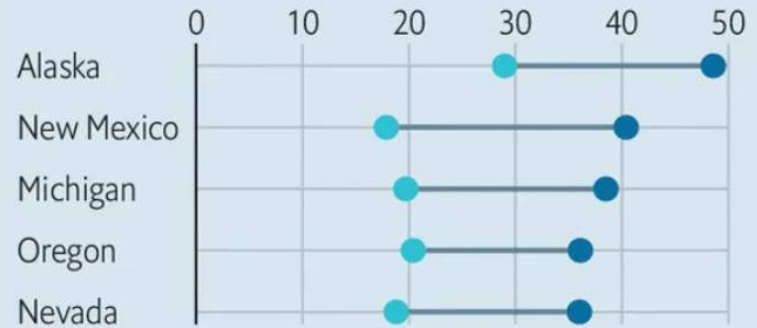
NM's chronic absenteeism rate among US states nationally

Bricks in the wall

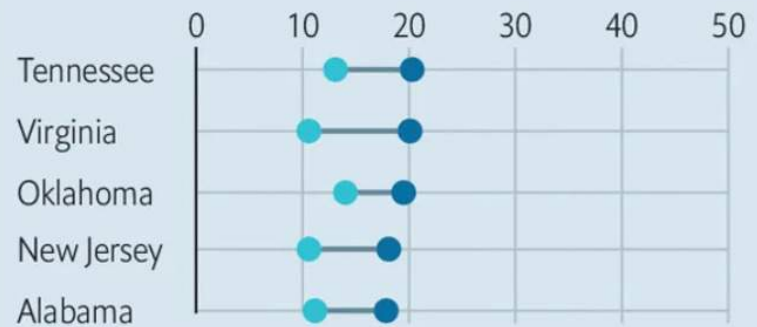
United States, state-school pupils absent for 10% or more of the academic year, % of total

● 2018-19 ● 2021-22

Highest rate



Lowest rate



Source: "Higher chronic absenteeism threatens academic recovery from the covid-19 pandemic", by T. S. Dee, Aug 2023

The Context

Federal Policy, Regulation & Funding

White House (December 2022)

Publicly committed to

- Provide guidance and funding for institutions to improve ventilation and filtration safely and effectively
- Announced first-ever Federal Performance Standard to cut energy use by 2030 in partnership with US states

CDC (May 2023)

Established health-based ventilation target for public buildings for the first time in its history (5 eACH)

ASHRAE (July 2023)

Published first ever code-enforceable standard for control of infectious aerosols at White House direction

Federal, State & Local Government Action (July 2023 -)

Health & building code updates and associated pilots for IAQ, infection control, and ASHRAE Standard 241




Policy Initiatives	Regulatory Standards	Funding Priorities
<ul style="list-style-type: none">• American Rescue Plan• Bipartisan Infrastructure Bill• Inflation Reduction Act• Clean Air in Buildings Challenge	<ul style="list-style-type: none">• CDC Health-Based Ventilation Targets• ASHRAE Std 241 – Infectious Aerosols• Federal Building Performance Std• ASHRAE Std 90.1 – Energy Efficiency	<ul style="list-style-type: none">• Health & Safety• Sustainability & Climate Resilience• Equity & Under-served Communities• Biosecurity & Future Preparedness

Since 2020, the US government has made \geq \$500B available for HVAC assessments and improvements, including for schools

The Opportunity

Federal Funding for School Infrastructure & HVAC Modernization

	Public / MUSH Buildings							Public / MUSH Buildings				School Facilities		
	Clean Energy Tax Credits	179D Energy-Efficient Commercial Buildings Tax Deduction	State Energy Program	Energy Efficiency Revolving Loan Fund	Energy Efficiency Conservation Block Grants	Renew America's Nonprofits	Greenhouse Gas Reduction Fund	Environmental and Climate Justice Block Grants	Climate Pollution Reduction Grants	Building Resilience in Communities	Flood Mitigation Assistance	Elementary and Secondary School Emergency Relief	Renew America's Schools Grant	School Air Pollution Grant
Administering Federal Agency	IRS	IRS	DOE	DOE	DOE	DOE	EPA	EPA	EPA	FEMA	FEMA	DoED	DOE	EPA
Implementing Agency	n/a	n/a	SEO	SEO	Local government energy or sustainability office; Tribal energy office, SEO	n/a	TBD; likely a state green bank or local CDFI	Community-based organization (CBO)	Varies by state	State, tribe, or territory Hazard Mitigation Office	State, tribe, or Hazard Mitigation Office	State Education Agencies (SEA)	Local Education Agency (LEA)	n/a
Program Type	Tax Credit	Tax Deduction	Formula Grants	Formula Grants	Formula Grants	Competitive Grants	Competitive Grants	Competitive Grants	Competitive Grants	Competitive Grants	Competitive Grants	Formula Grants	Competitive Grants	Competitive Grants
Total Funding	Uncapped	Uncapped	\$500 Million	\$250 Million	\$550 Million	\$50 Million	\$27 Billion	\$3 Billion	\$5 Billion	\$1 Billion	\$3.5 Billion	\$122 Billion	\$500 Million	\$50 Million
Funding Source	Inflation Reduction Act	Inflation Reduction Act	BIL	BIL	BIL	BIL	Inflation Reduction Act	Inflation Reduction Act	Inflation Reduction Act	BIL	BIL	ARP	BIL	Inflation Reduction Act
Program Timeline	2023-2035 (starting to phase out in 2032)	2023-2032	FY22-FY26	FY22-expended	FY22-FY24	FY22-FY26	FY22-FY24	FY22-FY26	FY22-FY31	FY22-FY26	FY22-FY26	FY22-FY24	FY22-FY26	FY22-FY31
Matching Requirements	n/a	n/a	No matching Requirement	No Matching Requirement	No Matching Requirement	TBD	No Matching Requirement	No Matching Requirement	No Matching Requirement	Sub-applicants required to cost share 25%	10-25% cost share	No Matching Requirement	At least 5% of total project costs	TBD
Target Recipients	Energy community, low-income community	n/a	SEP priority states	SEP priority states	n/a	Justice40 communities	Low-income and disadvantaged communities	Low-income and disadvantaged communities	n/a	Public buildings that provide essential services	Buildings at risk of flooding located in a participating National Flood Insurance Program (NFIP) Community (In good standing)	LEAs	Low-income and rural school districts	Prioritizes disadvantaged schools w/ demonstrated funding needs

Source: <https://www.bluegreenalliance.org/resources/roadmap-to-navigating-federal-funding-for-public-buildings/>

Design Guidance for Education Facilities: Prioritization for Advanced Indoor Air Quality Version 2.0

Developed by
ASHRAE Technical Committee 9.7, Educational Facilities



Peachtree Corners

Complete	Prerequisite Tasks
	Ventilation verification of HVAC airside components

Base	Improved	Advanced	Very High Priority Tasks
			HVAC equipment filtration upgrade
			HVAC for wellness/nurse suites for pre-K–12
			Classroom and assembly space air distribution effectiveness

Base	Advanced	High Priority Tasks
		IAQ sensors with data aggregation platform
		New HVAC equipment to achieve ASHRAE-recommended air change rates (ACH)
		Classroom-level air cleaning
		Restroom exhaust and air filtration upgrades
		Staff training and documentation organizational platform
		UV-C/UVGI for air handlers

Base	Advanced	Medium Priority Tasks
		Humidification and dehumidification systems
		Energy efficiency offset control schemes for advanced IAQ
		Operable windows

Infection Control for Schools

ASHRAE Standard 241

1. **Infection Risk Management Mode (IRMM):**
codifies resilience into building design and operation for periods of elevated disease transmission risk
2. **Equivalent Clean Airflow (ECAi) Rate:**
sets rate of pathogen free air flow into high occupancy areas via outdoor air, filtration & GUV
3. **Use of Filtration & Air Cleaning Technology:**
establishes requirements to effectively and safely meet ECA rates, including performance testing
4. **Assessment, Planning & Implementation:**
establishes requirements for Building Readiness Plan and Cx systems to their installed performance

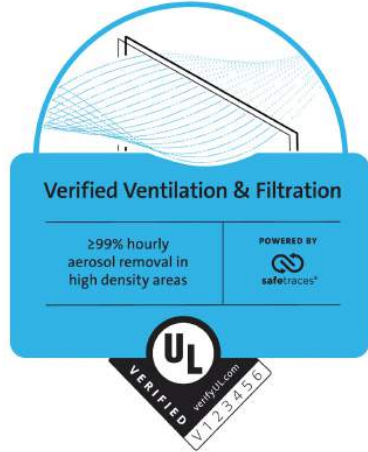
Occupancy Category	ECAi	
	cfm/person	L/s/person
Correctional Facilities		
Cell	30	15
Dayroom	40	20
Commercial/Retail		
Food and beverage facilities	60	30
Gym	80	40
Office	30	15
Retail	40	20
Transportation waiting	60	30
Educational Facilities		
Classroom	40	20
Lecture hall	50	25
Industrial		
Manufacturing	50	25
Sorting, packing, light assembly	20	10
Warehouse	20	10

IAQ-Focused Commissioning

Verification of CDC & ASHRAE Requirements

Normal Operations

UL + SafeTraces



Source: <https://www.ul.com/services/ul-verified-ventilation-and-filtration>

Centers for Disease Control & Prevention

Aim for 5 Air Changes per Hour (ACH)

When possible, aim for 5 or more air changes per hour (ACH) of clean air to help reduce the number of germs in the air.

This can be achieved through any combination of central ventilation system, natural ventilation, or additional devices that provide equivalent ACH (eACH!) to your existing ventilation. Supplying or exhausting an amount of air (use the larger of the two values but do not add them together) that is equal to all the air in a space is called an air change. Multiplying that amount by 5 and delivering it over one hour results in 5 ACH.

Source: <https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html>

Extraordinary Events

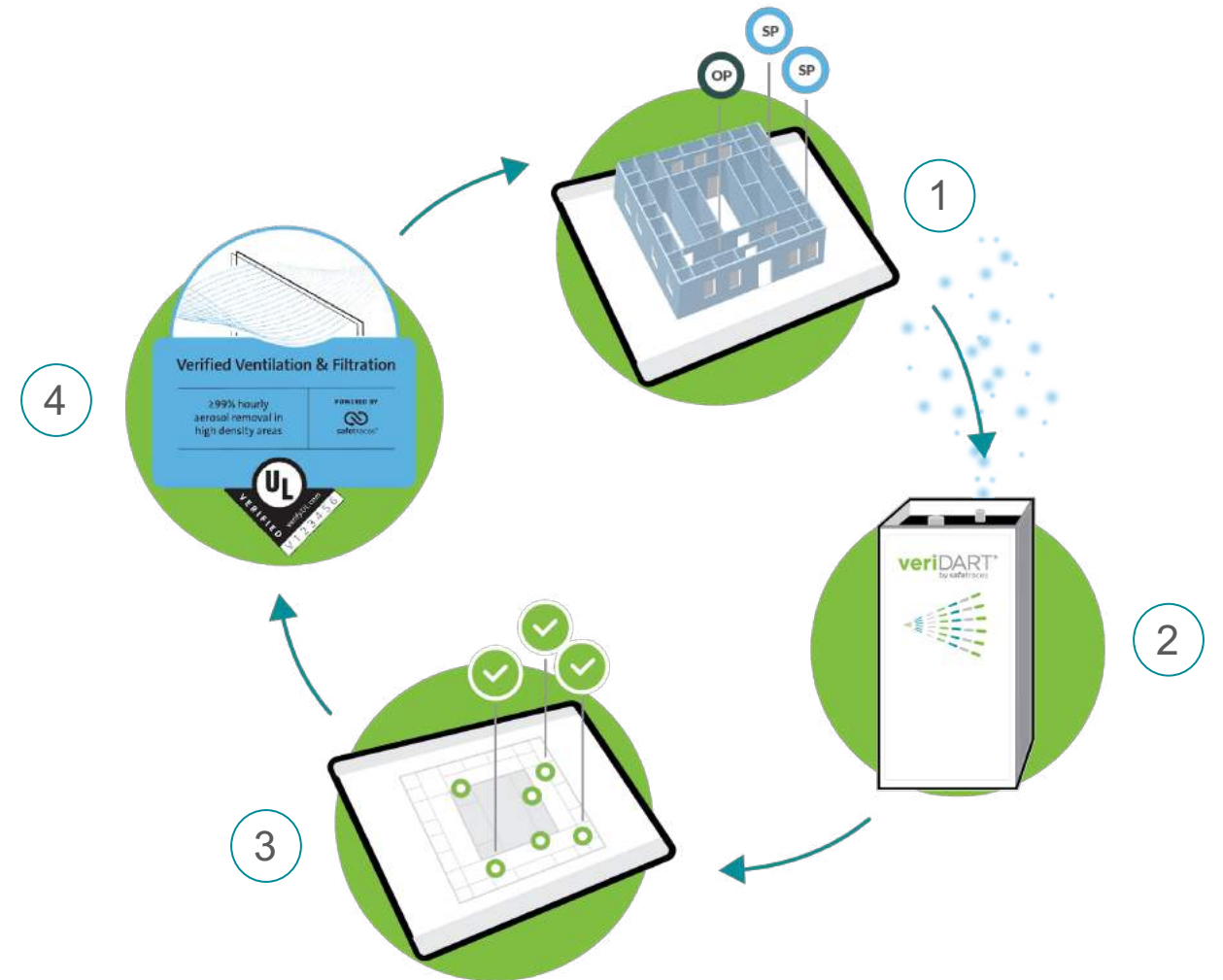
ASHRAE



- **Normal Operations:** UL-SafeTraces Verified Ventilation & Filtration annual verification mark supports CDC's health-based ventilation guidelines
- **Extraordinary Events:** SafeTraces' ASHRAE-qualified testing method supports compliance with Standard 241 (Control of Infectious Aerosols)

IAQ-Focused Commissioning Process Flow

1. Desktop Audit
2. Performance Testing
3. Verification & Optimization
4. Certification & Compliance



Sources: safetraces.com/veridart/; <https://www.ul.com/services/ul-verified-ventilation-and-filtration>

Case Study

Public School Facilities

Key Objective

- Test and verify HVAC systems in underserved schools in top 5 largest district to health-based ventilation standards

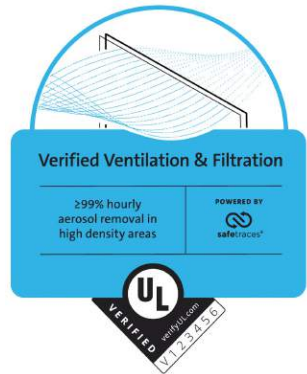
Key Risk Areas

- Classrooms
- Cafeterias
- Staff areas

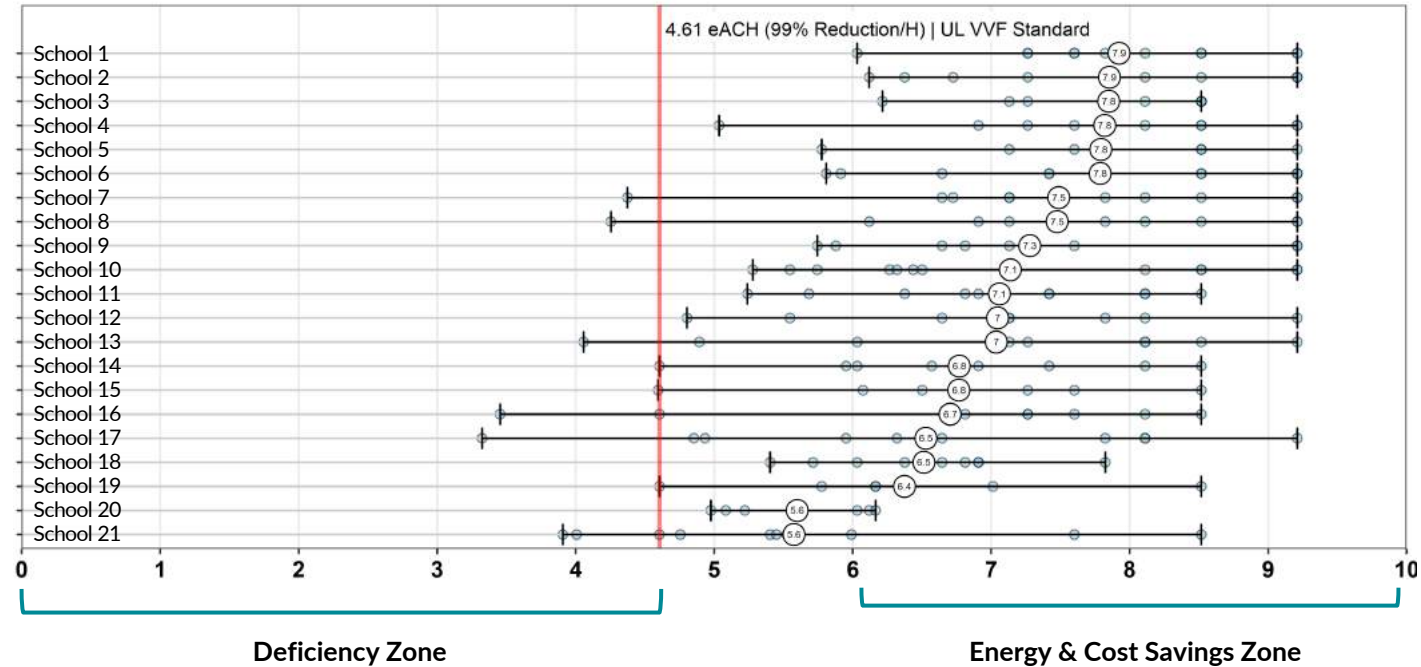
Key Findings

- 14/21 schools met health-based ventilation targets
- 7 schools with failing tests identified low-cost operational adjustments to improve performance
- Cost, energy, and carbon analysis identified savings and linked to capital planning for HVAC systems and controls
- Data leveraged for federal funding applications

“The UL-SafeTraces Verified Ventilation & Filtration program is one of the best and smartest investments that we can possibly make to strengthen student attendance, enrollment, and performance in order to strengthen our foundation for the future.”



Mean eACH value = big white circles, Individual Tests = small blue circles
Error bars are min and max values



State-Level IAQ Initiatives

Example Models

Initiative	Description
Kansas Air Quality Study	Thru a public-private partnership model, the Kansas Department of Health & Environment assessed baseline IAQ in a representative sample of schools statewide and provided recommendations on actions and remediation strategies for districts to improve IAQ for students and staff.
Colorado Air Quality Study	Funded by the CDC, the Colorado Department of Health & Environment and the University of Colorado Boulder is analyzing the linkage between student absenteeism and IAQ levels in classrooms statewide, including presence of SARS-CoV-2, influenza, respiratory syncytial virus (RSV) and other respiratory viruses.
CaISHAPE	Established by Assembly Bill 841, the California Energy Commission authorized funding (\geq \$300M) to local educational agencies to assess, maintain, repair, and/or upgrade school HVAC systems in order to meet classroom ventilation requirements.

Return on Investment

Health & Financial Payback

39%

Reduction in COVID cases in schools with improved ventilation

48%

Reduction in COVID cases in schools with improved ventilation + filtration

74%

Reduction in COVID cases in classrooms with effective HVAC or air cleaning systems vs open windows

Source: <https://www.nytimes.com/2023/08/27/health/schools-indoor-air-covid.html>

"...if every space improved its ECAi following Standard 241, an average person's risk of catching a respiratory virus via long-range aerosol transmission would decrease by 25%."

*Dr. Richard Bruns
Health Policy Economist
Johns Hopkins Center for Health Security*

Annual Costs and COVID-Prevention Benefits of Standard 241 in Model Sites

Occupancy Category	Area (sq ft)	Default Occupancy	IRMM Cost	Infections Prevented	Monetized Value	Payback Level
Classroom	1,200	30	\$820	3.8	\$7,000	9:1
Auditorium	2,000	150	\$7,500	13	\$25,000	3:1
Gym	5,000	180	\$11,000	39	\$72,000	7:1
Office	10,000	50	\$500	1.0	\$1,900	4:1

Source: . Bruns, "Cost-Benefit Analysis of ASHRAE Standard 241," ASHRAE Journal October 2023, p 14-16

Return on Investment

Energy Cost Payback

- ASHRAE 241 provides flexibility to meet ECAI requirements at highest cost & energy efficiency
- Reliance on dilution with outdoor air is long-standing, but energy-intensive and expensive
- Filtration and air cleaning can be much less expensive, lower energy use, and outperform OA

Location	\$/cfm Outdoor Air	\$/cfm MERV 13	\$/cfm % Decrease
Santa Fe, NM	0.74	0.12	83%
Boston, MA	3.25	0.26	92%
Minneapolis, MN	2.63	0.16	94%

Source: Zaatari, M, A. Goel, and J. Maser. 2023. ASHRAE J. 65(9):18-24.

Filtration is significantly more cost-effective than OA across climate zones

Path Forward

For Consideration

Proposal

Turnkey statewide IAQ study available to PSCOC to:

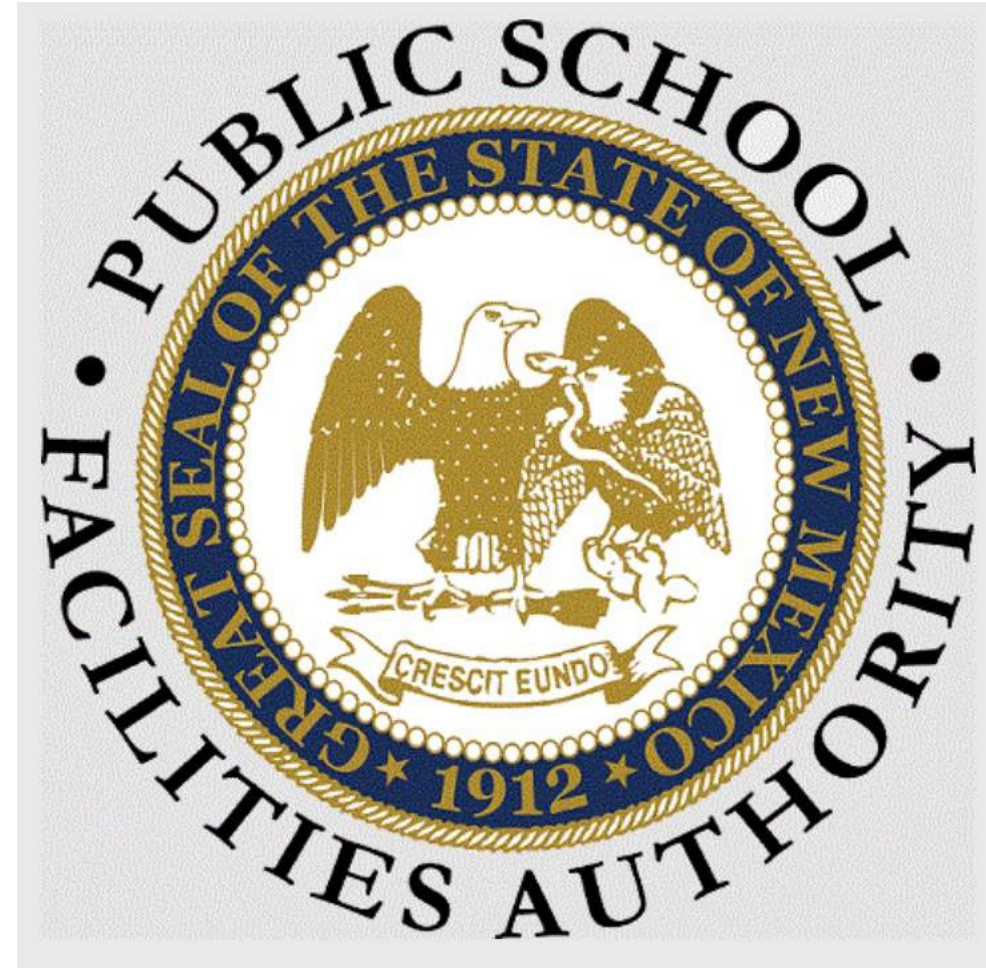
- Meet goals and intent of HJM 7
- Assess baseline & readiness for IAQ requirements
- Analyze linkage between IAQ and absenteeism
- Reduce chronic absenteeism in NM schools
- Enhance competitiveness for federal grant funding

Scope of Work

- 10%-20% representative sample of NM schools

Process & Timeline

- Phase 1 (1 month): Finalize site selection
- Phase 2 (2 months): Conduct field assessments
- Phase 3 (1 month): Report and recommendations



Contact Us



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