Roanoke City Public Schools IAQ Case Study

Lessons Learned from the Field

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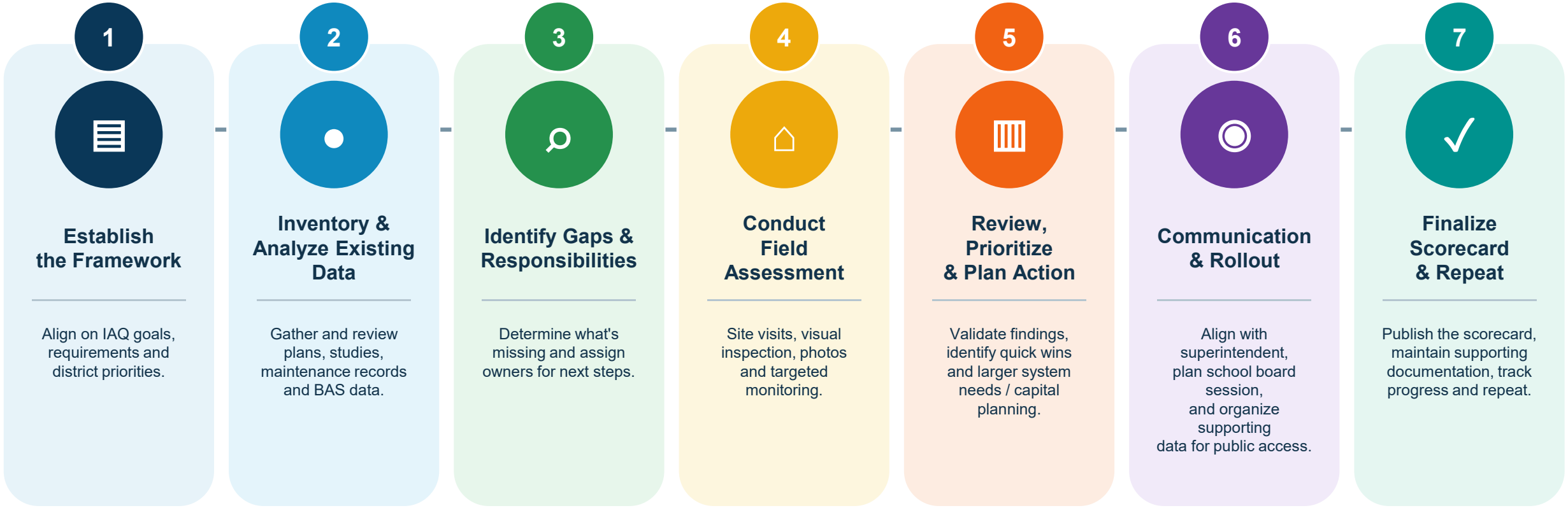
IAQ School Scorecard Process

From assessment to action. Healthier schools, stronger communities.



MEASURE | IMPROVE | BUILD TRUST

HEALTHY ENVIRONMENTS FOR BRIGHTER FUTURES.

Using What You Already Have

Before the walk: pull BAS and your studies/logs. Put findings on the IAQ sheet so techs already know what to check.

LPA

LAWRENCE PERRY & ASSOCIATES

Consulting Engineers

Executive Summary

This Indoor Air Quality (IAQ) report serves as an update to the ventilation study performed in 2020, in which an analysis of the ventilation at eight Roanoke City Schools and the transportation center was performed and compared to ASHRAE Standard 62.1-2019. The schools included in this study include: Patrick Henry High School, William Fleming High School, Lucy Addison Middle School, James Breckenridge Middle School, Woodrow Wilson Middle School, Fishburn Park Elementary School, Garden City Elementary School, Noel C. Taylor Academy.

The primary focus of this update is to consider a portion of ASHRAE's Epidemic Task Force's Building Readiness Guide. The guide recommends using an equivalent air change per hour (ACH) analysis, and provides direction for the use of in room filtration units. The methodology outlined in the guide was applied to a room by room analysis to calculate the number of in room filtration units required to meet the recommended five equivalent ACH (Six ACH for Nurses Spaces). For spaces requiring more than three in room filtration units, other measures were considered. The results of the calculations can be found within.

Contents:

- Areas Requiring More Than Three In Room Filtration Units
- Room by Room Equivalent ACH and Required Number of In Room Filtration Units
- Nurses Spaces

RCPS Unit Evaluation (RTU 9)

Roanoke City Public Schools
RCPS Garden City

Unit Name
RTU 9

Date
2026-04-16

Filter Type, Qty & Size
20 18x25x2 MERV 13 Pleat

Return Belts
Qty & Size
1 BX80



"Return bearing sling grease, seals may be busted."

Supply Belts
Qty & Size
1 BX98

Inspections - Dampers & Linkages
Good Condition

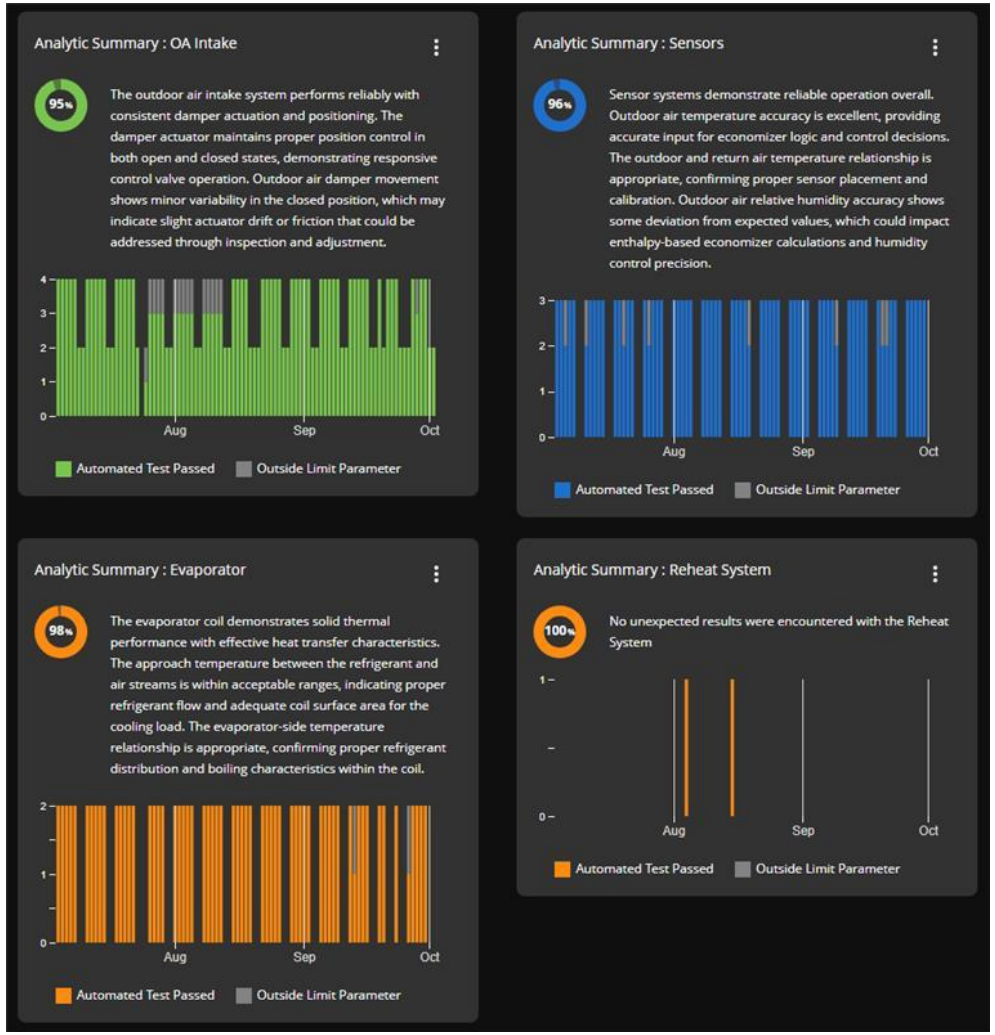
Inspections - Previous Filters
Moderate Debris

Inspections - Coil
Good Condition

- LPA COVID-era IAQ study (left) and unit ACH evaluation (right): work already paid for that still applies to this mandate
- Pull these, plus filter company logs and BAS data, before anyone walks a building
- Findings go on the IAQ sheet first, so inspections start guided, not blank

Using the BAS to Monitor IAQ

Start with the data you already have, before anyone walks a building.



What we did first

- Ran a building automation analysis before any walkthroughs
- Automated tests checked BAS data against expected operation across several months
- Tests tracked outside-air dampers, sensors, evaporator and reheat, marking passes and out-of-limit results
- Example finding: Outdoor Air Damper Stuck Closed (16 of 62 fails)
- The BAS tells us what to look for in the field

BAS data shows us where to look. Field checks confirm it.

Keeping It Simple: Observation with a Camera

Same photos, same order, every unit. Quick for the tech and easy to review later.

Photo & Observation Protocol

The reviewer never sets foot in the building. They can only evaluate what the camera saw and what you wrote down. Every shot below is required on every unit — a missing shot comes back as a data gap and somebody drives out again.

FILE NAMING

SCHOOL_TAG_WHAT_SEQ.jpg — for example **FISH_RTU-5A_damper-open_01.jpg** or **FISH_B104_meter-placement_01.jpg**.

School codes: FISH · GARD · FALL · MORN. Use the unit tag exactly as it appears on the equipment. Enter the file name in the Photo ref column of the workbook so the reviewer can find it.

PER UNIT — 14 REQUIRED SHOTS

#	SHOT	WHAT TO GET
01	**Nameplate**	Whole plate legible, square on, no glare
02	**Unit tag or asset label**	Proves which unit the next 12 shots belong to
03	**Filter bank, access door open**	Filters in place, wide enough to see the whole rack
04	**Filter frame close-up**	Close enough to read the MERV marking
05	**Filter gasket edge**	Where bypass would show — shoot along the seal, not at it
06	**Manometer — filter dP**	Display readable, taken at the filter bank
07	**OA damper FULL CLOSED**	Blades visible
08	**OA damper FULL OPEN**	Same angle as 07 — the pair is what proves stroke
09	**Actuator and linkage**	Include the min-position setting if it is marked
10	**Cooling coil face**	Straight on, light across the fins
11	**Drain pan and condensate**	Show standing water or the absence of it
12	**Fan wheel and drive**	Belt, sheave, wheel in one frame if possible
13	**Mixed air / economizer section**	Plenum interior
14	**Each deficiency — wide then close**	Wide shot for location, close shot for detail. Two frames per problem.

PER ROOM — CO_2 METER

#	SHOT	WHAT TO GET
01	**Room number**	Door plate or number card, legible
02	**CO_2 meter placement, wide**	Shows height and distance from the supply diffuser and the door. Get the meter ID in frame if you can.

No photo of the display is needed — the readings come off the meter download. These two shots exist so the reviewer can judge whether the meter was placed somewhere that gives a representative reading.

Technician Reports: XOI

Room-by-room findings with photos tied to each one. The detail behind the public report.

TRANE

https://www.tranetechnologies.com

Customer	Work Order
[redacted]	#13297881 [redacted]

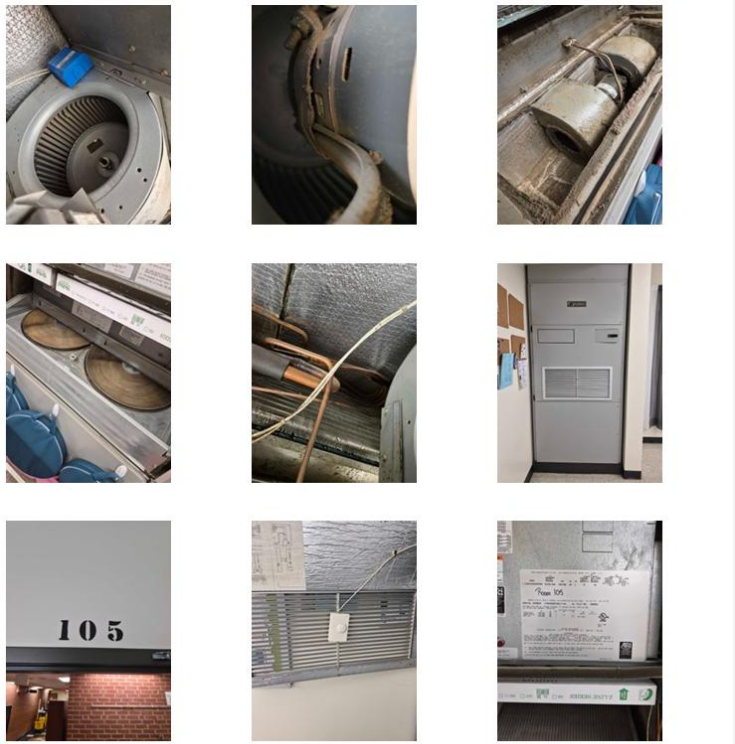
AI - Planned (Inspection, Quoted, Project)
ROOM 106

Today I arrived on site to perform unit inspections.

Initial Assessment
* Met with the customer and walked the site.
* Confirmed all 16x20x2 pleated filters were recently changed and are new on all units.
* Noted all units were operating as intended upon arrival.

Unit-Specific Findings
* **ROOM 106:**
  * Found a bad outside air fan motor and recovery wheel motor.
  * Observed a dirty DX coil.
  * Recorded total supply of 899 cfm, 588 cfm mixed air, and 460 cfm outside air with a -0.2338 differential pressure drop across the coil.
* **ROOM 105:**
  * Identified dirty and blocked recovery wheels and DX coils.
  * Recorded total supply of 1417 cfm, 827 cfm mixed air, and 533 cfm outside air with a -0.3173 pressure drop across the coil.
* **ROOM 104:**
  * Found dirty recovery wheels and DX coils.
  * Recorded supply of 1381 cfm, 765 cfm mixed air, and 461 cfm outside air with a -0.1932 pressure drop across the coil.

AI - Planned (Inspection, Quoted, Project)
ROOM 106 [redacted]



UNIFORM INDOOR AIR QUALITY INSPECTION & EVALUATION REPORT

Under §§ 22.1-141.3 to 22.1-141.5, every public school in Virginia must have its heating, ventilation, and air conditioning (HVAC) system inspected at least once every four years, beginning July 1, 2025. These uniform inspection and evaluation, conducted by certified professionals, assess filter efficiency, airflow levels, and carbon dioxide concentrations to help ensure a healthy learning environment for students and staff. Any items that do not comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) ventilation standards must be documented in a report. School divisions are required to make the report, including test results and any necessary corrective actions, publicly available at school board meetings and on the school board's website. Schools scheduled for closure within one year are exempt from this requirement.

School Name: Garden City Elementary **Start Date:** 8/24/2026 **Reinspection Date:** 8/24/2030 (must be done within 4 years of completion)

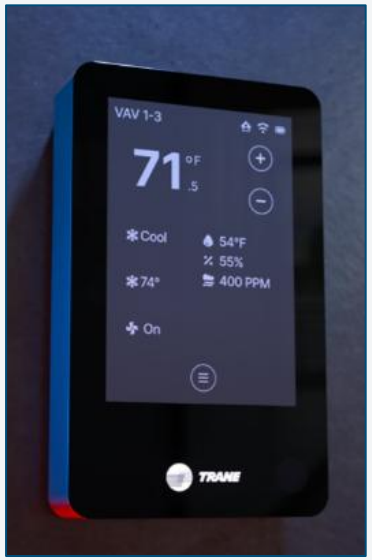
Device Name	Device Type	All HVAC Filters Provide Adequate Filtration	Sufficient Supply of Outdoor Air	All HVAC Parts Are Operating Properly	HVAC System Maintenance not Required	CO_2 Sensors are Functional, If Present	Classroom CO_2 Level Below 1100 PPM Threshold	PASS or FAIL	Observations	Necessary Repairs
RTU-1 VAV Area A Classrooms-2-32	Air Handler	✗	✗	✗	✗	✓	✗	**FAIL**	Calibrate MAT, RAT Sensors. Verify Filters	
Classroom 103 VVR-1 UCM-2-71	VAV Box	✗	✗	✓	✓	✓	✗	**FAIL**	Communication Failure	
Classroom 106 VVR-15 UCM-2-70	VAV Box	✗	✗	✓	✓	✓	✗	**FAIL**	Check CO2 Levels Onsite	
Classroom 107 VVR-12 UCM-2-68	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Classroom 108 VVR-14 UCM-2-66	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Classroom 109 VVR-13 UCM-2-65	VAV Box	✗	✗	✓	✓	✓	✗	**FAIL**	Check CO2 Levels Onsite	
Corridor VVR-2 UCM-2-69	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Corridor VVR-7 UCM-2-67	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Room 104-105 VVR-8 UCM-2-72	VAV Box	✗	✗	✗	✓	✓	✓	**FAIL**	More airflow than needed	Damper Actuator Replacement Needed
RTU-6 (Voyager)-2-57	Air Handler	✓	✓	✓	✓	✓	✓	**PASS**		
Conference Room 2-108	VAV Box	✗	✗	✓	✓	✓	✗	**FAIL**	Check CO2 Levels Onsite	
File Room 2-110	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Front Office 2-109	VAV Box	✗	✗	✓	✓	✓	✗	**FAIL**	Check CO2 Levels Onsite	
Principal's Office 2-112	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
RTU-8 VAV Area B Classrooms-2-33	Air Handler	✗	✗	✓	✓	✓	✓	**FAIL**	Verify Filters	
Classroom 001 VVR-10 UCM-2-82	VAV Box	✗	✗	✓	✓	✓	✗	**FAIL**	Check CO2 Levels Onsite	
Classroom 002 VVR-9 UCM-2-81	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Classroom 003 VVR-10 UCM-2-80	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Classroom 004 VVR-11 UCM-2-74	VAV Box	✗	✗	✗	✗	✓	✗	**FAIL**	More airflow than needed.	Damper Actuator Replacement Needed
Classroom 005 VVR-13 UCM-2-75	VAV Box	✗	✗	✓	✓	✓	✓	**FAIL**	Check CO2 Levels Onsite	
Classroom 006 VVR-11 UCM-2-77	VAV Box	✗	✗	✗	✗	✓	✗	**FAIL**	Communication Failure	Troubleshoot Communication Onsite
Classroom 007 VVR-11 UCM-2-78	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		
Classroom 008 VVR-13 UCM-2-79	VAV Box	✓	✓	✓	✓	✓	✓	**PASS**		

Low Investment, High Value IAQ Data

Two practical steps help spot IAQ risks early and turn BAS data into routine fixes.

4-in-1 Zone Sensors

- One sensor, four readings: occupancy, humidity, temperature and CO_2
- Wired or wireless



Quarterly Controls Review

- A controls engineer who knows the building reviews BAS analytics each quarter
- Temperature and humidity trends flag mold risk. Sustained CO_2 rises can point to ventilation faults
- School HVAC techs receive a short repair list, often dampers or actuators

Occupancy and CO_2 can guide outside air to demand, with potential energy savings.

Thank you!

Questions? Let's talk.

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