



December 22, 2011

Re: Indoor Air Quality Testing Summary Greenwich Central Middle School

Intent

The purpose of the testing was to take air quality samples in a typically used, occupied classroom where an AtmosAir model FC100 bi-polar ionization air purification system was installed into the unit ventilator HVAC system that serves the classroom. Testing was performed in a “before and after” format, one test with the AtmosAir system not operating and second test with the AtmosAir system operating. Intended was to see what affect the AtmosAir system would have on air quality readings.

Test Conditions

Greenwich Central Middle School is located at 9 Indian Rock Rd. in Greenwich, CT. The classroom chosen for the study was classroom 120 which is located on the first floor of the school. (See figure 1). As a part of a recent HVAC renovation project thirteen (13) AtmosAir model FC100 units were integrated into the unit ventilators in thirteen (13) classrooms (See figure 2).

IAQ testing was performed, November 21st thru 23rd. An Aircuity Optima 500 Monitor serial # 100-0249 was used to perform the air quality testing. The following elements were measured:

Temperature
Relative Humidity
Carbon Dioxide
Particles (PM10)
Particles (PM2.5)
TVOC (Total Volatile Organic Compounds)
Radon
Carbon Monoxide
Ozone
Mold Spores



*Figure 1
Classroom 120. Pictured is unit ventilator
where AtmosAir unit is integrated into.*

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*Figure 2
AtmosAir model FC100 inside unit ventilator
serving Classroom 120*

Baseline testing without the AtmosAir unit operating was performed starting at approx. 3:30 pm on Nov 21st for 24 consecutive hours. The first 3 hours were used for mold spore sampling and the remaining 21 hours for the various sensor readings. Testing with the AtmosAir system operating was performed beginning Nov 22nd at approx. 3 pm for 24 consecutive hours. The first 3 hours were used for mold spore sampling and the remaining 21 hours for the various sensor readings.

Results

See below summary charts showing the results of the various sensor readings taken.

Baseline Readings taken without the AtmosAir system operating 11/21 – 11/22/11

	Comfort and Ventilation				Air Cleanliness			Building Pollutants		
	CO2 (ppm)	Temperature (°F)	Relative Humidity (%)	**CFM (Outdoor Air PP)	PM 10 (µg/m3)	PM 2.5 (µg/m3)	TVOC (index)	CO (ppm)	Radon (pCi/l)	Ozone (ppm)
Classroom	1007	70	36	17	12	7	2	0	0.2	0.001
Typical/Comfort	< 1100	71 - 74	20 - 60	> 15	< 40	< 20	< 10	< 3	< 2	< 0.1
Recommended	< 1100	68 - 78	20 - 60	> 15	< 40	< 20	< 35	< 9	< 4	< 0.1

Readings with the AtmosAir system operating 11/22 – 11/23/11

	Comfort and Ventilation				Air Cleanliness			Building Pollutants		
	CO2 (ppm)	Temperature (°F)	Relative Humidity (%)	**CFM (Outdoor Air PP)	PM 10 (µg/m3)	PM 2.5 (µg/m3)	TVOC (index)	CO (ppm)	Radon (pCi/l)	Ozone (ppm)
Classroom	769	72	41	26	7	1	0	0	0.1	0
Typical/Comfort	< 1100	71 - 74	20 - 60	> 15	< 40	< 20	< 10	< 3	< 2	< 0.1
Recommended	< 1100	68 - 78	20 - 60	> 15	< 40	< 20	< 35	< 9	< 4	< 0.1

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In looking at the results of the sensor readings, the measurements taken with the AtmosAir system operating showed a 42% reduction of PM 10 range particles and a 96% reduction in PM 2.5 range particles. PM10 is particulate matter 10 microns or less in size. These are particles that are small enough to be breathed in and enter into the throat. PM 2.5 is particulate matter 2.5 microns or less in size. These are particles that are small enough to be breathed in and enter the lungs.

Measurements of TVOC (Total Volatile Organic Compounds) showed a reduction of over 95% with the AtmosAir system operating. TVOC are gaseous elements that can cause odors and irritations. Chemicals, materials off-gassing, etc typically produce TVOC. TVOC exposure can be irritating and sometime toxic.

Airborne mold spores were also sampled on both days of testing. Below are charts summarizing the results:

Baseline Mold Spore sampling without the AtmosAir system operating taken 11/21/11

	Outdoor	Classroom
Alternaria Ulocladium	0	0
Ascospores	0	0
Basidiospores	276	209
Cladosporium	0	0
Curvularia	0	0
Drechslera	0	0
Epicoccum	0	0
Nigrospora	0	0
Penicillium Aspergillus types	0	0
Periconia sp smuts myxomycetes	0	0
Pithomyces	0	0
Stachybotrys	0	0
Stemphyllium	0	0
Torula	0	0
Unknown	0	0
Other	0	0
Chart Total	276	209

Mold Spore sampling with the AtmosAir system operating taken 11/22/11

	Outdoor	Classroom
Alternaria Ulocladium	0	0
Ascospores	0	0
Basidiospores	276	0
Cladosporium	0	0
Curvularia	0	0
Drechslera	0	0
Epicoccum	0	0
Nigrospora	0	0
Penicillium Aspergillus types	0	0
Periconia sp smuts myxomycetes	0	0
Pithomyces	0	0
Stachybotrys	0	0
Stemphyllium	0	0
Torula	0	0
Unknown	0	0
Other	0	0
Chart Total	276	0

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Airborne mold spore results are determined by a comparison between outdoor spore levels and indoor spore levels. There are 2 factors evaluated in looking at this comparison:

1. What is the ratio of indoor spores to outdoor spores?
2. What are the spore species and are indoor and outdoor types similar?

The results of the baseline sampling without the AtmosAir system operating taken on 11/21 show a ratio of indoor to outdoor spores of 76%. Typically an indoor to outdoor spore ratio should be 50% or less. The results of the sampling with the AtmosAir system operating taken on 11/22 show no measurable indoor spores within the classroom, while outdoor spore levels were similar on both days of sampling.

Conclusions

In comparing the results, readings taken in Classroom 120 with the AtmosAir system operating showed definite improvement in air quality by reduction of particles, TVOC and spores. Also notable, measurements with the AtmosAir system operating showed no measurable amount of ozone found. Ozone production has in the past been linked to some electronic air purification technologies.

Sincerely,

A handwritten signature in black ink that reads "Anthony M. Abate". The signature is written in a cursive style.

Anthony M Abate CIE CMI
Clean Air Group

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