



IAQ Verification Report

Sterling Community School

Sterling, CT

SES Project No. 24-211

September 12, 2024

Prepared by:

Sustainable Engineering Solutions, LLC

865 Brook Street

Rocky Hill, CT 06067

(860) 270-0413

www.sustainable-eng.com



Table of Contents

Executive Summary	1
IAQ Verification Process.....	1
<i>Filter Evaluation</i>	1
<i>Ventilation Evaluation</i>	1
<i>Demand Control Ventilation</i>	2
Project Approach.....	2
Participants.....	4
Facility Description	5
<i>Building</i>	5
<i>Occupancy</i>	5
<i>Building Automation System Description</i>	5
<i>HVAC Systems Description</i>	6
<i>Rooftop Units</i>	6
Recommendations.....	7
<i>Recommendation #1: Recalibrate VAV System and install CO2 Sensors</i>	7
<i>Recommendation #2: Rebalance Minimum Outside Air Levels of RTUs</i>	7
<i>Recommendation #3: Filter Improvements</i>	8
<i>Recommendation #4: Energy Recovery Wheels</i>	8
<i>Recommendation #5: Exhaust Fans</i>	8
<i>Recommendation #6: Filters</i>	9
Next Steps	9
<i>Review Recommendations</i>	9

Appendix A	IAQ Evaluation Sheet
Appendix B	Testing, Adjusting and Balancing Report
Appendix C	International Mechanical Code Minimum Ventilation Rates (2021) per ASHRAE 62.1



Executive Summary

Sustainable Engineering Solutions, LLC (SES) and Trueflow Testing and Balancing were retained by the Town of Sterling to provide professional engineering and test and balancing (TAB) services to meet the indoor air quality (IAQ) verification requirements of the state legislation Public Act No. 23-167 at the Sterling Community School facility. This combined effort successfully completed the required verification as outlined in the legislation. With a focus on validating and improving indoor air quality, SES and Trueflow systematically assessed each air handling system to measure current ventilation rates, filtration rates and distribution levels compared to current ventilation standards.

Overall, the facility has been well maintained with the majority of the RTU systems being in an operational state. However, the VAV system was found to be out of calibration and requires a rebalancing effort and new control sequences to achieve the current state code ventilation requirements.

Note that throughout this report the term “ventilation” air and “outside” are used interchangeably and are one in the same.

IAQ Verification Process

Filter Evaluation

As required by the law, the team reviewed the current level of filtration installed on each air handling system and analyzed the feasibility of increasing the filter ratings to MERV 13. A filter’s minimum efficiency reporting value, or MERV, is a rating system that measures how efficient a filter is at trapping harmful particulate matter, dust, and debris in the air. This rating system categorizes filters into a ranking from 2 to 20, with a MERV 8 being the standard. A higher MERV rating means that a filter is more efficient and MERV 13 is recommended for many commercial and industrial buildings and by state code. At its minimum, a MERV 13 filter traps less than 75% of air particles that are 0.3 to 1.0 microns in size and is at least 90% effective when the particles increase to 3 to 10 microns in size. Along with assessing the filter efficiencies, the condition of unit’s filters and proper sealing of the filter banks to eliminate bypass air was also evaluated.

Ventilation Evaluation

The amount of ventilation air delivered into interior occupied spaces is governed by the 2022 Connecticut State Building Code, which references ASHRAE Standard 62.1. This code prescribes the flow rate of ventilation air that must be supplied mechanically, or otherwise, to occupied areas based on occupancy classifications. Depending on the type of use of a space and total space area, outdoor air flow rates in cubic feet per minute (CFM) per person and square foot are defined when the parameters are known. When total occupants per space are unknown, the code defines occupant density for each



classification type in number of occupants per space floor area. The final flow rate in CFM for every occupied space can thus be calculated.

As an alternative to providing outside air mechanically to occupied spaces, the building code also allows for outside air to enter occupied areas naturally through operable windows. If the area of operable windows for an occupied space is at least 4% of the space's floor area, mechanical ventilation for that space is not required by code. However, although spaces with sufficient operable window area may satisfy code requirements, this is not a realistic way of providing adequate ventilation during periods of cold or hot weather.

The amount of outside air supplied to occupied spaces is important for occupant comfort and health because contaminants generated by people and materials in the space must be removed or they will build up to unhealthy levels. Diluting interior air with outside air reduces the concentration of carbon dioxide, volatile organic compounds (VOCs) along with various airborne viral and bacterial contaminants.

Demand Control Ventilation

In certain applications, the amount of outside air delivered to a space can be reduced if occupancy and indoor air quality can be safely monitored and controlled. This is most typically accomplished through monitoring carbon dioxide (CO₂) and occupancy sensors in the space, otherwise known as "Demand Control Ventilation" or DCV. As occupancy rises in a space, so does the amount of CO₂ as a result of the occupant's natural respiration and exhalation of CO₂. By monitoring CO₂ and occupancy status, an HVAC system can reduce the amount of outside air to a zone when levels and occupancy are low. If CO₂ levels rise above a certain threshold or occupancy is detected, the HVAC system can then increase the amount of fresh air until the levels fall back below an acceptable level. Having an operational demand control ventilation strategy in place will help reduce energy consumption of a facility while simultaneously ensuring all spaces are achieving the required fresh air requirements.

Project Approach

During the review of the school, SES took the following steps to complete the study:

- Develop an IAQ evaluation plan and conduct a kickoff meeting with the client and Trueflow to review the plan, project schedule, access, etc.
- Perform a walkthrough of the building to review the HVAC systems providing ventilation air for a condition assessment of the systems and understand any maintenance issues that may be related.
- Review available documentation for the HVAC systems that includes:
 - As-built drawings or original design drawings
 - O&M documentation for systems performance data
- Review any previous testing adjusting and balancing reports from the HVAC systems



- Review documentation describing the chronology of known problems, system failures, complaints, and alterations.
- Develop IAQ evaluation documentation for field evaluation of equipment.
- Perform field evaluation of equipment for ventilation sequence of operation and verify calibration of CO2 sensors where used (+/- 50 PPM).
- Review Trueflow's completed ventilation rate verification sheets for each space for compliance with ASHRAE 62.1
- Review the Trueflow's completed unit data sheets for each system providing ventilation air for ventilation airflows, filter condition and efficiency, damper conditions and maintenance adequacy.
- Prepare a report that summarizes the verification process, identifies any deficiencies that require correction and any recommendations to address the deficiencies found and next steps.



Participants

The participants in the IAQ verification process for this project are identified below.

Owner

Sterling Community School
251 Sterling Rd.
Sterling, CT 06377
Contact: Kevin Kerrigan
Email: kkerrigan@sterlingschool.com
Phone: 860.481.1521

Engineer

Sustainable Engineering Solutions, LLC
865 Brook Street
Rocky Hill, CT 06067
Contact: Brian Messerschmidt, PE, CCP, CEM
Email: bmesserschmidt@sustainable-eng.com
Mobile: 860-247-8265

TAB Provider

Trueflow
121 Broadway Street, Suite 1
Colchester, CT 06415
Contact: Bonnie Boothroyd
Email: bonnie@trueflowct.com
Phone: 860-682-5165

Facility Description

Building

Building:	Sterling Community School
Location:	251 Sterling Rd., Sterling, CT 06377
Building Size (gross):	87,000 ft ²
Year Constructed:	2008
Building Use (current):	Education



The 87,000 square foot Sterling Community School building was constructed in 2008 and provides a learning space for Kindergarten through 8th grade. The building consists of classrooms, administration offices, gymnasium, cafeteria, media center and other typical educational spaces.

Occupancy

The building is occupied Monday through Friday between 7 a.m. and 3 p.m. Special events are held on the weekends and after hours as needed for school extracurricular activities. In addition, the school hosts summer school activities during the summer break.

Building Automation System Description

The HVAC system is controlled by a Honeywell / Allerton Compass building automation system. This system has graphics for all the HVAC equipment and is capable of trending and performing custom control algorithms.



HVAC Systems Description

Rooftop Units

In total, there are seven (7) rooftop units (RTUs) in the facility. Of the seven, five are multizone variable-air-volume (VAV) units that serve multiple VAV box zones. The remaining RTUs are variable-volume serving single zones.

For the multizone VAV RTUs, airflow to the space is controlled by the VAV box with ventilation air being provided and controlled by the RTU. As the heating and cooling requirements of the space change, the VAVs adjust the total airflow introduced in the space. The air entering the VAV box is served by the associated rooftop unit. The rooftop unit mixes return air from the building with fresh outside air, filters the airstream and then conditions it by heating or cooling as necessary. As the airflow requirements of the spaces change, the supply fan of the unit will increase and decrease speed accordingly.

For the single zone air handling units, the spaces are conditioned and ventilated by the associated unit. The unit mixes return air from the space with fresh outside air, filters the airstream and then conditions it by heating or cooling as necessary at a constant airflow. As the space requires cooling and heating, the RTU supply fan will modulate speed between a minimum and a maximum setpoint.

All RTUs maintain a fixed minimum outside air damper setpoint but are equipped with return air carbon dioxide (CO₂) sensors for demand control ventilation. As the CO₂ in the building rises above the RTUs setpoint, the outside air damper will modulate from minimum setpoint to 100% open. Once CO₂ levels fall below setpoint, the outside air damper will modulate back towards minimum position.

Unit Tag	Serves	Type	Min OA Damper Setpoint	CO ₂ Setpoint
RTU-1	Art Music	Multizone VAV	40%	800 PPM
RTU-2	Gymnasium	Single zone VAV	50%	800 PPM
RTU-3	Cafeteria	Single zone VAV	35%	800 PPM
RTU-4	Media	Multizone VAV	45%	800 PPM
RTU-5	A Wing Rooms	Multizone VAV	50%	800 PPM
RTU-6	Admin Support	Multizone VAV	40%	800 PPM
RTU-7	D Wing Rooms	Multizone VAV	45%	800 PPM



Recommendations

The following recommendations were made based on the review of TAB report, ventilation comparisons to the IMC Minimum Ventilation Rates (2021) and industry best practices. Additional supporting information can be found in the Appendices of the report.

Due to the limited area of focus of the required IAQ verification and this review, SES strongly recommends verifying the condition of all related HVAC equipment components and control functionality outside of the scope of this verification, is performed prior to implementing any modifications to the HVAC systems.

Recommendation #1: Recalibrate VAV System and install CO2 Sensors

During testing, adjusting and balancing it was determined that the majority of the VAV boxes are out of calibration and unable to control to their airflow setpoints. Many VAV boxes were found to be wide open or fully closed. In addition, nearly all airflow setpoints have been adjusted from the initial design. In addition, the design minimum VAV airflows are lower than the required ventilation air requirements for the majority of the spaces.

SES recommends recalibrating all VAV boxes so that they can properly maintain the associated airflow setpoints. In the event VAV controllers are failed or inoperable they should be replaced. In addition to recalibrating the VAVs, SES recommends installing zone CO2 sensors. By installing zone CO2 sensors, the building automation system can safely reduce airflows to these zones during periods of low occupancy. Controls should be programmed to satisfy the following sequence:

“The zone CO2 setpoint for each space should be 1,000 PPM (adj.). If the space CO2 rises above 1,000 PPM, the VAV airflow setpoint shall modulate from minimum to maximum setpoint. The reheat valve shall continue to modulate as required to maintain space temperature. In the event the VAV is at maximum airflow setpoint for 15 minute (adj.) and the space CO2 is still above setpoint, the associated RTU shall modulate the outside air damper from minimum to maximum damper position as a second stage of ventilation, subject to a mixed air low limit setpoint of 50F (adj.).”

Recommendation #2: Rebalance Minimum Outside Air Levels of RTUs

After the VAV system is recalibrated and corrected, the minimum outside air levels of the RTUs should be rebalanced as outlined below.

Currently the AHUs maintain minimum outside airflows through a fixed minimum outside air damper set via the BMS. Overall, many of the AHUs were found to be operating with outside airflows lower than required. It is recommended that new minimum outside air damper setpoints be set corresponding to the following airflow requirements:

Unit Tag	Served	Design Supply Airflow (CFM)	Min OA (CFM)	Min OA (%)
RTU-1	Art and Music	5,100	1,400	27%
RTU-2	Gymnasium	19,200	6,050	32%

Unit Tag	Served	Design Supply Airflow (CFM)	Min OA (CFM)	Min OA (%)
RTU-3	Cafeteria	12,000	4,260	36%
RTU-4	Media Center	5,900	690	12%
RTU-5	A-Wing Rooms	16,700	5,920	35%
RTU-6	Admin Support	3,900	560	14%
RTU-7	D-Wing Rooms	14,700	6,250	43%

In addition, the following system deficiencies were noted in the TAB report. It is recommended that these issues be addressed as they currently prohibit the equipment from achieving the necessary ventilation rates.

1. RTU-1 has a failed outside air damper and currently brings in no outside air. The outside air damper actuator and assembly should be repaired.
2. RTU-2 power exhaust fan has failed. Fan motor should be serviced, and operation restored.
3. The CO2 sensors for RTU-3 has failed. CO2 sensor should be replaced.

Recommendation #3: Filter Improvements

Currently all RTUs are equipped with MERV 11 filters. SES recommends replacing and upgrading all final filters to at least MERV 13 for increased filtration efficiency.

Recommendation #4: Energy Recovery Wheels

All RTU energy recovery wheels are currently failed in inoperable. SES recommends servicing, repairing and cleaning all energy wheels to improve RTU performance. Operable energy recovery wheels will help reduce the load on the unit's heating and cooling coils resulting in improved temperature & humidity control and reduced energy consumption

Recommendation #5: Exhaust Fans

The following exhaust fans were found to be inoperable, resulting in little to no airflow being exhausted in the associated zones. SES recommends servicing and repairing the following exhaust fans

Unit Tag	Served
EF-3	Toilet 1111A
EF-4	Toilet 1109A
EF-6	Toilet 1101A
EF-7	Toilet 1106A



Unit Tag	Served
EF-9	Cust Closet
EF-11	Toilet 112

Recommendation #6: Filters

The prefilters in RTUs 2, 3, 4 & 7 were found to be dirty and should be replaced.

Next Steps

Review Recommendations

It is recommended that the client review this report and the proposed recommendations for further clarification, if needed and decide a course of action. SES can provide additional assistance if needed, to further analyze and develop these recommendations for future implementation, and if desired, provide commissioning of the implemented measures.



Appendix A: IAQ Evaluation Sheet

Tag	AREA SERVED	Type	Filters (1 = clean, 2 = partially loaded, 3 = dirty)		Unit Condition	Outside Air Control Method	CO2 Control?	TAB Measured		% OA	Summated OA Airflow	Calculated Min. Outside Airflow2	% OA of Design	Comments
			Pre-Filter Condition	Final Filter Conditon				Supply Airflow2	Min. Outside Airflow3					
RTU-1	Art and Music	Multizone VAV	2	2	OKAY	Fixed Min OA	Yes	1,426	0	0%	1,395	1,400	27%	OAD stuck at 0%. Motor is noisy. ERW is inoperable.
RTU-2	Gymnasium	Single Zone VAV	3	2	OKAY	Fixed Min OA	Yes	22,607	5,165	23%	6,044	6,050	32%	Power exhaust is inoperable. ERW is inoperable.
RTU-3	Cafeteria	Single Zone VAV	3	2	OKAY	Fixed Min OA	Yes	6,782	4,565	67%	4,260	4,260	36%	Current CO2 High Limit Setpoint is -60. ERW is inoperable.
RTU-4	Media Center	Multizone VAV	3	2	OKAY	Fixed Min OA	Yes	3,176	1,636	52%	686	690	12%	ERW is inoperable.
RTU-5	A-Wing Rooms	Multizone VAV	2	1	OKAY	Fixed Min OA	Yes	8,200	5,204	63%	5,911	5,920	35%	ERW is inoperable.
RTU-6	Admin Support	Multizone VAV	2	2	OKAY	Fixed Min OA	Yes	2,345	1,443	62%	560	560	14%	ERW is inoperable.
RTU-7	D-Wing Rooms	Multizone VAV	3	2	OKAY	Fixed Min OA	Yes	7,832	3,178	41%	6,245	6,250	43%	ERW is inoperable.

IMC 2021 Ventilation Assessment																	
Unit Tag	Room #	Category	Infiltration	ZoneArea, Az, per space (SF)	Zone Population, Pz, per space	People OA Rate in Breathing Zone, Rp (CFM/person)	Area OA Rate in Breathing Zone, Ra (CFM/SF)	Default Occupant Density	Breathing Zone OA (CFM) Vbz=RpPz+RaAz	Table 6-2 Zone Air Distribution Effectiveness	Zone OA Flow, Voz	Min. Ventilation Airflow (CFM)	Actual Supply Airflow (CFM)	RTU % OA	Actual Ventilation Airflow (CFM)	Ventilation Difference (CFM)	Code Satisfied?
RTU-1	1305	Classrooms (ages 5 to 8)	0	247.25	6	10	0.12	25	90	1	90	90	130	0%	-	(90)	No
RTU-1	1305A	Classrooms (ages 5 to 8)	0	247.25	8	10	0.12	25	110	1	110	110	136	0%	-	(110)	No
RTU-1	1307	Art Classroom	0	819	26	10	0.18	20	407	1	407	407	28	0%	-	(407)	No
RTU-1	1309	Music/theater/dance	0	946	24	10	0.06	35	297	1	297	297	0	0%	-	(297)	No
RTU-1	1309B PRACTICE	Music/theater/dance	0	55	1	10	0.06	35	13	1	13	13	0	0%	-	(13)	No
RTU-1	1309C PRACTICE	Music/theater/dance	0	40.8	1	10	0.06	35	12	1	12	12	0	0%	-	(12)	No
RTU-1	1311	Classrooms (ages 5 to 8)	0	1014.8	23	10	0.12	25	352	1	352	352	241	0%	-	(352)	No
RTU-1	1313B	Office spaces	0	168.3	2	5	0.06	5	20	1	20	20	31	0%	-	(20)	No
RTU-1	CORRIDOR	Corridors	0	1560	0	0	0.06	0	94	1	94	94	657	0%	-	(94)	No
RTU-2	GYM	Spectator areas	0	5980	758	7.5	0.06	150	6,044	1	6,044	6,044	22,607	23%	5,200	(844)	No
RTU-3	CAFETERIA	Cafeteria/fast-food dining	0	3622.5	481	7.5	0.18	100	4,260	1	4,260	4,260	6,782	67%	4,544	284	Yes
RTU-4	COMM ROOM 1304B	Lecture Classroom	0	484	31	7.5	0.06	65	262	1	262	262	1259	52%	655	393	Yes
RTU-4	MEDIA CENTER	Libraries	0	2214	28	5	0.12	10	406	1	406	406	698	52%	363	(43)	No
RTU-4	1301C	Office spaces	0	224	1	5	0.06	5	18	1	18	18	37	52%	19	1	Yes
RTU-5	1101	Office spaces	0	210	1	5	0.06	5	18	1	18	18	113	63%	71	54	Yes
RTU-5	1101B	Office spaces	0	237.5	6	5	0.06	5	44	1	44	44	126	63%	79	35	Yes
RTU-5	1101C	Office spaces	0	199.5	4	5	0.06	5	32	1	32	32	211	63%	133	101	Yes
RTU-5	1106	Classrooms (ages 5 to 8)	0	649	10	10	0.12	25	178	1	178	178	140	63%	88	(90)	No
RTU-5	1106B	Office spaces	0	190	10	5	0.06	5	61	1	61	61	57	63%	36	(25)	No
RTU-5	1110C	Classrooms (ages 5 to 8)	0	264	10	10	0.12	25	132	1	132	132	66	63%	42	(90)	No
RTU-5	1110B	Classrooms (ages 5 to 8)	0	76	2	10	0.12	25	29	1	29	29	27	63%	17	(12)	No
RTU-5	1110	Classrooms (ages 5 to 8)	0	489.3	11	10	0.12	25	169	1	169	169	114	63%	72	(97)	No
RTU-5	1112	Classrooms (ages 5 to 8)	0	961	36	10	0.12	25	475	1	475	475	507	63%	319	(156)	No
RTU-5	1114	Classrooms (ages 5 to 8)	0	900	10	10	0.12	25	208	1	208	208	568	63%	358	150	Yes
RTU-5	1107	Classrooms (ages 5 to 8)	0	399	16	10	0.12	25	208	1	208	208	35	63%	22	(186)	No
RTU-5	1109	Classrooms (ages 5 to 8)	0	1155	40	10	0.12	25	539	1	539	539	37	63%	23	(515)	No
RTU-5	1111	Classrooms (ages 5 to 8)	0	1116	32	10	0.12	25	454	1	454	454	36	63%	23	(431)	No
RTU-5	CORRIDOR	Corridors	0	840	0	0	0.06	0	50	1	50	50	317	63%	200	149	Yes
RTU-5	2106	Classrooms (ages 5 to 8)	0	744	24	10	0.12	25	329	1	329	329	68	63%	43	(286)	No
RTU-5	2108	Classrooms (ages 5 to 8)	0	427.5	16	10	0.12	25	211	1	211	211	0	63%	-	(211)	No
RTU-5	2110	Classrooms (ages 5 to 8)	0	775.5	20	10	0.12	25	293	1	293	293	49	63%	31	(262)	No
RTU-5	2112	Classrooms (ages 5 to 8)	0	752	30	10	0.12	25	390	1	390	390	0	63%	-	(390)	No
RTU-5	2114	Science laboratories	0	1120	28	10	0.18	25	482	1	482	482	197	63%	124	(357)	No
RTU-5	2105	Classrooms (ages 5 to 8)	0	736	26	10	0.12	25	348	1	348	348	121	63%	76	(272)	No
RTU-5	2109	Classrooms (ages 5 to 8)	0	752	22	10	0.12	25	310	1	310	310	218	63%	137	(173)	No
RTU-5	2111	Classrooms (ages 5 to 8)	0	752	32	10	0.12	25	410	1	410	410	393	63%	248	(163)	No
RTU-5	2113	Classrooms (ages 5 to 8)	0	768	34	10	0.12	25	432	1	432	432	586	63%	369	(63)	No
RTU-5	CORRIDOR UPSTAIRS	Corridors	0	960	0	0	0.06	0	58	1	58	58	432	63%	272	215	Yes
RTU-5	CORRIDOR DOWNSTAIRS	Corridors	0	840	0	0	0.06	0	50	1	50	50	310	63%	195	145	Yes
RTU-6	2203	Classrooms (ages 5 to 8)	0	500.5	14	10	0.12	25	200	1	200	200	309	62%	192	(8)	No
RTU-6	ADMIN SUITE 1202	Office spaces	0	341	6	5	0.06	5	50	1	50	50	211	62%	131	80	Yes
RTU-6	1202A PRINCIPAL	Office spaces	0	209	5	5	0.06	5	38	1	38	38	133	62%	82	45	Yes
RTU-6	1202B CONFERENCE	Conference rooms	0	143	6	5	0.06	50	39	1	39	39	88	62%	55	16	Yes
RTU-6	1202C	Office spaces	0	143	2	5	0.06	5	19	1	19	19	0	62%	-	(19)	No
RTU-6	1202F	Office spaces	0	169	4	5	0.06	5	30	1	30	30	144	62%	89	59	Yes
RTU-6	CORRIDOR	Corridors	0	182.5	0	0	0.06	0	11	1	11	11	105	62%	65	54	Yes
RTU-6	1204A	Office spaces	0	104.625	1	5	0.06	5	11	1	11	11	120	62%	74	63	Yes
RTU-6	NURSE 1204	Office spaces	0	414	5	5	0.06	5	50	1	50	50	405	62%	251	201	Yes
RTU-6	1304C PE OFFICE	Office spaces	0	180	1	5	0.06	5	16	1	16	16	82	62%	51	35	Yes
RTU-6	CORRIDOR DOWNSTAIRS	Corridors	0	680	0	0	0.06	0	41	1	41	41	164	62%	102	61	Yes
RTU-6	CORRIDOR UPSTAIRS	Corridors	0	928	0	0	0.06	0	56	1	56	56	1216	62%	754	698	Yes
RTU-7	2215	Classrooms (ages 5 to 8)	0	740	21	10	0.12	25	299	1	299	299	45	41%	18	(280)	No
RTU-7	2217	Classrooms (ages 5 to 8)	0	737	22	10	0.12	25	308	1	308	308	96	41%	39	(269)	No
RTU-7	2219	Classrooms (ages 5 to 8)	0	755	27	10	0.12	25	361	1	361	361	29	41%	12	(349)	No
RTU-7	2221	Classrooms (ages 5 to 8)	0	776	16	10	0.12	25	253	1	253	253	596	41%	244	(9)	No
RTU-7	2223	Classrooms (ages 5 to 8)	0	738	30	10	0.12	25	389	1	389	389	654	41%	268	(120)	No
RTU-7	2225	Office spaces	0	426	2	5	0.06	5	36	1	36	36	133	41%	55	19	Yes
RTU-7	2214	Classrooms (ages 5 to 8)	0	752	26	10	0.12	25	350	1	350	350	28	41%	11	(339)	No
RTU-7	2216	Classrooms (ages 5 to 8)	0	434	8	10	0.12	25	132	1	132	132	93	41%	38	(94)	No
RTU-7	2218	Classrooms (ages 5 to 8)	0	752	24	10	0.12	25	330	1	330	330	91	41%	37	(293)	No
RTU-7	2220	Classrooms (ages 5 to 8)	0	752	16	10	0.12	25	250	1	250	250	0	41%	-	(250)	No
RTU-7	2222	Classrooms (ages 5 to 8)	0	752	24	10	0.12	25	330	1	330	330	0	41%	-	(330)	No
RTU-7	1212A	Classrooms (ages 5 to 8)	0	329	8	10	0.12	25	119	1	119	119	87	41%	36	(84)	No
RTU-7	1212B	Classrooms (ages 5 to 8)	0	400	15	10	0.12	25	198	1	198	198	250	41%	103	(95)	No
RTU-7	1206	Classrooms (ages 5 to 8)	0	102	2	10	0.12	25	32	1	32	32	25	41%	10	(22)	No
RTU-7	1208	Office spaces	0	120	2	5	0.06	5	17	1	17	17	8	41%	3	(14)	No
RTU-7	1210	Office spaces	0	174	6	5	0.06	5	40	1	40	40	76	41%	31	(9)	No
RTU-7	1214A	Conference rooms	0	122	8	5	0.06	50	47	1	47	47	185	41%	76	29	Yes
RTU-7	1214B	Office spaces	0	158	3	5	0.06	5	24	1	24	24	47	41%	19	(5)	No
RTU-7	1214	Office spaces	0	124	2	5	0.06	5	17	1	17	17	110	41%	45	28	Yes
RTU-7	1216	Classrooms (ages 5 to 8)	0	729	16	10	0.12	25	247	1	247	247	32	41%	13	(234)	No
RTU-7	1218	Classrooms (ages 5 to 8)	0	752	30	10	0.12	25	390	1	390	390	224	41%	92	(298)	No
RTU-7	1220	Classrooms (ages 5 to 8)	0	768	24	10	0.12	25	332	1	332	332	200	41%	82	(250)	No
RTU-7	1209	Classrooms (ages 5 to 8)	0	374	8	10	0.12	25	125	1	125	125	216	41%	89	(36)	No

IMC 2021 Ventilation Assessment																	
Unit Tag	Room #	Category	Infiltration	ZoneArea, Az, per space (SF)	Zone Population, Pz, per space	People OA Rate in Breathing Zone, Rp (CFM/person)	Area OA Rate in Breathing Zone, Ra (CFM/SF)	Default Occupant Density	Breathing Zone OA (CFM) Vbz=RpPz+RaAz	Table 6-2 Zone Air Distribution Effectiveness	Zone OA Flow, Voz	Min. Ventilation Airflow (CFM)	Actual Supply Airflow (CFM)	RTU % OA	Actual Ventilation Airflow (CFM)	Ventilation Difference (CFM)	Code Satisfied?
RTU-7	1213	Classrooms (ages 5 to 8)	0	415	16	10	0.12	25	210	1	210	210	182	41%	75	(135)	No
RTU-7	1215	Classrooms (ages 5 to 8)	0	752	22	10	0.12	25	310	1	310	310	109	41%	45	(266)	No
RTU-7	1217	Classrooms (ages 5 to 8)	0	787	28	10	0.12	25	374	1	374	374	414	41%	170	(205)	No
RTU-7	1219	Classrooms (ages 5 to 8)	0	787	32	10	0.12	25	414	1	414	414	353	41%	145	(270)	No
RTU-7	1221	Classrooms (ages 5 to 8)	0	395	12	10	0.12	25	167	1	167	167	379	41%	155	(12)	No
RTU-7	CORRIDOR UPSTAIRS	Corridors	0	1,140	0	0	0.06	0	68	1	68	68	0	41%	-	(68)	No
RTU-7	CORRIDOR DOWNSTAIRS	Corridors	0	1,178	0	0	0.06	0	71	1	71	71	448	41%	184	113	Yes

Unit Tag	Room #	Category	ZoneArea, Az, per space (SF)	TAB Exhaust CFM	# of Toilets	Calc'd Exhaust CFM	Ventilation Difference (CFM)	Code Satisfied?	Comments
	BOYS RESTROOM	Toilet rooms - public	150	229	3	150	79	Yes	
	GIRLS RESTROOM	Toilet rooms - public	150	310	3	150	160	Yes	
	1101 RESTROOM	Toilet rooms - private	72	-	1	25	(25)	No	
	1106 RESTROOM	Toilet rooms - private	76	-	1	25	(25)	No	
	1110 RESTROOM	Toilet rooms - private	76	89	1	25	64	Yes	
	1112 RESTROOM	Toilet rooms - private	76	77	1	25	52	Yes	
	1114 RESTROOM	Toilet rooms - private	71	90	1	25	65	Yes	
	1109 RESTROOM	Toilet rooms - private	76	-	1	25	(25)	No	
	1111 RESTROOM	Toilet rooms - private	76	-	1	25	(25)	No	
	BOYS RESTROOM	Toilet rooms - public	226	0	4	200	(200)	No	
	GIRLS RESTROOM	Toilet rooms - public	205	0	5	250	(250)	No	
	GIRLS RESTROOM	Toilet rooms - public	241	0	5	250	(250)	No	
	BOYS RESTROOM	Toilet rooms - public	229	0	5	250	(250)	No	
	MENS RESTROOM	Toilet rooms - private	53	0	1	25	(25)	No	
	BOYS/GIRLS BR	Toilet rooms - private	60	27	1	25	2	Yes	
	BOYS BR	Toilet rooms - public	220	0	5	250	(250)	No	
	MENS BR	Toilet rooms - public	153	0	2	100	(100)	No	
	WOMENS BR	Toilet rooms - public	149	0	2	100	(100)	No	
	GIRLS BR	Toilet rooms - public	220	0	0	-	-	Yes	
	GIRLS LOCKER ROOM	Sports locker rooms	147	27	0	74	(47)	No	
	BOYS LOCKER ROOM	Sports locker rooms	147	26	0	74	(48)	No	
	RESTROOM	Toilet rooms - public	80	56	1	50	6	Yes	
	RESTROOM	Toilet rooms - public	76	0	1	50	(50)	No	

Notes

No fresh air requirements for public bathrooms, only exhaust. Exhaust is 50 CFM or 70 CFM per water closet or urinal. If exhaust fan is intermittent than the higher value is used.

No fresh air requirements for private bathrooms, only exhaust. Exhaust is 25 CFM or 50 CFM per water closet or urinal. If exhaust fan is intermittent than the higher value is used.

No fresh air requirements for shower rooms, only exhaust. Exhaust is 20 CFM or 50 CFM per shower head. If exhaust fan is intermittent than the higher value is used.

Corridors are .06 CFM/sf only

Locker rooms are exhasut only at 0.5 CFM/sf

Corridors are .06 CFM/sf only



Appendix B: Testing, Adjusting & Balancing Report



121 Broadway Street, Suite 1
Colchester, CT 06415
Office: (860) 531-9398
www.TrueflowCT.com

PROJECT:	Ventilation Verification Assessment
DATE:	July 10, 2024
ADDRESS:	Sterling School
	251 Sterling Road
	Sterling, Connecticut



TABB Technician: Jacob Boothroyd, Jaron Zimmitti

SCHOOL: STERLING SCHOOLDATE: 17APR2024**VENTILATION VERIFICATION ASSESSMENT - UNIT DATA**

UNIT DESIGNATION: RTU-1 ART & MUSIC

UNIT MANUFACTURER: AAON

UNIT MODEL NUMBER: RM-016-3-0-AA02-3JK

UNIT SERIAL NUMBER: 200610-AMWM01875

MOTOR NAMEPLATE INFORMATION

MANUFACTURER: BALDOR

FRAME: 213T

HORSEPOWER: 7.5

RPM: 1770

VOLTAGE: 460

FULL LOAD AMPERAGE: 9.7

DRIVE COMPONENT INFORMATION

FAN SHEAVE: 1" X 9 1/8"

MOTOR SHEAVE: 1 3/4" X 7 1/4"

BELTS: (1) BX75

SHEAVE POSITION: 100% OPEN

UNIT DATA

(MEASURED WHILE AT MAXIMUM CAPACITY)

	100% OA	MIN OA
SUPPLY CFM:	----	566 (GRILLE TOTAL)
RETURN CFM:	----	582 (GRILLE TOTAL)
OUTSIDE AIR CFM:	----	0
VFD SETTING:	----	30.18
OPERATING AMPERAGE:	----	
SUPPLY STATIC PRESSURE SETPOINT:	----	NO SETPOINT CONTROL
SUPPLY STATIC PRESSURE:	----	1.265"

GENERAL PHYSICAL CONDITION & OPERATION

O/A NOT CONTROLLING. STAYS AT 0%

MOTOR VERY NOISY. ENERGY WHEEL NON-OPERATIONAL.

OUTSIDE AIR DAMPER POSITION: 0%

PROPER OPERATION?: (Y/N) NO. WILL NOT COMMAND OPEN OR TO A SETPOINT

MIN. OA DAMPER SETPOINT: 40%
(AT TIME OF TESTING)

FILTER DATA

	PREFILTER	MAIN FILTER
MANUFACTURER:	TRI DIM	TRI DIM
SIZE:	20X25X4	20X25X4
QUANTITY:	3	6
MERV 13? Y/N	NO MERV RATING	NO MERV RATING
DIFFERENTIAL PRESSURE:	----	-.1 - .04 = .06"
FILTER LOAD:* (1-3 RATING)	2	2
INSTALLED PROPERLY? Y/N	YES	YES

IF NO, FILTER RATING? _____

GENERAL NOTES

Bathrooms / Showers Only

[illegible]

SCHOOL: STERLING SCHOOLDATE: 17APR2024**VENTILATION VERIFICATION ASSESSMENT - UNIT DATA**

UNIT DESIGNATION: RTU-2 GYMNASIUM

UNIT MANUFACTURER: AAON

UNIT MODEL NUMBER: RN-050-3-0-AB02-FJK

UNIT SERIAL NUMBER: 200610-BNWW00353

MOTOR NAMEPLATE INFORMATION

MANUFACTURER: BALDOR

FRAME: 256T

HORSEPOWER: 20

RPM: 1765

VOLTAGE: 460

FULL LOAD AMPERAGE: 23.5

DRIVE COMPONENT INFORMATION

FAN SHEAVE: DIRECT DRIVE

MOTOR SHEAVE: DIRECT DRIVE

BELTS: DIRECT DRIVE

SHEAVE POSITION: DIRECT DRIVE

UNIT DATA

(MEASURED WHILE AT MAXIMUM CAPACITY)

	100% OA	MIN OA
SUPPLY CFM:	28388	22607
RETURN CFM:	----	17445
OUTSIDE AIR CFM:	28388	5165
VFD SETTING:	51 Hz	44.3
OPERATING AMPERAGE:	23.6	19.2
SUPPLY STATIC PRESSURE SETPOINT:	UNABLE TO LOCATE SETPOINT	
SUPPLY STATIC PRESSURE:	0.76"	0.61"

GENERAL PHYSICAL CONDITION & OPERATION

IN DECENT SHAPE FOR 20 YEARS OLD.

POWER EXHAUSTER DOESN'T OPERATE. ENERGY WHEEL NON OPERATIONAL.

OUTSIDE AIR DAMPER POSITION: 100%PROPER OPERATION?: (Y/N) PARTIALLY. TWO SETS OF DAMPERS. ONE GOOD ONE.MIN. OA DAMPER SETPOINT: 45%
(AT TIME OF TESTING)**FILTER DATA**

	PREFILTER	MAIN FILTER
MANUFACTURER:	TRI DIM	TRI DIM
SIZE:	12X24X4	12X24X4
QUANTITY:	12	12
MERV 13? Y/N	MERV 10	MERV 10
DIFFERENTIAL PRESSURE:	----	-1.7 - .55 = 1.15"
FILTER LOAD:* (1-3 RATING)	3	2
INSTALLED PROPERLY? Y/N	YES	YES

IF NO, FILTER RATING? _____

GENERAL NOTES

ENERGY WHEEL NON-OPERATIONAL.

SUPPLY MEASURED BY COIL SCAN.

Bathrooms / Showers Only

[illegible]

SCHOOL: STERLING SCHOOLDATE: 17APR2024**VENTILATION VERIFICATION ASSESSMENT - UNIT DATA**

UNIT DESIGNATION: RTU-3 CAFETERIA
 UNIT MANUFACTURER: AAON
 UNIT MODEL NUMBER: RN-026-3-0-AA02-EJK
 UNIT SERIAL NUMBER: 200610-BNWS00354

MOTOR NAMEPLATE INFORMATION

MANUFACTURER: BALDOR
 FRAME: 215T
 HORSEPOWER: 10 HP
 RPM: 1770
 VOLTAGE: 460
 FULL LOAD AMPERAGE: 12.5

DRIVE COMPONENT INFORMATION

FAN SHEAVE: DIRECT DRIVE
 MOTOR SHEAVE: DIRECT DRIVE
 BELTS: DIRECT DRIVE
 SHEAVE POSITION: DIRECT DRIVE

UNIT DATA

(MEASURED WHILE AT MAXIMUM CAPACITY)

	100% OA	MIN OA
SUPPLY CFM:	7330	6782
RETURN CFM:	----	2217
OUTSIDE AIR CFM:	7330	4565
VFD SETTING:	47 Hz	47 Hz
OPERATING AMPERAGE:	14.07	13.63
SUPPLY STATIC PRESSURE SETPOINT:	UNABLE TO LOCATE SETPOINT	
SUPPLY STATIC PRESSURE:	----	1.05"

GENERAL PHYSICAL CONDITION & OPERATION

EVERYTHING OPERATING AS IT SHOULD AND IN GOOD SHAPE.
 ENERGY WHEEL NON OPERATIONAL.

OUTSIDE AIR DAMPER POSITION: 100%
 PROPER OPERATION?: (Y/N) YES
 MIN. OA DAMPER SETPOINT: ----
 (AT TIME OF TESTING)

FILTER DATA

	PREFILTER	MAIN FILTER
MANUFACTURER:	PRIME	NO BRAND NAME
SIZE:	24X24X4	24X24X4
QUANTITY:	4	8
MERV 13? Y/N	MERV 10	NO MERV RATING
DIFFERENTIAL PRESSURE:	----	-1.89 - 1.98 = .09"
FILTER LOAD:* (1-3 RATING)	3	2
INSTALLED PROPERLY? Y/N	YES	YES

IF NO, FILTER RATING? _____

GENERAL NOTES

ENERGY WHEEL NON-OPERATIONAL.
 SUPPLY MEASURED BY COIL SCAN.

Bathrooms / Showers Only

[illegible]

SCHOOL: STERLING SCHOOLDATE: 17APR2024**VENTILATION VERIFICATION ASSESSMENT - UNIT DATA**

UNIT DESIGNATION: RTU-4
UNIT MANUFACTURER: AAON
UNIT MODEL NUMBER: RM-016-3-0-AB02-EJK
UNIT SERIAL NUMBER: 200610-AMWM01876

MOTOR NAMEPLATE INFORMATION

MANUFACTURER: BALDOR
FRAME: 213T
HORSEPOWER: 7.5
RPM: 1770
VOLTAGE: 460
FULL LOAD AMPERAGE: 9.6

DRIVE COMPONENT INFORMATION

FAN SHEAVE: 1 1/8" X 8 7/8"
MOTOR SHEAVE: 1 3/4" X 7 1/4"
BELTS: (1) BX75
SHEAVE POSITION: 100% OPEN

UNIT DATA

(MEASURED WHILE AT MAXIMUM CAPACITY)

	100% OA	MIN OA
SUPPLY CFM:	<u>3176</u>	<u>----</u>
RETURN CFM:	<u>0</u>	<u>----</u>
OUTSIDE AIR CFM:	<u>3176</u>	<u>1636</u>
VFD SETTING:	<u>44.7</u>	<u>40.7</u>
OPERATING AMPERAGE:	<u>14.5</u>	<u>13.7</u>
SUPPLY STATIC PRESSURE SETPOINT:	<u>1.4"</u>	<u>1.4"</u>
SUPPLY STATIC PRESSURE:	<u>1.65"</u>	<u>1.75"</u>

GENERAL PHYSICAL CONDITION & OPERATION

UNIT GENERALLY IN GOOD SHAPE.
ENERGY WHEEL NON OPERATIONAL.

OUTSIDE AIR DAMPER POSITION: 100%
PROPER OPERATION?: (Y/N) YES
MIN. OA DAMPER SETPOINT: 40%
(AT TIME OF TESTING)

FILTER DATA

	PREFILTER	MAIN FILTER
MANUFACTURER:	<u>TRI DIM</u>	<u>TRI DIM</u>
SIZE:	<u>20X25X4</u>	<u>20X25X4</u>
QUANTITY:	<u>3</u>	<u>6</u>
MERV 13? Y/N	<u>NO MERV RATING</u>	<u>NO MERV RATING</u>
DIFFERENTIAL PRESSURE:	<u>.07"</u>	<u>.07"</u>
FILTER LOAD:* (1-3 RATING)	<u>3</u>	<u>2</u>
INSTALLED PROPERLY? Y/N	<u>YES</u>	<u>YES</u>

IF NO, FILTER RATING? _____

GENERAL NOTES

Bathrooms / Showers Only

[illegible]

SCHOOL: STERLING SCHOOLDATE: 17APR2024**VENTILATION VERIFICATION ASSESSMENT - UNIT DATA**

UNIT DESIGNATION: RTU-5
 UNIT MANUFACTURER: AAON
 UNIT MODEL NUMBER: RN-040-3-0-AA02-EJK
 UNIT SERIAL NUMBER: 200610-BN WV00355

MOTOR NAMEPLATE INFORMATION

MANUFACTURER: BALDOR (2)
 FRAME: 254T (2)
 HORSEPOWER: 15 HP (2)
 RPM: 1765 (2)
 VOLTAGE: 460 (2)
 FULL LOAD AMPERAGE: 17.7 (2)

DRIVE COMPONENT INFORMATION

FAN SHEAVE: DIRECT DRIVE
 MOTOR SHEAVE: DIRECT DRIVE
 BELTS: DIRECT DRIVE
 SHEAVE POSITION: DIRECT DRIVE

UNIT DATA

(MEASURED WHILE AT MAXIMUM CAPACITY)

	100% OA	MIN OA
SUPPLY CFM:	8205	8200
RETURN CFM:	----	2996
OUTSIDE AIR CFM:	8205	5204
VFD SETTING:	33.61	33.41
OPERATING AMPERAGE:	16.9	16.8
SUPPLY STATIC PRESSURE SETPOINT:	NO SETPOINT	NO SETPOINT
SUPPLY STATIC PRESSURE:	1.7"	1.72"

GENERAL PHYSICAL CONDITION & OPERATION

UNIT IN GOOD SHAPE.
 ENERGY WHEEL NON OPERATIONAL.

OUTSIDE AIR DAMPER POSITION: 100% THEN 50%PROPER OPERATION?: (Y/N) YESMIN. OA DAMPER SETPOINT: 50%

(AT TIME OF TESTING)

FILTER DATA

	PREFILTER	MAIN FILTER
MANUFACTURER:	NO BRAND NAME	PRIME 10
SIZE:	24X24X4	24X24X4
QUANTITY:	4	8
MERV 13? Y/N	NO MERV RATING	MERV 10
DIFFERENTIAL PRESSURE:	----	-24 - .4 - .16"
FILTER LOAD:* (1-3 RATING)	2	1
INSTALLED PROPERLY? Y/N	YES	YES

IF NO, FILTER RATING? _____

GENERAL NOTES

Bathrooms / Showers Only

Unit Tag	Room #	Category	Operable Windows?	CO2 Sensor?	Space Width (ft)	Space Length (ft)	Space Height (ft)	Area (ft^2)	Volume (ft^3)	Zone Population	Supply Airflow (CFM)	Outside Air (%)	Exhaust CFM	# of Toilets	# of Shower Heads	Comments
AHU-A1	EXAMPLE RM115	Lecture Classroom	No	No	25	39	9	975	8775	66	981	16%	N/A	N/A	N/A	VAV is failed and inoperable
AHU-A1	Bathroom 100	Toilet rooms - public	No	No	10	12	9	120	1080	0	N/A	N/A	200	5	0	
RTU-5 A WING (UP & DOWN)																
	1101	Office spaces	No		14	15	10	210	2100	1	113		48			
	1101B	Office spaces	Yes		12.5	19	10.5	237.5	2493.75	6	126		33			
	1101C	Office spaces	Yes		10.5	19	10.5	199.5	2094.75	4	211		41			
	1101 RESTROOM	Toilet rooms - private	No		7.5	9.6	10	72	720	1	NO SUPPLY		0	1		
	1106	Classrooms (ages 5 to 8)	Yes		22	29.5	10.5	649	6814.5	10	140		0			
	1106 RESTROOM	Toilet rooms - private	No		8	9.5	10	76	760	1	NO SUPPLY		0	1		
	1106B	Office spaces	No		9.5	20	10	190	1900	10	57	NO RETURN				
	1110C	Classrooms (ages 5 to 8)	Yes		16	16.5	10.5	264	2772	10	66		0			
	1110B	Classrooms (ages 5 to 8)			8	9.5	10	76	760	2	27	NO RETURN				
	1110	Classrooms (ages 5 to 8)	Yes		21	23.3	10.5	489.3	5137.65	11	114		43			
	1110 RESTROOM	Toilet rooms - private	No		8	9.5	10	76	760	2	NO SUPPLY		89	1		
	1112	Classrooms (ages 5 to 8)	Yes		31	31	10.5	961	10090.5	36	507		61			
	1112 RESTROOM	Toilet rooms - private	No		8	9.5	10	76	760	1	NO SUPPLY		77	1		
	1114	Classrooms (ages 5 to 8)	Yes		30	30	10.5	900	9450	10	568		27			
	1114 RESTROOM	Toilet rooms - private	No		7.5	9.5	10	71.25	712.5	1	NO SUPPLY		90	1		
	1107	Classrooms (ages 5 to 8)	Yes		13.3	30	10.5	399	4189.5	16	35		46			
	1109	Classrooms (ages 5 to 8)	Yes		33	35	10.5	1155	12127.5	40	37		40			
	1109 RESTROOM	Toilet rooms - private	No		8	9.5	10	76	760	1	NO SUPPLY		0	1		
	1111	Classrooms (ages 5 to 8)	Yes		31	36	10.5	1116	11718	32	36		31			
	1111 RESTROOM	Toilet rooms - private	No		8	9.5	10	76	760	1	NO SUPPLY		0	1		
	CORRIDOR	Corridors	No		8	105	10	840	8400	CORRIDOR	317	NO RETURN				
	2106	Classrooms (ages 5 to 8)	Yes		24	31	10.5	744	7812	24	68		137			
	2108	Classrooms (ages 5 to 8)	Yes		15	28.5	10.5	427.5	4488.75	16	0		51			
	2110	Classrooms (ages 5 to 8)	Yes		23.5	33	10.5	775.5	8142.75	20	49		153			
	2112	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	30	0		153			
	2114	Science laboratories	Yes		28	40	10.75	1120	12040	28	197		198			
	2105	Classrooms (ages 5 to 8)	Yes		23	32	10.5	736	7728	26	121		174			
	2109	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	22	218		83			
	2111	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	32	393		96			
	2113	Classrooms (ages 5 to 8)	Yes		24	32	10.5	768	8064	34	586		102			
	CORRIDOR UPSTAIRS	Corridors	No		8	120	10	960	9600	CORRIDOR	432		139			
	CORRIDOR DOWNSTAIRS	Corridors	No		8	105	10	840	8400	CORRIDOR	310		31			
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							

SCHOOL: STERLING SCHOOLDATE: 17APR2024**VENTILATION VERIFICATION ASSESSMENT - UNIT DATA**

UNIT DESIGNATION: RTU-6
 UNIT MANUFACTURER: AAON
 UNIT MODEL NUMBER: RM-010-3-0-AA02-EJL
 UNIT SERIAL NUMBER: 200609-AMWJ01874

MOTOR NAMEPLATE INFORMATION

MANUFACTURER: BALDOR
 FRAME: 164T
 HORSEPOWER: 5.0
 RPM: 1750
 VOLTAGE: 460
 FULL LOAD AMPERAGE: 6.6

DRIVE COMPONENT INFORMATION

FAN SHEAVE: NO ACCESS
 MOTOR SHEAVE: 1" X 5 1/4"
 BELTS: (1) BX62
 SHEAVE POSITION: 80% OPEN

UNIT DATA

(MEASURED WHILE AT MAXIMUM CAPACITY)

	100% OA	MIN OA
SUPPLY CFM:	2345	2345
RETURN CFM:	----	902
OUTSIDE AIR CFM:	2345	1443
VFD SETTING:	59 Hz	59 Hz
OPERATING AMPERAGE:	4.6	4.6
SUPPLY STATIC PRESSURE SETPOINT:	1.2"	1.2"
SUPPLY STATIC PRESSURE:	.74"	.76"

GENERAL PHYSICAL CONDITION & OPERATION

ENERGY WHEEL NON OPERATIONAL.

OUTSIDE AIR DAMPER POSITION: 100% THEN 40%PROPER OPERATION?: (Y/N) YESMIN. OA DAMPER SETPOINT: 40%

(AT TIME OF TESTING)

FILTER DATA

	PREFILTER	MAIN FILTER
MANUFACTURER:	PRIME 10	NO BRAND NAME
SIZE:	16X20X4	16X20X4
QUANTITY:	2	4
MERV 13? Y/N	MERV 10	NO MERV RATING
DIFFERENTIAL PRESSURE:	----	-.67 - .87 = .2"
FILTER LOAD:* (1-3 RATING)	2	2
INSTALLED PROPERLY? Y/N	YES	YES

IF NO, FILTER RATING? _____

GENERAL NOTES

Bathrooms / Showers Only

[illegible]

SCHOOL: STERLING SCHOOLDATE: 17APR2024**VENTILATION VERIFICATION ASSESSMENT - UNIT DATA**

UNIT DESIGNATION: RTU-7
 UNIT MANUFACTURER: AAON
 UNIT MODEL NUMBER: RN-031-3-0-AB02-EJK
 UNIT SERIAL NUMBER: 200610-BNWW00356

MOTOR NAMEPLATE INFORMATION

MANUFACTURER: BALDOR
 FRAME: 256T
 HORSEPOWER: 20
 RPM: 1765
 VOLTAGE: 460
 FULL LOAD AMPERAGE: 23.5

DRIVE COMPONENT INFORMATION

FAN SHEAVE: DIRECT DRIVE
 MOTOR SHEAVE: DIRECT DRIVE
 BELTS: DIRECT DRIVE
 SHEAVE POSITION: DIRECT DRIVE

UNIT DATA

(MEASURED WHILE AT MAXIMUM CAPACITY)

	100% OA	MIN OA
SUPPLY CFM:	7942	7832
RETURN CFM:	----	4654
OUTSIDE AIR CFM:	7942	3178
VFD SETTING:	38.52	37.92
OPERATING AMPERAGE:	16.6	16.5
SUPPLY STATIC PRESSURE SETPOINT:	NO SETPOINT	NO SETPOINT
SUPPLY STATIC PRESSURE:	----	2.1"

GENERAL PHYSICAL CONDITION & OPERATION

UNIT IN GOOD SHAPE.
 ENERGY WHEEL NON-OPERATIONAL.

OUTSIDE AIR DAMPER POSITION: 100% THEN 45%
 PROPER OPERATION?: (Y/N) YES
 MIN. OA DAMPER SETPOINT: 100% THEN 45%
 (AT TIME OF TESTING)

FILTER DATA

	PREFILTER	MAIN FILTER
MANUFACTURER:	NO BRAND NAME	NO BRAND NAME
SIZE:	24X24X4	24X24X4
QUANTITY:	4	8
MERV 13? Y/N	NO MERV RATING	NO MERV RATING
DIFFERENTIAL PRESSURE:	----	-1.0 - .87 = .13"
FILTER LOAD:* (1-3 RATING)	3	2
INSTALLED PROPERLY? Y/N	YES	YES

IF NO, FILTER RATING? _____

GENERAL NOTES

Bathrooms / Showers Only

Unit Tag	Room #	Category	Operable Windows?	CO2 Sensor?	Space Width (ft)	Space Length (ft)	Space Height (ft)	Area (ft^2)	Volume (ft^3)	Zone Population	Supply Airflow (CFM)	Outside Air (%)	Exhaust CFM	# of Toilets	# of Shower Heads	Comments
AHU-A1	EXAMPLE RM115	Lecture Classroom	No	No	25	39	9	975	8775	66	981	16%	N/A	N/A	N/A	VAV is failed and inoperable
AHU-A1	Bathroom 100	Toilet rooms - public	No	No	10	12	9	120	1080	0	N/A	N/A	200	5	0	
RTU-7 D WING (UP & DOWN)																
	2215	Classrooms (ages 5 to 8)	Yes		31.5	23.5	10.5	740.25	7772.625	21	45		115			
	2217	Classrooms (ages 5 to 8)	Yes		24	30.7	10.5	736.8	7736.4	22	96		77			
	2219	Classrooms (ages 5 to 8)	Yes		23.6	32	10.5	755.2	7929.6	27	29		75			
	2221	Classrooms (ages 5 to 8)	Yes		23.5	33	10.5	775.5	8142.75	16	596		108			
	2223	Classrooms (ages 5 to 8)	Yes		23.8	31	10.5	737.8	7746.9	30	654		96			
	2225	Office spaces	Yes		27.5	15.5	15.6	426.25	6649.5	2	133		41			
	RESTROOM	Toilet rooms - public	No		10	8	9	80	720	1	NO SUPPLY		56	1	0	
	2214	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	26	28		158			
	2216	Classrooms (ages 5 to 8)	Yes		15.5	28	10.5	434	4557	8	93		99			
	2218	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	24	91		151			
	2220	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	16	0		174			
	2222	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	24	0		165			
	1212A	Classrooms (ages 5 to 8)	Yes		23.5	14	10.5	329	3454.5	8	87		0			
	1212B	Classrooms (ages 5 to 8)	Yes		23.5	17	10.5	399.5	4194.75	15	250		0			
	1206	Classrooms (ages 5 to 8)	No		8.5	12	10.5	102	1071	2	25		0			
	1208	Office spaces	No		10	12	10.5	120	1260	2	8		0			
	1210	Office spaces	Yes		12	14.5	10.5	174	1827	6	76		33			
	1214A	Conference rooms	No		9	13.5	10	121.5	1215	8	185		0			
	1214B	Office spaces	Yes		10.5	15	10.5	157.5	1653.75	3	47		0			
	1214	Office spaces	No		8	15.5	10	124	1240	2	110		0			
	1216	Classrooms (ages 5 to 8)	Yes		23.5	31	10.5	728.5	7649.25	16	32		76			
	1218	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	30	224		66			
	1220	Classrooms (ages 5 to 8)	Yes		24	32	10.5	768	8064	24	200		113			
	1209	Classrooms (ages 5 to 8)	Yes		11.5	32.5	10.5	373.75	3924.375	8	216		50			
	1213	Classrooms (ages 5 to 8)	Yes		13.4	31	10.5	415.4	4361.7	16	182		0			
	1215	Classrooms (ages 5 to 8)	Yes		23.5	32	10.5	752	7896	22	109		0			
	1217	Classrooms (ages 5 to 8)	Yes		23.5	33.5	10.5	787.25	8266.125	28	414		79			
	1219	Classrooms (ages 5 to 8)	Yes		23.5	33.5	10.5	787.25	8266.125	32	353		116			
	1221	Classrooms (ages 5 to 8)	Yes		15.5	25.5	10.5	395.25	4150.125	12	379		107			
	RESTROOM	Toilet rooms - public	No		7.8	9.8	10	76.44	764.4	1	350		0			
	CORRIDOR UPSTAIRS	Corridors	No		120	9.5	10	1140	11400	CORRIDOR	NO SUPPLY		34	1	0	
	CORRIDOR DOWNSTAIRS	Corridors	No		124	9.5	10	1178	11780	CORRIDOR			59			
								0	0		483					
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							
								0	0							

Bathrooms / Showers Only

[illegible]



Appendix C: International Mechanical Code Minimum Ventilation Rates (2021) per ASHRAE 62.1

Minimum Ventilation Rates in Breathing Zone		People Outdoor Air Rate <i>R_p</i>	Area Outdoor Air Rate <i>R_a</i>	Default Values (Occupant Density)	Air Class	OS (6.2.6.1.4)	Comments
Occupancy Classification	Category	cfm/person	cfm/sf	#/1000sf			
Educational Facilities	Art Classroom	10	0.18	20	2	No	
Educational Facilities	Classrooms (ages 5 to 8)	10	0.12	25	1	No	
Educational Facilities	Classrooms (ages 9 plus)	10	0.12	35	1	No	
Educational Facilities	Computer Lab	10	0.12	25	1	No	
Educational Facilities	Daycare Sickroom	10	0.18	25	3	No	
Educational Facilities	Daycare (through age 4)	10	0.18	25	2	No	
Educational Facilities	Auditoriums	5	0.06	150	0		
Educational Facilities	Lecture Classroom	7.5	0.06	65	1	Yes	Per ASHRAE, lecture classrooms are spaces with low space generated emissions and hard surfaces. Little off gassing so reduced levels. Most standard classrooms will be lecture classroom type.
Educational Facilities	Lecture hall (fixed seats)	7.5	0.06	150	1	Yes	University style (see occupant density)
Educational Facilities	Libraries	5	0.12	10	n/a	No	
Educational Facilities	Media Center	10	0.12	25	1	No	
Educational Facilities	Multiuse assembly	7.5	0.06	100	1	Yes	
Educational Facilities	Music/theater/dance	10	0.06	35	1	Yes	
Educational Facilities	Science laboratories	10	0.18	25	2	No	
Educational Facilities	University/college laboratories	10	0.18	25	2	No	
Educational Facilities	Sports locker rooms	0	-0.7	0	0	No	
Educational Facilities	Wood/metal shop	10	0.18	20	2	No	
Food and Beverage	Bars, cocktail lounges	7.5	0.18	100	2	No	
Food and Beverage	Cafeteria/fast-food dining	7.5	0.18	100	2	No	
Food and Beverage	Kitchen (cooking)	7.5	0.18	20	2	No	
Food and Beverage	Restaurant dining rooms	7.5	0.18	70	2	No	
Private Dwellings	Toilet rooms - private	0	0	0	0		
Offices	Conference rooms	5	0.06	50	1	Yes	
Offices	Main entry lobbies	5	0.06	10	1	Yes	
Offices	Office spaces	5	0.06	5	1	Yes	
Offices	Reception areas	5	0.06	30	1	Yes	
Offices	Telephone/data entry	5	0.06	60	1	Yes	
Public spaces	Corridors	0	0.06	0			
Public spaces	Shower room	0	0	0			
Public spaces	Toilet rooms - public	0	0	0			
Public Assembly Spaces	Auditorium seating area	5	0.06	150	1	Yes	
Public Assembly Spaces	Libraries	5	0.12	10	1	No	
Public Assembly Spaces	Toilet rooms - public	0	0	0			
Sports and Entertainment	Bowling alley (seating)	10	0.12	40	1	No	
Sports and Entertainment	Disco/dance floors	20	0.06	100	2	Yes	
Sports and Entertainment	Gambling casinos	7.5	0.18	120	1	No	
Sports and Entertainment	Game arcades	7.5	0.18	20	1	No	
Sports and Entertainment	Gym, sports arena (play area)	20	0.18	7	2	No	
Sports and Entertainment	Health club/aerobics room	20	0.06	40	2	No	
Sports and Entertainment	Health club/weight room	20	0.06	10	2	No	
Sports and Entertainment	Spectator areas	7.5	0.06	150	1	Yes	
Sports and Entertainment	Stages, studios	10	0.06	70	1	Yes	
Sports and Entertainment	Swimming (pool and deck)	0	0.48	0	2	No	

Minimum Exhaust Rates		CFM/fixture	CFM/SF	Comments
Occupancy Classification	Category			
Educational Facilities	Toilet rooms - public	50	0	20
Educational Facilities	Toilet rooms - private	25	0	
Educational Facilities	Shower rooms	20	0	
Educational Facilities	Sports locker rooms	0	0.5	