



March 11, 2011

Re: Air Quality Testing Whittier School 337 Broadway Everett MA.

The intent of the attached air testing results is part of air purification system commissioning and is also meant to validate the ventilation system design per ASHRAE 62.1 IAQ procedure.

The location is the Whittier School in Everett, MA. The air handling systems in place were outfitted with AtmosAir bipolar ionization air purification systems. Air sampling was performed to look at contaminant levels with the ventilation system operating at the standard prescribed outside ventilation rate with the AtmosAir systems not operating and then with the AtmosAir systems operating and outside air reduced in accordance with ASHRAE 62.1 IAQ Procedure. The intention was to see that the combination of AtmosAir and reduced outside air intake would control contaminant levels as well as the standard prescribed outside ventilation rate without AtmosAir.

The area tested was classroom 219, a typically occupied elementary classroom with 23 students. Air sampling was performed on 12/8/10 and 12/9/10. Air samples were taken for four consecutive hours each day sampling was performed. The contaminants tested were those as described in the ASHRAE applications handbook as being the contaminants of concern in this type of environment. The list of elements tested is below:

- Carbon Dioxide
- Carbon Monoxide
- Particles PM10
- Particles PM 2.5
- Hydrogen Sulfide
- Ammonia
- Methane
- Propane

Mass balance contaminant calculations in the ventilation design phase of the project were performed. The projected contaminant levels are listed below:

Contaminant	Ventilation Only 16.7 CFM per person	Ventilation & BPI 7.5 CFM per person	Ventilation & BPI 5 CFM per person
Ammonia	7.336 ppm	3.220 ppm	4.025 ppm
Carbon Dioxide	1168 ppm	1810 ppm	2188 ppm
Carbon Monoxide	.285 ppm	.090 ppm	.112 ppm
Hydrogen Sulfide	0 ppm	0 ppm	0 ppm
Methane	0.077 ppm	.020 ppm	.025 ppm
Propane	.0008 ppm	0 ppm	0 ppm
Particulate			
PM 10	59 µg/m3	7.4 µg/m3	7.4 µg/m3
PM 2.5	41 µg/m3	5.9 µg/m3	5.9 µg/m3

The permissible exposure limits for each of the contaminants listed is found below:

<u>Contaminant</u>	<u>PEL</u>	<u>Source</u>	<u>Contaminant</u>	<u>PEL</u>	<u>Source</u>
Ammonia	50 ppm	OSHA	Carbon Dioxide	5000 ppm	OSHA
	25 ppm	ACGIH		3500 ppm	Canadian
	25 ppm	NIOSH		5000 ppm	ACGIH
Carbon Monoxide	9 ppm	USEPA	Hydrogen Sulfide	20 ppm	OSHA
	50 ppm	OSHA		10 ppm	ACGIH
	25 ppm	ACGIH		10 ppm	NIOSH
Methane	N/A	N/A	Propane	1000 ppm	OSHA
				2500 ppm	ACGIH
				1000 ppm	NIOSH
Particulate PM10	150 ug/m3	USEPA			
Particulate PM 2.5	65 ug.m3	USEPA			

The samples taken on 12/8/10 were performed with the ventilation systems operating at the standard prescribed outside ventilation rate per design (approx 16 cfm of outside air per person). The installed AtmosAir systems were powered off during this testing period. Sampling began at approx. 10:30 am and concluded at approx. 2:30 pm. Carbon Dioxide, Carbon Monoxide, PM10 and PM 2.5 were sampled using an Aircuity Optima 500 monitor, serial # 100-0249. Methane and Propane were sampled using EPA TO-15 method via suma canister. Ammonia was sampled using sorbent tube via NIOSH 6010 method. Hydrogen Sulfide was sampled using sorbent tube via OSHA 1008 method. Laboratory results were analyzed by LA Testing, a division of EMSL Analytical. Samples were taken in classroom 219 during occupied daytime classroom activities with the air testing devices set approx 5' off the floor to sample in the normal 4'-6' breathing zone.

The samples taken on 12/9/10 were performed in identical fashion as above except the installed AtmosAir systems were operating as designed and the outside air was reduced via ASHRAE 62.1 IAQ procedure by approx. 10 cfm per person. Sampling began at approx 9:30 am and concluded at approx. 1:30 pm.

The results of the elements tested are included below:

Sampling Performed 12/8/2010

Carbon Dioxide	743 ppm (parts per million)
Carbon Monoxide	1 ppm
Particles PM 10	9 ug/m3 (micrograms per cubic meter)
Particles PM 2.5	3 ug/m3
Ammonia	ND (non-detectable)
Hydrogen Sulfide	ND
Methane	.0008 ppm
Propane	ND

Sampling Performed 12/9/10

Carbon Dioxide	726 ppm
Carbon Monoxide	1 ppm
Particles PM 10	7 ug/m3
Particles PM 2.5	3 ug/m3
Ammonia	ND
Hydrogen Sulfide	ND
Methane	ND
Propane	ND

In reviewing the results of the air sampling none of the levels exceed the published permissible exposure limits for the elements tested on either the sampling taken on 12/8/10 or 12/9/10 and that the overall air quality is very good. In comparing the results on both days, they are quite similar and show that the combination of the AtmosAir bi-polar ionization systems and reduced outside ventilation air provided overall air quality equal to the standard prescribed outside ventilation air alone.

AtmosAir™ Solutions Offered By Clean Air Group
418 Meadow Street, Suite 201 • Fairfield, CT 06824
PH: (203) 335-3700 • FX: (203) 335-1075
www.AtmosAir.com