

Town of New Hartford, Connecticut Air Quality & HVAC Review for New Hartford Schools Ann Antolini School

January 2025



TOWN OF NEW HARTFORD REPORT

Prepared for:
New Hartford, CT
Ann Antolini School, New Hartford, CT 06057



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FACILITY HVAC CONDITIONS ASSESSMENT

BUILDING DESCRIPTION

Ann Antolini School is an elementary school at 30 Antolini Road in New Hartford Connecticut. The school is in the 5A ASHRAE climate zone. The building consists of classrooms, offices, a kitchen, Gymnasium and a Library.

The HVAC system consists of hot water boilers, radiators, unit heaters, window air conditioners, and exhaust fans.

SCOPE OF WORK

Silver Petrucelli and Associates (SP+A) completed a building walkthrough and noted all systems of heating, ventilation and cooling throughout the school. The systems were assessed based on their ages, visual conditions, capacities, controls, and energy efficiencies.

The TAB contractor measured all areas of ventilation throughout the building for their outdoor air capabilities as well as their damper controls.

Based on the information gathered, and a comparison with ASHRAE 62.1, SP+A made several recommendations for consideration to increase the indoor air quality and energy efficiency of the building.

HEATING VENTILATION AND COOLING SYSTEMS

HOT WATER BOILERS AND HEATING

There are two (2) gas fired hot water boilers that serve the school (see Photos 1: Hot Water Boilers).



Photo 1: Hot Water Boilers

The boilers are in fair condition and serve the perimeter radiation and unit heaters. With proper maintenance, the typical lifespan of the boilers is about 35 years. As the boilers approach the end of their useful lifespans, SP+A recommends replacing them with gas fired condensing boilers. Condensing boilers are more efficient than traditional cast iron boilers because they recover heat from the flue gases.

Much of the hot water piping and insulation is in fair condition (see Photo 2: Hot Water Piping).



Photo 2: Hot Water Piping

SP+A recommends replacing all piping and fittings that are beyond their useful lifespans or are failing. SP+A also recommends insulating the entire hot water heating system with energy code compliant insulation.

There are two (2) variable speed hot water pumps (see Photo 3: Hot Water Pumps).

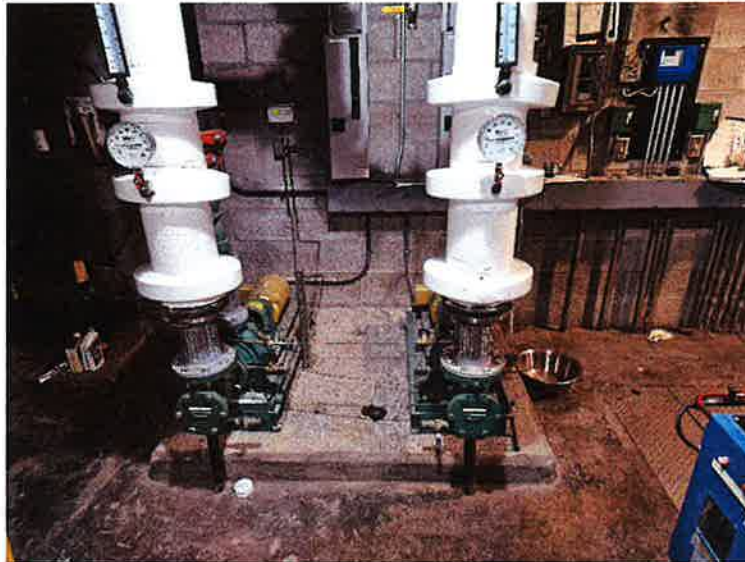


Photo 3: Hot Water Pumps

The pumps are in good condition. With proper maintenance, the typical lifespans of pumps and variable frequency drives is about 25 years and 15 years respectively.

DOMESTIC WATER HEATER

There is one (1) electric domestic hot water heater (see Photo 4: Domestic Hot Water Heater)



Photo 4: Domestic Hot Water Heater

The heater was manufactured in 2023 and is in excellent condition. With proper maintenance, the typical lifespan of an electric domestic hot water heater is about 10 years. The domestic hot water insulation is in poor condition (see Photo 5: Domestic Hot Water Insulation).



Photo 5: Domestic Hot Water Insulation

SP+A recommends replacing the domestic hot water heater with a new gas fired condensing hot water heater that can save money by converting the fuel from electric to natural gas. Coordination with the local utility will have to be done to determine if natural gas is an option for the school. SP+A also recommends insulating the domestic hot water piping with code compliant insulation. SP+A also recommends replacing the hot water recirculation pumps with new pumps with electrically commutate motors (ECM). ECMs are more efficient because they have less motor losses than traditional motors.

There are also other domestic water heaters located throughout the school that are in good condition (see Photos 6,7, 8 and 9: Other Hot Water Heaters).



Photo 6: Other Hot Water Heaters



Photo 7: Other Hot Water Heaters



Photo 8: Other Hot Water Heaters



Photo 9: Other Hot Water Heaters

With the installation of the proposed condensing domestic water heater, SP+A recommends the consideration of consolidating the domestic hot water heaters with one or two heaters that will be located in the same place to make maintenance easier as well as consolidate the loads of the heaters. Another option would also be to provide instantaneous hot water heaters in the desired locations that would only operate when the connected load calls for it.

AIR HANDLING UNITS

There are multiple air handling units that serve the school (see Table 1 for Air Handling Units). The visual conditions of the units are based on the units' ages, tag conditions and visible damage.

Table 1: Air Handling Units

Unit Tag	Make	Visual Condition
RTU-2 (Gym)	AAON	Fair
AHU-3 (Gym)	Titan	Poor
AHU-2 (Kitchen)	-	Poor
AHU (East Wing)	-	Fair
AHU (Oakville)	-	Fair
AHU Multipurpose North	-	N/A
AHU Multipurpose South	-	N/A

The units are overall in poor condition and should be replaced if they are approaching or are past their useful lifespans of about 25 years. The TAB contractor measured the supply and outdoor air capabilities of the units. SP+A analyzed the data and compared the outdoor air capabilities to the ASHRAE 62.1 recommended values for the various

space types (see Table 2 for mechanically ventilated spaces). A space was considered deficient and highlighted yellow if the outdoor air supplied is outside of the +/- 10 percent range of the ASHRAE value.

Table 2: Mechanically Ventilated Spaces

Room No.	Area	Supply Air (SA) Sum	Return Air (RA) Sum	Outside Air (OA)	Code Required Ventilation Air (OA) or Exhaust Air (EA)
Classroom 16W	880	617	0	325	326
Classroom 18W	880	734	0	0	326
Classroom 20W	880	546	0	108	326
Classroom 21W	880	728	0	255	326
Classroom 19W	880	735	0	377	326
Classroom 17W	880	759	0	245	326
Classroom 15W	880	612	0	0	326
Classroom 3E	880	654	0	363	326
Classroom 4E	880	780	0	0	326
Classroom 5E	880	870	0	177	326
Classroom 6E	880	717	0	0	326
Classroom 7E	880	775	0	343	326
Classroom 8E	880	652	0	280	326
Classroom 23W	800	316	0	82	296
Classroom 9E	795	301	0	67	294
Classroom 10E	811	432	0	125	300
Classroom 11E	823	419	588	122	305
Classroom 12E	823	377	613	109	305
Classroom 13E	820	368	85	107	304
Classroom 14E	822	367	188	106	304
Classroom 22W	453	157	134	41	168
Library/Media	3169	683	551	177	1172
Office 34W	160	71	40	18	14
Multipurpose North	5990	1295	0	-	4852
Classroom 40N	880	550	0	0	326
Classroom 42N	602	884	0	37	223
Classroom 41N	938	808	0	254	347
Classroom 44N	450	933	0	463	167
Classroom 46N	450	1025	0	715	167
Music Room	531	789	0	142	196
Nurse's Office	528	709	0	324	45
Classroom 25W	842	331	251	86	312
Classroom 27W	842	285	100	74	312

Classroom 29W	783	223	161	58	290
Classroom 24W	152	67	100	17	56
Classroom 26W	152	62	121	16	56
Classroom 28W	220	50	59	13	81
Classroom 30W	450	193	203	50	166
West Hallway	2832	232	0	0	170
East Hallway	2277	83	0	0	137
Classroom 36W	450	67	0	17	1178
Multipurpose South	5990	2075	0	-	4852

Almost every mechanically ventilated space in the building is outside of the +/- 10 percent range of the ASHRAE ventilation value. The primary issue is the units are only supplying a fraction of the outdoor air required to adequately ventilate the spaces. SP+A recommends installing dedicated outdoor air systems (DOAS). DOAS will serve only the code required ventilation to the classrooms and corridors. The DOAS is an energy efficient system that will help the air quality of the building by ensuring the rooms will always be mechanically ventilated. The exact location of the DOAS will require architectural and structural investigation. To be paired with the DOAS, SP+A recommends installing variable refrigerant flow (VRF) equipment throughout the building. Heat pumps provide heating or cooling by removing or adding heat to the space depending on the system. VRF changes the flow of the refrigerant to modulate the heat transfer capability of the system depending on the heating and cooling load. Overall, VRF is an energy efficient system that will provide supplemental heating to the fin tube radiation as well as introduce cooling to the building. Provisions will have to be made for the heat pump outdoor units and their locations.

See Table 3 for all the spaces that are not currently mechanically ventilated and are recommended to be tied into the proposed DOAS system.

Table 3: Non Mechanically Ventilated Spaces

Room No.	Area	Equipment Tag	Code Required Exhaust Air (EA) (per fixture for rest rooms)
Restroom	53	No Mechanical	50
Restroom	59	No Mechanical	50

Restroom	57	No Mechanical	50
Office 34E	176	No Mechanical	15
Gym/Café	8978	No Mechanical	7272
Gym Office	313	No Mechanical	27
Custodial/Office	300	No Mechanical	230
Main Office	459	No Mechanical	39
Principal's Office	192	No Mechanical	16
Class Bathroom 29NB	36	No Mechanical	50
Classroom Kitchen	179	No Mechanical	48
North Hallway	2287	No Mechanical	137

UNIT VENTILATORS

There are also various unit ventilators throughout the school (see Photo 10: Unit Ventilator).



Photo 10: Unit Ventilator

SP+A recommends removing all unit ventilators in the school and supplying the associated rooms with the recommended DOAS. Unit ventilators return air through the

bottoms of the units which draws dust and debris across the floor and affects the overall air quality.

EXHAUST FANS

There are various restrooms with exhaust fans throughout the school (see Table 4 Toilet Rooms and Exhausts).

Table 4: Toilet Rooms and Exhausts

Room No.	Area	Exhaust Air (EA)	Estimated Number of Fixtures
Girls East	218	1296	26
Girls West	192	0	0
Boys West	192	0	0
Boys North	138	166	3
Girls North	135	340	7
Nurse Bathroom	38	44	1
Custodial Bathroom	77	106	2

SP+A was unable to determine the exact number of toilet fixtures (toilets and urinals) in each restroom. The estimated number of fixtures is based on the code required toilet exhaust value per fixture. If the restrooms have more or less fixtures than the estimated value, SP+A recommends balancing the exhausts for the restrooms and ensuring they are exhausting an adequate amount of air to ensure that they remain negatively pressured and do not leak odors. SP+A recommends replacing all exhaust fans that are approaching or past their useful lifespans of about 20 years.

MISCELLANEOUS MEASURES

- SP+A was informed of multiple abandoned AHUs in the ceiling spaces throughout the school. SP+A recommends investigation into the proper sealing and abandonment of the air handling units to ensure that no unconditioned outdoor air gets into the building.
- SP+A recommends replacing all cleaning equipment such as brooms, mops and dusters that are past their useful lifespans or are in poor condition. If the cleaning equipment does not adequately clean the rooms and furniture, it could have a negative impact on the overall indoor air quality of the building due to bacteria growth and dust accumulation.
- SP+A recommends installing hand sanitation stations throughout the school to promote a healthy environment

- SP+A recommends investigation into installing high efficiency sinks and hand dryers (see Photo 13: High Efficiency Sink and Hand Dryer).



Photo 13: High Efficiency Sink and Hand Dryer

High efficiency hand dryers (and others like it) can aid in promoting healthy indoor air quality because they filter the air for the dryer as opposed to traditional hand dryers which recirculate dirty bathroom air. They save energy because they are water efficient and dry hands faster.

- SP+A recommends the abatement of any asbestos in the school in accordance with CT standards.
- No radon provisions were witnessed. Per the CT Dept of Public Health, buildings should be tested for radon, and retested every 5 years if the initial measurements are less than 4.0 pCi/L. If the measurements are above the state's acceptable level then radon mitigation is required to reduce levels, and re-evaluation is performed every 2.5 years. Test for radon and take corrective action as needed.
- SP+A recommends investigating if there is adequate sealing for windows and door sweeps for exterior doors to help control the amount of moisture and bugs that get into the building.

APPENDICES

The following documents attached in order are:

- HVAC data
- Ventilation Survey
- EPA Checklists



Environmental Testing & Balancing, Inc.
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(203) 234-2089 Fax (203) 234-2147

CERTIFIED TESTING and BALANCING REPORT

Date: November 5, 2024

Project: Ann Antolini Elementary School
HVAC Survey

Address: 30 Antolini Road
New Hartford
Connecticut

HVAC Contractor: Enviro-Med Services, Inc.

The data presented in this report is a record of system measurements and final adjustment that have been obtained in accordance with the current edition of the NEBB *Procedure Standard for Testing, Adjusting and Balancing of Environmental Systems*. The measurements shown, and the information presented in this report, are certified to be accurate and complete, at the time and date information was gathered. Any variances from design quantities, which exceed NEBB tolerances, are noted in the TAB report project summary.

Submitted and Certified by:
NEBB Professional Michael R. DeZinno



Environmental Testing & Balancing, Inc.
Registration No.: 2968



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Glossary

Abbreviation	Meaning	Abbreviation	Meaning
" W.G.	(measured in) Inches Water Gauge	MBH	Thousand BTUs per Hour
A/C	Air Changes per Hour	MIN	Minimum
AF	Air Foil	MVD	Manual Volume Damper
AFMS	Air Flow Monitoring (Measuring) Station	N/A	Not Applicable, Not Available
AHU	Air Handling Unit	N/ACC	No Reasonable Access
AMP(S)	Amperage(s)	NDI	No Damper Installed
BD	Balancing Damper	NF	No Flow
BHP	Brake Horsepower	NG	Not Given
BLNC	Balance	No.	Number
BTU	British Thermal Unit	NPSH	Net Positive Suction Head
BTUh	BTU per Hour	NPSHA	Net Positive Suction Head Available
BV	Balancing Valve	NPSHR	Net Positive Suction Head Required
CD	Ceiling Diffuser	OA	Outside Air
CEF	Ceiling Exhaust Fan	OBD	Opposed Blade Damper
CF	Correction Factor	OD	Outside Diameter
CF for DDC	BMS Correction Factor	OED	Open End Duct
CFLA	Corrected Full Load Amperage	P	Pump
CFM	Cubic Feet per Minute	PD	Pressure Drop
CH	Chiller	PH	Phase
CHWC, CC	Chilled Water Coil, Cooling Coil	PP	Pressure Port
CONFIG	Configuration	PSI	Pounds per Square Inch
CS	Circuit Setter	PSIA	Pounds per Square Inch Absolute
CT	Cooling Tower	PSIG	Pounds per Square Inch Gauge
CV	Constant Volume	QTY	Quantity
dB	Decibel	RA	Return Air
DB	Dry Bulb	RAF	Return Air Fan
DFC	Damper Fully Closed	RCP	Radiant Ceiling Panel
Dia	Diameter	RECT	Rectangular
dP, DP	Differential Pressure	Req'd	Required
DWO	Damper Wide Open	RG	Return Grille
EA	Exhaust Air	RGD(s)	Register(s), Grille(s), Diffuser(s)
EADB	Entering Air Dry Bulb	RHC	Reheat Coil
EAT	Entering Air Temperature	Rm Press	Room Pressure
EAWB	Entering Air Wet Bulb	RND	Round
EF	Exhaust Fan	RP	Radiant Panel
EG	Exhaust Grille	RPM	Revolutions per Minute
ER	Exhaust Register	RR	Return Register
ESP	External Static Pressure	RTU	Roof Top Unit
EWT	Entering Water Temperature	RVA, RV	Rotating Vane Anemometer
EX / EXH	Exhaust	SA	Supply Air
F	Fahrenheit	SD	Supply Diffuser

FCU	Fan Coil Unit	SL	Slot
FD	Fire Damper	SNRKL	Snorkel
FH	Flow Hood	SP	Static Pressure
FLA	Full Load Amperage	TADBF	Total Air Delivered by Fan
FPM	Feet per Minute	TB	Terminal Box
GPM	Gallons per Minute	TD	Temperature Differential
HP	Horsepower	TDH	Total Dynamic Head
HWC, HC	Hot Water Coil, Heating Coil	TEMP	Temperature
HX	Heat Exchanger	TF	Thermafuser
HZ	Hertz	TP	Thermally Protected
kW	Kilowatt	TRAV/TRV	Traverse
LADB	Leaving Air Dry Bulb	TSP	Total Static Pressure
LAT	Leaving Air Temperature	V	Volt(s) / Voltage
LAWB	Leaving Air Wet Bulb	VAV	Variable Air Volume
LD	Linear Diffuser	VD	Volume Damper
LS	Linear Slot	VEL	Velocity
LWT	Leaving Water Temperature	VFD	Variable Frequency Drive
MA	Mixed Air	VG	Velgrid
MAU, MUA	Make-Up Air Unit	WB	Wet Bulb
MAX	Maximum		

Notes

Measuring with Flow Hood (referencing Air Outlet Test Sheets and Grille, Register & Diffuser Test Sheets):

Registers, diffusers and grilles are read directly in CFM. (Report program indicates 1.00 in Ak Factor column.)

Measuring in Velocity (referencing Air Outlet Test Sheets and Grille, Register & Diffuser Test Sheets):

Ak Factor indicates actual area of registers, following multiplying the Ak by the area equals the actual free area; therefore CFM is calculated and based on this factor (FPM x Ak).

Codes (referencing Air Outlet Test Sheets and Grille, Register & Diffuser Test Sheets):

If codes are not listed here, please reference design drawings.

ENVIRONMENTAL TESTING & BALANCING, INC.

Ann Antolini Elementary School HVAC Survey

Remarks

November 5, 2024

RTU-2, AHU-3

These units work together to provide air to the Gym, based on the season. When put in 'auto', the units both operated. This sequence should be reviewed by the controls contractor.

Outside air minimum setting is 0%.

AHUs Serving East Wing and Oakville

There was no access to the unit tag.

AHU Multipurpose North

No minimum; goes to 100% outside air. Needs to be cleaned.

No access to unit due to size of the space and items stored in the space.

AHU Multipurpose South

100% outside air.

No access to unit due to size of the space and items stored in the space.

General Note

Rooms identified as "No Mech" on the Room Air Change Report have no mechanical ventilation.

AIR APPARATUS TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey
 Tested by: Mike DeZinno November 5, 2024 (24082A)

RTU-1 DESIGN DATA

Manufacturer =	AAON	Model No. =	RN-025-8-0
Type =	RTU	Serial No. =	201702-BNCR12147
Total Scheduled cfm =			
Outside Air cfm =			
Total Static Pressure =		External Static Pressure =	
Fan rpm =		Brake Horsepower =	

MOTOR DESIGN DATA

Horsepower =	7.5	Voltage =	208	Phase =	3	rpm =	1760
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AIR TEST DATA

Total cfm by Traverse =	8785
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PRESSURE TEST DATA

Total Suction Static Pressure =	-1.67
Total Discharge Static Pressure =	0.31
Total Static Pressure =	1.98
External Suction Static Pressure =	-1.01
External Discharge Static Pressure =	0.31
External Static Pressure =	1.32
Cooling Coil DP =	0.66
Final Filters DP =	0.66

MOTOR TEST DATA

Motor Manufacturer / Frame = NL					
Horsepower = 7.5		Phase = 3		Voltage = 208 208 208	
Full Load Amps = 24.2			FLA Corrected for Voltage = 24.2		
Motor rpm = 1611			Service Factor = 1.15		
No Load Amps = 6.0		6.0	6.0	Operating Amps = 24.9 24.9 24.9	
Calculated Brake Horsepower = 7.75					

FAN TEST DATA

Motor Sheave Model / Dia. =	Direct Drive
Motor Sheave Bore =	
Fan Sheave Model / Dia. =	
Fan Sheave Bore =	Fan rpm = 1611
Adjustable Sheave Dia. =	Center Line Distance =
Belts =	
Filters =	(6) 20"x25"x6"

AIR APPARATUS TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey
 Tested by: Mike DeZinno November 5, 2024 (24082A)

RTU-2 DESIGN DATA

Manufacturer =	AAON	Model No. =	RN-040-8
Type =	RTU	Serial No. =	201702-BNCV12149
Total Scheduled cfm =			
Outside Air cfm =			
Total Static Pressure =		External Static Pressure =	
Fan rpm =		Brake Horsepower =	

MOTOR DESIGN DATA

Horsepower =	15	Voltage =	208	Phase =	3	rpm =	1760
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AIR TEST DATA

Total cfm by Traverse =	11611
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PRESSURE TEST DATA

Total Suction Static Pressure =	-1.00
Total Discharge Static Pressure =	0.17
Total Static Pressure =	1.17
External Suction Static Pressure =	-0.35
External Discharge Static Pressure =	0.17
External Static Pressure =	0.52
Cooling Coil DP =	0.44
Final Filters DP =	0.31

MOTOR TEST DATA

Motor Manufacturer / Frame = NL						
Horsepower = 15		Phase = 3		Voltage = 208		208
Full Load Amps = 46.2				FLA Corrected for Voltage = 46.2		
Motor rpm = 1027				Service Factor = 1.15		
No Load Amps = 15.0		15.0	15.0	Operating Amps = 38.9		38.9
Calculated Brake Horsepower = 12.17						

FAN TEST DATA

Motor Sheave Model / Dia. =	Direct Drive
Motor Sheave Bore =	
Fan Sheave Model / Dia. =	
Fan Sheave Bore =	Fan rpm =
Adjustable Sheave Dia. =	Center Line Distance =
Belts =	
Filters =	(8) 24"x24"x2"

AIR APPARATUS TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey
 Tested by: Mike DeZinno November 5, 2024 (24082A)

AHU-3 DESIGN DATA

Manufacturer =	Titan	Model No. =	TAH-11.1-125
Type =	AHU	Serial No. =	16314
Total Scheduled cfm =			
Outside Air cfm =			
Total Static Pressure =		External Static Pressure =	0.70
Fan rpm =		Brake Horsepower =	

MOTOR DESIGN DATA

Horsepower =	Voltage =	Phase =	rpm =
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AIR TEST DATA

Total cfm by Traverse =	975
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PRESSURE TEST DATA

Total Suction Static Pressure =	-0.06
Total Discharge Static Pressure =	0.06
Total Static Pressure =	0.12
External Suction Static Pressure =	-0.02
External Discharge Static Pressure =	0.06
External Static Pressure =	0.08
Cooling Coil DP =	0.04
Final Filters DP =	0.04

MOTOR TEST DATA

Motor Manufacturer / Frame = Baldor / 182T					
Horsepower = 3		Phase = 3		Voltage = 210 208 209	
Full Load Amps = 8.4			FLA Corrected for Voltage = 0.0		
Motor rpm = 1765			Service Factor = 1.5		
No Load Amps = 3.5		3.5	3.5	Operating Amps = 3.8 3.8 3.8	
Calculated Brake Horsepower = -3.51					

FAN TEST DATA

Motor Sheave Model / Dia. =				1 VP 60		
Motor Sheave Bore =				1 1/8"		
Fan Sheave Model / Dia. =				12 13/16"		
Fan Sheave Bore =				13 7/16"	Fan rpm =	825
Adjustable Sheave Dia. =				50%	Center Line Distance =	
Belts =				B56		
Filters =				(8) 16"x20"x2"		

FAN TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey
Tested by: Mike DeZinno November 5, 2024 (24082A)

Fan Number	AHU	AHU	
Serving	Oakville	East Wing	
Manufacturer	N/A	N/A	
Model Number	N/A	N/A	
Serial Number	N/A	N/A	

	Design	Test	Design	Test	Design	Test
Total cfm	N/A	2537	N/A	2201		

Suction Static Pressure		-0.20		-0.67		
Discharge Static Pressure		0.19		0.00		
External Static Pressure	N/A	0.39	N/A	0.673		
Motor Sheave						
Model / Diameter	4.5"		3.7/5"			
Bore	3/4"		3/4"			
Fan Sheave						
Model / Diameter	10"		8"			
Bore	7/8"		7/8"			
Belts	(1) 4L690		(1) AP56			
Center Line Distance	21		22.5			

Motor Manufacturer / Frame	Magnetek / 145T		Magnetek / 145T			
Horsepower	N/A	1.5	N/A	1.5		
Motor rpm	N/A	1745	N/A	1745		
Phase	N/A	3	N/A	3		
Voltage	N/A	211	N/A	211		
		211		211		
		209		209		
Service Factor						
Rated Amperage						
Corrected for Voltage		0.0		0.0		
No Load Amperage						
Operating Amperage		1.9		1.6		
		1.9		1.5		
		1.8		1.6		
Brake Horsepower	N/A	N/A	N/A	N/A		
Fan rpm	N/A		N/A			

GRILLE, REGISTER & DIFFUSER TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey

Tested by: Mike DeZinno November 5, 2024 (24082A)

Outlet Number	Room Number	Code	Size	"Ak" Factor	Required		First Test	New Req'd	fpm/cfm Reading	Final cfm
					fpm	cfm				
Classroom 4E										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	780			780
1	OA	WD	55"x8 1/2"	1.00	0	N/A	0			0
Classroom 5E										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	870			870
1	OA	WD	55"x8 1/2"	1.00	0	N/A	177			177
Classroom 6E										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	717			717
1	OA	WD	55"x8 1/2"	1.00	0	N/A	0			0
Classroom 7E										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	775			775
1	OA	WD	55"x8 1/2"	1.00	0	N/A	343			343
Classroom 8E										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	652			652
1	OA	WD	55"x8 1/2"	1.00	0	N/A	280			280
Nurse's Office										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	709			709
1	OA	WD	44"x8 1/2"	1.00	0	N/A	324			324
Classroom 40N										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	550			550
1	OA	WD	55"x8 1/2"	1.00	0	N/A	0			0
Classroom 41N										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	808			808
1	OA	WD	67"x8 1/2"	1.00	0	N/A	254			254

GRILLE, REGISTER & DIFFUSER TEST SHEET**Job Name:** Ann Antolini Elementary School HVAC Survey**Tested by:** Mike DeZinno November 5, 2024 (24082A)

Outlet Number	Room Number	Code	Size	"Ak" Factor	Required		First Test	New Req'd	fpm/cfm Reading	Final cfm
					fpm	cfm				
Classroom 42N										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	884			884
1	OA	WD	43.5"x8.5"	1.00	0	N/A	37			37
Classroom 44N										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	933			933
1	OA	WD	43.5"x8.5"	1.00	0	N/A	463			463
Classroom 46N										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	1025			1025
1	OA	WD	43.5"x8.5"	1.00	0	N/A	715			715
Music Room 43N										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	789			789
1	OA	WD	43.5"x8.5"	1.00	0	N/A	142			142
Classroom 16W										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	617			617
1	OA	WD	55"x8 1/2"	1.00	0	N/A	325			325
Classroom 20W										
1	Supply	CD	50 1/2"x5"	1.00	0	N/A	546			546
1	OA	WD	55"x8 1/2"	1.00	0	N/A	108			108
Classroom 21W										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	728			728
1	OA	WD	55"x8 1/2"	1.00	0	N/A	255			255
Classroom 19W										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	735			735
1	OA	WD	55"x8 1/2"	1.00	0	N/A	377			377

GRILLE, REGISTER & DIFFUSER TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey

Tested by: Mike DeZinno November 5, 2024 (24082A)

Outlet Number	Room Number	Code	Size	"Ak" Factor	Required		First Test	New Req'd	fpm/cfm Reading	Final cfm
					fpm	cfm				
Classroom 18W										
1	Supply	CD	50 1/2"x5"	1.00	0	N/A	734			734
1	OA	WD	55"x8 1/2"	1.00	0	N/A	0			0
Classroom 17W										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	759			759
1	OA	WD	55"x8 1/2"	1.00	0	N/A	245			245
Classroom 15W										
1	Supply	CD	50 1/2"x5"	1.00	0	N/A	612			612
1	OA	WD	55"x8 1/2"	1.00	0	N/A	0			0
Classroom 3E										
1	Supply	CD	46 1/2"x5"	1.00	0	N/A	654			654
1	OA	WD	55"x8 1/2"	1.00	0	N/A	363			363
Classroom 22W										
1	Supply	CD	15"x10"	1.00	0	N/A	157			157
1	Return	CD	12"x12"	1.00	0	N/A	134			134
Classroom 23W										
1	Supply	CD	12"x12"	1.00	0	N/A	139		139	139
2	Supply	CD	12"x12"	1.00	0	N/A	177		177	177
										316
1	Return	CD	18"x12"	1.00	0	N/A	0			0
Classroom 24W										
1	Supply	CD	10"x6"	1.00	0	N/A	67			67
1	Return	CD	8"x8"	1.00	0	N/A	100			100

GRILLE, REGISTER & DIFFUSER TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey

Tested by: Mike DeZinno November 5, 2024 (24082A)

Outlet Number	Room Number	Code	Size	"Ak" Factor	Required		First Test	New Req'd	fpm/cfm Reading	Final cfm
					fpm	cfm				
Classroom 25W										
1	Supply	CD	12"x12"	1.00	0	N/A	151		151	151
2	Supply	CD	12"x12"	1.00	0	N/A	180		180	180
										331
1	Return	CD	18"x12"	1.00	0	N/A	251			251
Classroom 26W										
1	Supply	CD	10"x6"	1.00	0	N/A	62			62
1	Return	CD	8"x8"	1.00	0	N/A	121			121
Classroom 27W										
1	Supply	CD	12"x12"	1.00	0	N/A	136		136	136
2	Supply	CD	12"x12"	1.00	0	N/A	149		149	149
										285
1	Return	CD	12"x2"	1.00	0	N/A	100			100
Classroom 28W										
1	Supply	CD	10"x6"	1.00	0	N/A	50			50
1	Return	CD	8"x4"	1.00	0	N/A	59			59
Classroom 29W										
1	Supply	CD	12"x12"	1.00	0	N/A	106		106	106
2	Supply	CD	12"x12"	1.00	0	N/A	117		117	117
										223
1	Return	CD	8"x8"	1.00	0	N/A	161			161
Classroom 30W										
1	Supply	CD	15"x10"	1.00	0	N/A	193			193
1	Return	CD	12"x12"	1.00	0	N/A	203			203

GRILLE, REGISTER & DIFFUSER TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey

Tested by: Mike DeZinno November 5, 2024 (24082A)

Outlet Number	Room Number	Code	Size	"Ak" Factor	Required		First Test	New Req'd	fpm/cfm Reading	Final cfm
					fpm	cfm				
West Hallway										
1	Supply	CD	9"x9"	1.00	0	N/A	106		106	106
2	Supply	CD	9"x9"	1.00	0	N/A	126		126	126
										232
Office 34W										
1	Supply	CD	10"x6"	1.00	0	N/A	71			71
1	Return	CD	8"x4"	1.00	0	N/A	40			40
Classroom 36W										
1	Supply	CD	10"x6"	1.00	0	N/A	67			67
1	Return	CD	8"x8"	1.00	0	N/A	0			0
Library/Media										
1	Supply	CD	9"x9'	1.00	0	N/A	92		92	92
2	Supply	CD	12"x8"	0.48	0	N/A	352		352	169
3	Supply	CD	12"x8"	0.48	0	N/A	353		353	169
4	Supply	CD	12"x8"	0.48	0	N/A	340		340	163
5	Supply	CD	12"x8"	0.48	0	N/A	187		187	90
										683
1	Return	CD	22"x22"	1.00	0	N/A	551			551
Classroom 9E										
1	Supply	CD	12"x12"	1.00	0	N/A	63		63	63
2	Supply	CD	12"x12"	1.00	0	N/A	238		238	238
										301
1	Return	CD	18"x12"	1.00	0	N/A	0			0
Classroom 9E Storage										
1	EF	CD	N/A	1.00	0	N/A	N/A			N/A

GRILLE, REGISTER & DIFFUSER TEST SHEET

Job Name: Ann Antolini Elementary School HVAC Survey

Tested by: Mike DeZinno November 5, 2024 (24082A)

Outlet Number	Room Number	Code	Size	"Ak" Factor	Required		First Test	New Req'd	fpm/cfm Reading	Final cfm
					fpm	cfm				
Classroom 10E										
1	Supply	CD	12"x12"	1.00	0	N/A	209		209	209
2	Supply	CD	12"x12"	1.00	0	N/A	223		223	223
										432
1	Return	CD	18"x12"	1.00	0	N/A	0			0
Classroom 11E										
1	Supply	CD	12"x12"	1.00	0	N/A	217		217	217
2	Supply	CD	12"x12"	1.00	0	N/A	202		202	202
										419
1	Return	CD	18"x12"	1.00	0	N/A	588			588
Classroom 12E										
1	Supply	CD	12"x12"	1.00	0	N/A	195		195	195
2	Supply	CD	12"x12"	1.00	0	N/A	182		182	182
										377
1	Return	CD	18"x12"	1.00	0	N/A	613			613
Classroom 13E										
1	Supply	CD	12"x12"	1.00	0	N/A	187		187	187
2	Supply	CD	12"x12"	1.00	0	N/A	181		181	181
										368
1	Return	CD	18"x12"	1.00	0	N/A	85			85
Classroom 14E										
1	Supply	CD	12"x12"	1.00	0	N/A	195		195	195
2	Supply	CD	12"x12"	1.00	0	N/A	172		172	172
										367
1	Return	CD	18"x12"	1.00	0	N/A	188			188
East Hallway										
1	Supply	CD	6"x6"	1.00	0	N/A	83			83

Outlet Number	Room Number	Code	Size	"Ak" Factor	Required		First Test	New Req'd	fpm/cfm Reading	Final cfm
					fpm	cfm				
Custodial Bathroom										
1	Exhaust	EG	10"x10"	1.00	0	N/A	106			106
Custodial Storage										
1	Exhaust	EG	10"x10"	1.00	0	N/A	86			86
North Restroom										
1	Exhaust	EG	11"x11"	1.00	0	N/A	36		36	36
2	Exhaust	EG	11"x11"	1.00	0	N/A	44		44	44
3	Exhaust	EG	11"x11"	1.00	0	N/A	34		34	34
										114
Boys West Bathroom										
1	Exhaust	EG	7"x7 1/2"	1.00	0	N/A	0		0	0
2	Exhaust	EG	7"x7 1/2"	1.00	0	N/A	0		0	0
										0
Girls West Bathroom										
1	Exhaust	EG	7"x7 1/2"	1.00	0	N/A	0		0	0
2	Exhaust	EG	7"x7 1/2"	1.00	0	N/A	0		0	0
										0
Girls East Bathroom										
1	Exhaust	EG	7"x11"	1.00	0	N/A	463		463	463
2	Exhaust	EG	7"x11"	1.00	0	N/A	299		299	299
3	Exhaust	EG	7"x11"	1.00	0	N/A	310		310	310
4	Exhaust	EG	7"x11"	1.00	0	N/A	224		224	224
										1296
Boys East Bathroom										
1	Exhaust	EG	7"x11"	1.00	0	N/A	340		340	340
2	Exhaust	EG	7"x11"	1.00	0	N/A	167		167	167
3	Exhaust	EG	7"x11"	1.00	0	N/A	584		584	584
4	Exhaust	EG	7"x11"	1.00	0	N/A	364		364	364
										1455

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Ann Antolini Elementary School HVAC Survey

Mike DeZinno November 5, 2024 (24082A)

Mike DeZinno November 5, 2024 (24082A)

ROOM AIR CHANGE REPORT

Job Name: Ann Antolini Elementary School HVAC Survey
Tested by: Mike DeZinno November 5, 2024 (24082A)

Room No.	Room Designation	Room Volume	Design ACH	Design cfm		Test cfm		Final	
				Supply	Exhaust	Supply	Exhaust	ACH	
46N	Classroom	4050				1025		15.19	
46N	Classroom OA	4050				715		10.59	
	Custodial / Office	2700	No Mech					0.00	
	Boys North	1243					166	0.00	
	Girls North	1211					340	0.00	
43N	Music Room	4776				789		9.91	
43N	Music Room OA	4775.7				142		1.78	
	Main Office	4131	No Mech					0.00	
	Principal's Office	1728	No Mech					0.00	
	Nurse's Office	4756				709		8.94	
	Nurse's Office OA	4755.9				324		4.09	
	Nurse Bathroom	346					44	0.00	
25W	Classroom	7581				331		2.62	
25W	Classroom OA	7168.5				86		0.72	
27W	Classroom	7581				285		2.26	
27W	Classroom OA	7581				74		0.59	
29W	Classroom	7047				223		1.90	
29W	Classroom OA	7047				58		0.49	
29NB	Class Bathroom	324	No Mech					0.00	
	Classroom Kitchen	1609	No Mech					0.00	
24W	Classroom	1364				67		2.95	
24W	Classroom OA	1364.6				17		0.75	
26W	Classroom	1364				62		2.73	
26W	Classroom OA	1364.6				16		0.70	
28W	Classroom	1980				50		1.52	
28W	Classroom OA	1980				13		0.39	
30W	Classroom	4046				193		2.86	
30W	Classroom OA	4046.2				50		0.74	
9ES	Classroom Storage	1797	No Mech					0.00	
	North Hallway	20581	No Mech					0.00	
	West Hallway	25489				232		0.55	
	East Hallway	20492				83		0.24	
	Custodial Bathroom	693					106	0.00	
36W	Classroom	4046				67		0.99	
36W	Classroom OA	4046				17		0.25	
	Multipurpose South	53913				2075		2.31	

Final Room Air Change Rate is Based on the Higher of the Two Test Flow Rates

Room Volume = Cubic Feet, ACH = Air Changes per Hour

Manufacturer: MONARCH INSTRUMENTS	CUSTOMER: Environmental Testing & Balancing
Model: PLT200	154 State St. Suite 204
Serial Number: 1623190	North Haven CT 06460
Asset Number: ETB-075	

Case Date	4 Apr 2024	Temperature	31.0°C	Ag. Result	Ag. Reference
Test Case Date	4 Apr 2023	Humidity	45 %	Ag. Result	Ag. Reference
Case Processed	Wang, Richard, Sanyoukang	Test Result			

Example: _____

Asset Number	Asset Name	Cd Date	Exp Date
C1008	PRO CAL LS-1 LIGHT SOURCE	08 Mar 2014	08 Mar 2017
C1013	HEWLETT PACKARD 5054A GENERATOR	01 Jan 2004	01 Jan 2017

David [Signature]

PRINTED ON 8 Apr 2024

Manufacturer: FISHIE
Model: 517
Serial Number: 3018502
Asset Number: E TSP-774

Our Commitment
Environmental Impact & Stewardship
We strive to reduce our
carbon footprint & protect the planet.

PLANNING INFORMATION				
Est Date	17 Jul 2021	Temperature	21 °C	As Planned In Test-06
Next Est Due	17 Oct 2021	Humidity	40 %	As Planned In Test-06
Est Prepared	Ben/Jane/Stephen	Est Valid	Y	

Formulas

Accession Number	Classification	Call Date	Rev Date
7160	PLATE INDIAN POLYMER FUNCTIONALIZATION	28 Sep 2012	28 Sep 2014

[Signature]

Certificate Number

Manufacturer	DELSON	CUSTOMER	Enterprise Testing & Training
Model	1033		1500 Ave 54 Suite 204
Serial Number	0131777		San Mateo CA 94401
Asset Number	ETN-007		

Ex Date	01 Jan 2023	Trade Date	21 Dec	Ag. Exchanged	in / otherwise
Term (in Dec)	01 Jan 2024	Settlement	40 %	Ag. Not used	in / otherwise
		Open Interest	%		

Remarks:

STANDARD LENSE FROM COLUMBIANUM

[illegible]

[Signature]

Report ID: 11 Jan 2022 Certificate Number: CTR-001-1-00-INT-CAB Page 1 of 1

CO. OILFIELD
Customer ESTHERDALE TREATING & BALANCING, INC. Co. NORTH DAKOTA
PO # _____ Customer Cap No. Calibration Due Date Order # 2217151

Part two is devoted to the study of different meetings

[illegible][illegible]

FIS' WATER TOLERANCE - FISH IN WATER		GROSS PRODUCTION OF TISSUE IN WATER		FISH IN WATER		FISH IN WATER		FISH IN WATER		FISH IN WATER	
Approx. Time	Water Temp	Fish Temp	Water Temp	Fish Temp	Water Temp	Fish Temp	Water Temp	Fish Temp	Water Temp	Fish Temp	Water Temp
5:15	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
5:30	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
5:45	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
5:55	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
6:10	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
6:25	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
6:40	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
6:55	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
7:10	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
7:25	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
7:40	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
7:55	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
8:10	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
8:25	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
8:40	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
8:55	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
9:10	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
9:25	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
9:40	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
9:55	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
10:10	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
10:25	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
10:40	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
10:55	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
11:10	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
11:25	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
11:40	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
11:55	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
12:10	14.00	14.00									

Shorridge Instruments, Inc.
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