Marlborough Elementary School Indoor Air Quality (IAQ) Verification Report

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Prepared by:

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Speaker Introduction

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Sustainable Engineering Solutions

Sustainable Engineering Solutions

- Whole Building Commissioning
- Building Envelope Testing
- Retro-Commissioning
- Energy Engineering
- IR Scanning
- Condition Assessments
- Troubleshooting and Diagnostics



Our Purpose

Advocating for clients to achieve healthy and efficient buildings

Agenda

IAQ Requirements Background
SES Approach
Elmer Thienes – Mary Hall Facility
HVAC System Components
Overall Condition Assessment
Overall IAQ Assessments
Findal Recommendations
Next Steps
Q&A



IAQ Study Background

School IAQ Assessment

- COVID-19 until now
- Conducted per Public Act No. 23-167 IAQ Verification requirements
- Assess current ventilation, filtration, and system condition
- Identify short-term corrections and long-term capital needs

School District Requirements

- Conduct an IAQ inspection every 5 years
- Make results public available
- Submit appropriate form to DAS

Website:

https://portal.ct.gov/das/grants/hvac-grants/iaq-requirements-for-school-districts

SES IAQ Approach

School IAQ Assessment

- Developed an IAQ evaluation plan and conducted a kickoff meeting with the client and TAB contractor (Trueflow).
- Completed a facility walkthrough to assess HVAC system condition and identify maintenance issues.
- Reviewed available HVAC documentation:
- Performed field testing to verify ventilation sequences and CO_2 sensor calibration (+/-50 PPM).
- Reviewed Trueflow's ventilation rate verification sheets for ASHRAE 62.1 compliance.
- Reviewed unit data sheets for airflow, filtration, damper condition, and maintenance adequacy.
- Prepared a comprehensive report summarizing verification results, deficiencies, recommendations, and next steps.

Elmer Thienes – Mary Hall Elementary School

Facility Background

- Originally constructed in 1949; renovation & addition in 2002
- 105,870 SF
- Detailed condition assessment report provided by Antinozzi Associates dated 12/11/2024
- IAQ assessment mirrors & provide additional details



HVAC Systems – Rooftop Units

Unit Tag	Serves
RTU-1	Gym
RTU-2	Stage
RTU-3	Cafeteria
RTU-4	Art Room
RTU-5	Administration
RTU-6	Library / Media Center
RTU-7	Computer Lab
RTU-8	BLDG “B” Core Area







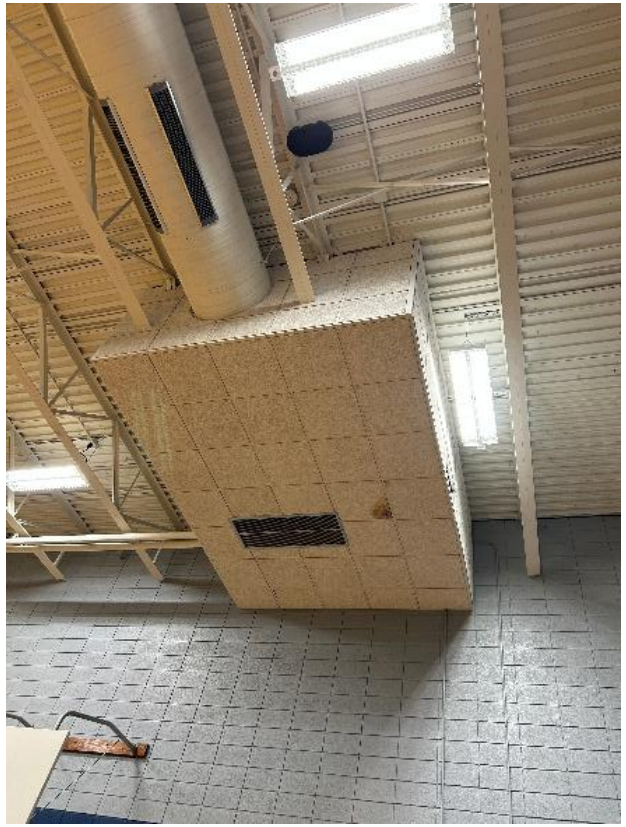
HVAC Systems – Air Handlers

AHU-1

- Serves mechanical boiler room
- Excluded from survey (non-occupied space)

AHU-2, 3 & 4

- Serves Gym
- Provide fresh air & heating
- No cooling



HVAC Systems – Unit Ventilators

Unit Ventilators

- ~46 unit ventilators total
- Provide heating & fresh air to the classrooms & admin spaces





HVAC Systems – Exhaust Fans

Exhaust Fans

- 33 exhaust fans total
- Provide exhaust air to classrooms & restrooms

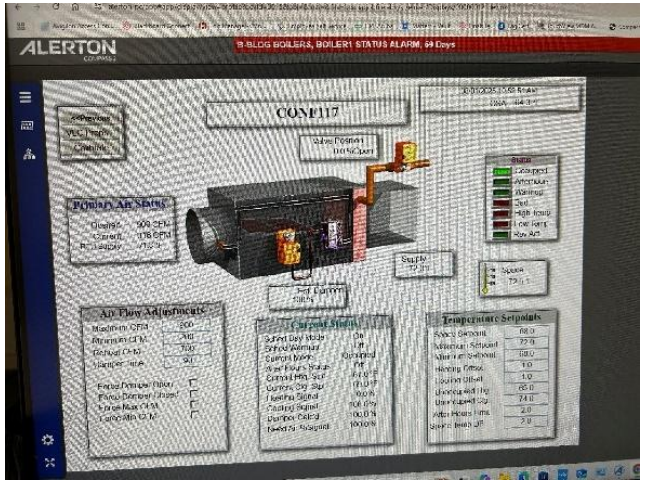


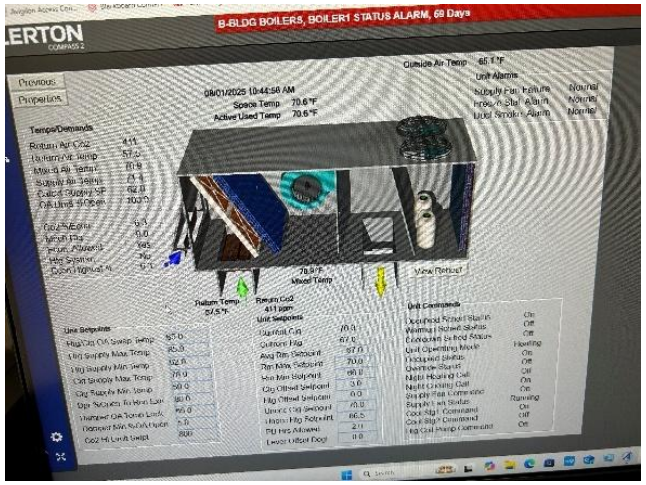
HVAC Systems – Building Automation System

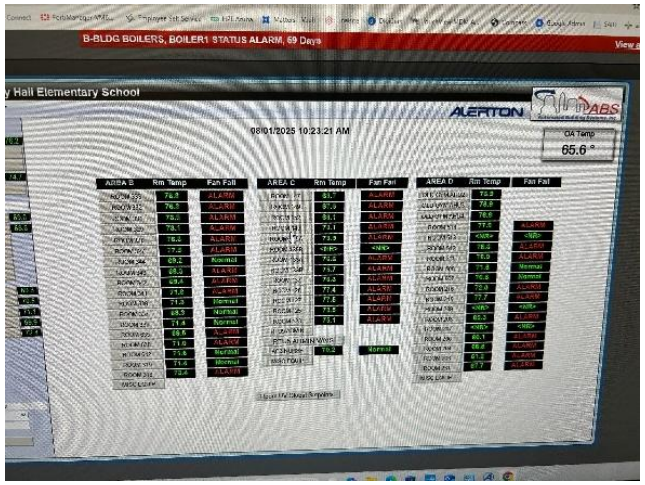
Allerton Compass

- Original to 2002
- Provide exhaust air to classrooms & restrooms









Overall Condition Assessment

- Rooftop equipment is old & nearing end of useful life expectancy
- Air handling units are old & nearing end of useful life expectancy
  - No mechanical cooling
- Unit ventilators are old & nearing end of useful life expectancy.
  - No mechanical cooling
- BAS is outdated, many controller's & parts obsolete and discontinued

ASHRAE Equipment Life Expectancy chart

ASHRAE is the industry organization that sets the standards and guidelines for most all HVAC-R equipment. For additional info about ASHRAE the website is www.ashrae.org .

Equipment Item	Median Years
Air conditioners	
Window unit	10
Residential single or Split Package	15
Commercial through-the wall	15
Water-cooled package	15
Heat Pumps	
Residential air-to-air	15
Commercial air-to-air	15
Commercial water-to-air	19
Roof-top air conditioners	
Single-zone	15
Multi-zone	15
Boilers, hot water (steam)	
Steel water-tube	24 (30)
Steel fire-tube	25 (25)
Cast iron	35 (30)
Electric	15
Burners	21
Furnaces	
Gas- or oil-fired	18
Unit heaters	
Gas or electric	13
Hot water or steam	20
Radiant Heaters	
Electric	10
Hot water or steam	25

Equipment Item	Median Years
Air terminals	
Diffusers, grilles, and registers	27
Induction and fan coil units	20
VAV and double-duct boxes	20
Air washers	17
Ductwork	30
Dampers	20
Fans	
Centrifugal	25
Axial	20
Propeller	15
Ventilating roof-mounted	20
Coils	
DX, water, or steam	20
Electric	15
Heat Exchangers	
Shell-and-tube	24
Reciprocating compressors	20
Packaged chillers	
Reciprocating	20
Centrifugal	23
Absorption	23
Cooling towers	
Galvanized metal	20
Wood	20
Ceramic	34

Equipment Item	Median Years
Air-cooled condensers	20
Evaporative condensers	20
Insulation	
Molded	20
Blanket	24
Pumps	
Base-mounted	20
Pipe-mounted	10
Sump and well	10
Condensate	15
Reciprocating engines	20
Steam turbines	30
Electric motors	18
Motor starters	17
Electric transformers	30
Controls	
Pneumatic	20
Electric	16
Electronic	15
Valve actuators	
Hydraulic	15
Pneumatic	20
Self-contained	10

Overall IAQ Assessment

Short Term – Immediate Solutions

- Replace 26 failed CO_2 sensors
- Rebalance and reprogram demand control ventilation for RTUs & AHUs
- Service/repair non-functioning fans (RTU-2, RTU-3 & exhaust fans)
- Upgrade filters to MERV 13 (higher efficiencies)
- Recalibrate VAVs serving Admin Wing



Overall IAQ Assessment

Unit Ventilators

- Majority are either failed or shut off due to noise & comfort concerns
- Lack of mechanical cooling
- SES identified O&M items such as CO2 sensor replacements, filter replacements & rebalancing – not recommended if unit ventilators are not allowed to operate during all hours
- Recommend replacing in near future
- To solve any immediate concerns – town could quote portable filtration units

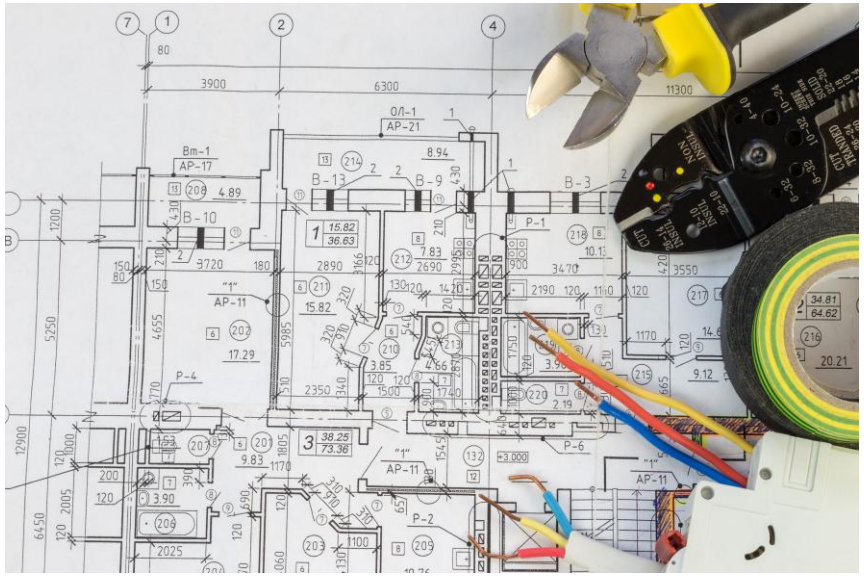


Cost Estimates

#	Recommendation	Cost Estimate
1	Replace CO2 Sensors	$23,885
2	Rebalance Air Handler Outside Airflows and Reprogram Demand Control Ventilation	$13,100
3	Service RTU-2 Supply Fan	TBD
4	Service RTU-3 Supply Fan	TBD
5	Rebalance Nurse Office AC-3	$500
6	VAV Recalibration	$8,200
7	Filter Improvements	TBD
8	Replace Existing Unit Ventilators	TBD
9	Spaces Without Mechanical Ventilation	TBD
10	Service & Repair Exhaust Fans	$4,800

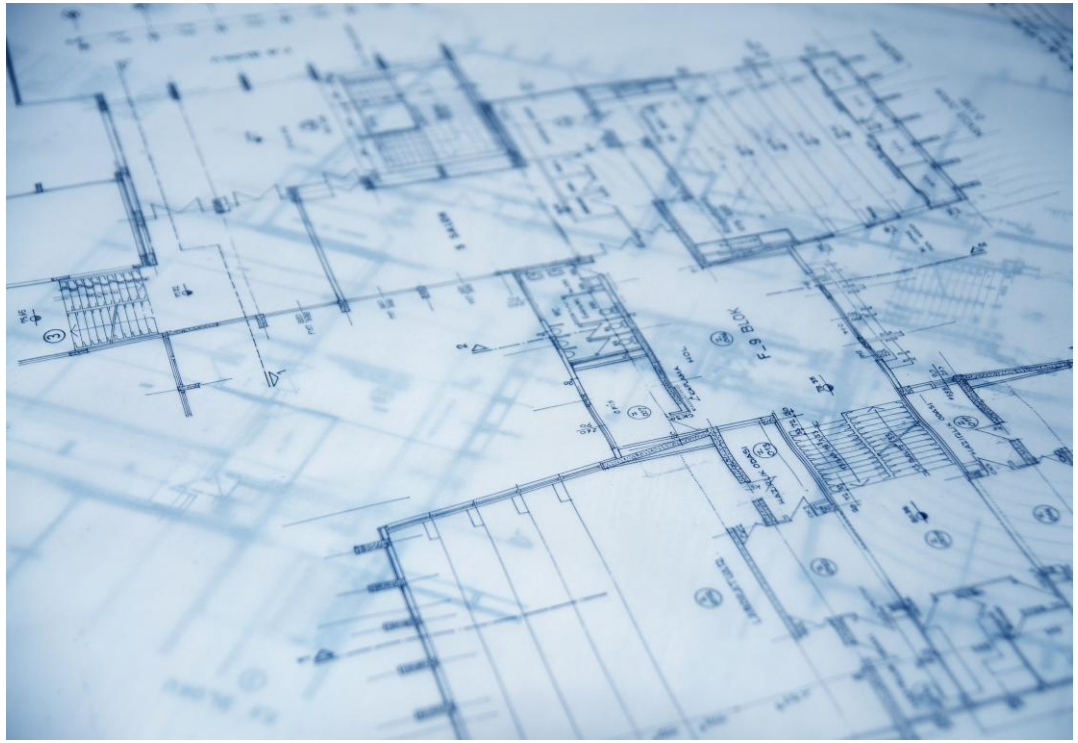
Final Recommendations

- Replace all Unit Ventilators and aging HVAC systems
- Beyond useful life; limited comfort control; no mechanical cooling
- Plan for full HVAC modernization as part of next capital improvement cycle
- Spaces without mechanical ventilation:
  - Rooms 202, 212, 218, 303, 335 → Currently rely on windows and exhaust fans only
  - Recommend inclusion in future HVAC replacement design



Next Steps

- Implement short-term fixes to stabilize IAQ
  - Reviewing short-term recommendations with Marlborough and soliciting pricing
- Begin budgetary planning for system replacement project
- Consider including HVAC upgrades in Capital Improvement Plan (CIP)
- SES available for continued support through design and commissioning



Questions?

