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ATC ASSOCIATES INC.

104 East 25th Street
New York, New York 10010
www.atc-enviro.com
212.353.8280
Fax 212.353.8306

December 19, 2001

Mr. Bernard P. Orlan
Director, Environmental Health & Safety
New York City Board of Education
28-11 Queens Plaza North
Long Island City, NY 11101-4008

Re: Real-Time Air Monitoring
P. S. 89M
201 Warren St.
New York, New York
ATC Project No. 15-19125-0297

Dear Mr. Orlan:

ATC Associates Inc. (ATC) is pleased to provide this report of the results of real-time air monitoring conducted on December 15-16, 2001, at the referenced school. The New York City Board of Education (BOE) requested this monitoring at the recommendation of Environ Corp., the consultant to the parents association.

SCOPE OF WORK

ATC assessed the basic indoor air quality (IAQ) parameters of temperature, relative humidity, carbon dioxide (CO_2) and carbon monoxide (CO).

In addition, total volatile organic compounds (TVOCs), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), nitric oxide (NO) and nitrogen dioxide (NO_2) were also measured.

Respirable particulates ($PM_{2.5}$) were monitored for 24 hours in three locations.

Tenzin Namgyal and Wagdi Abdelshahid, Industrial Hygienists from ATC's New York City office, conducted the assessment. ATC's findings and conclusions are based on a visual inspection, real-time environmental measurements and conditions present in the school at the time of the assessment.

ATC measured temperature, relative humidity, CO_2 and CO with a Q-Trak® Model 8551, manufactured by TSI, Inc.

ATC recorded concentrations of respirable particulates with a Dust Trak® Aerosol Monitor Model 8520, manufactured by TSI, Inc.

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ATC measured concentrations of TVOCs using a RAE Systems, Inc. MiniRAE® photoionization detector (PID). Nitrogen oxides and SO_2 were measured using a RAE Systems, Inc. VRAE® multi-gas detector. H_2S was measured using a BioSystems PhD Ultra® gas detector.

The assessments were performed consistent with generally accepted indoor air quality assessment practices. As with all such assessments, there were inherent limitations created by constraints of time, operational and work practice variability, variations in indoor air quality parameters, and sampling and analytical accuracy. The results of the sampling represent conditions found on the dates of the survey and may not represent conditions found at other times. The information presented in this report should be used by the Board of Education as a guide to assess the need for further improvements in current indoor air quality control activities.

EVALUATION CRITERIA

Currently, there are no regulatory standards for indoor air quality in non-industrial buildings, such as offices and schools. For the real-time data collected, ATC uses the commonly accepted guidelines cited in the following publications:

- *Ventilation for Acceptable Indoor Air Quality (ASHRAE 62-1999)*, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE);
- *Thermal Environmental Conditions for Human Occupancy (ASHRAE 55-1992);*
- *Industrial Hygienists Guide to Indoor Air Quality Investigations* (1993), American Industrial Hygiene Association (AIHA).

Table 1 lists target guidelines for the parameters that ATC evaluated during this investigation. Meeting one, some, or all of the listed values does not assure that acceptable indoor air quality will be achieved at all times.

TABLE 1
TARGET GUIDELINES FOR INDOOR AIR QUALITY PARAMETERS EVALUATED*

PARAMETER	TARGET LEVEL	AGENCY OR ORGANIZATION
Carbon Dioxide (CO_2)	<700 parts per million (ppm) above background level	ASHRAE 62
Carbon Monoxide (CO)	9 ppm	ASHRAE 62 (adopted from USEPA NPAAQS)
Respirable Particulates ($PM_{2.5}$)	65 micrograms per cubic meter of air ($\mu g/m^3$) 24 hour average	USEPA NPAAQS
Temperature	Summer: 73-79°F at 50% RH Winter: 68-75°F at 50% RH	ASHRAE 55
Relative Humidity	30 – 60 %	ASHRAE 55
Total Volatile Organic Compounds (TVOC)	1 ppm	AIHA
Hydrogen Sulfide (H_2S)	0.01 ppm (one hour)	NYS DEC
Sulfur Dioxide (SO_2)	0.14 ppm (24-hour average)	USEPA NPAAQS
Nitrogen Dioxide (NO_2)	0.053 ppm (annual average)	USEPA NPAAQS

USEPA = United States Environmental Protection Agency
NPAAQS = National Primary Ambient-Air Quality Standard

* Guidelines for NO are not available.

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AIHA = American Industrial Hygiene Association
NYS DEC = New York State Department of Environmental Conservation

REAL-TIME SAMPLING RESULTS

ATC collected real-time environmental measurements three times during the day. Two sets of readings were collected indoors and two sets were collected outdoors. The results are shown in Tables 2, 3 and 4. Field data sheets are found in Attachment 1.

TABLE 2
REAL-TIME MEASUREMENTS 9:30 AM

Location	Temp. (°F)	Rel. Humid. (%)	CO_2 (ppm)	CO (ppm)	Resp. Part. (ug/m^3)	TVOC (ppm)	SO_2 (ppm)	H_2S (ppm)	NO (ppm)	NO_2 (ppm)
Playground	43.5	28.6	365	2	21	0.0	0.0	0.0	0.0	0.3
Hallway by cafeteria	66.5	27.7	371	1	22	0.0	0.0	0.0	0.0	0.1
Room 202	66.4	26.1	370	1	25	0.0	0.0	0.0	0.0	0.2
Roof by intake	43.4	29.3	360	1	15	0.0	0.0	0.0	0.0	0.2

TABLE 3
REAL-TIME MEASUREMENTS 12:00 Noon

Location	Temp. (°F)	Rel. Humid. (%)	CO_2 (ppm)	CO (ppm)	Resp. Part. (ug/m^3)	TVOC (ppm)	SO_2 (ppm)	H_2S (ppm)	NO (ppm)	NO_2 (ppm)
Playground	44.1	28.8	360	2	21	0.0	0.0	0.0	0.0	0.3
Hallway by cafeteria	66.4	27.5	378	1	21	0.0	0.0	0.0	0.0	0.2
Room 202	66.1	26.7	369	1	24	0.0	0.0	0.0	0.0	0.1
Roof by intake	43.1	29.1	359	3	13	0.0	0.0	0.0	0.0	0.2

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TABLE 4
REAL-TIME MEASUREMENTS 3:00 PM

Location	Temp. (^{0}F)	Rel. Humid. (%)	CO_2 (ppm)	CO (ppm)	Resp. Part. (ug/m^3)	TVOC (ppm)	SO_2 (ppm)	H_2S (ppm)	NO (ppm)	NO_2 (ppm)
Playground	43.6	27.1	360	2	21	0.0	0.0	0.0	0.0	0.2
Hallway by cafeteria	66.4	25.5	375	0	20	0.0	0.0	0.0	0.0	0.2
Room 202	66.0	24.9	369	1	22	0.0	0.0	0.0	0.0	0.1
Roof by intake	42.2	29.1	358	3	13	0.0	0.0	0.0	0.0	0.3

All of the indoor measurements were collected when the building was unoccupied except for ATC and custodial personnel and do not indicate directly what conditions may be when students, faculty and staff are present. The temperature and relative humidity levels were below guideline ranges (Table 1), other parameters were acceptable. There were no appreciable changes any of the values over the measurement period. Temperature and CO_2 levels would be expected to rise when the building is fully occupied.

The concentrations of NO_2 were measured at 0.1 - 0.3 ppm for the instantaneous readings. There were no significant differences between indoor and outdoor levels. The NPAAQS for NO_2 is an *annual average* concentration of 0.053 ppm. No secondary, i.e. short duration, ambient air quality standard exists.

24-HOUR $PM_{2.5}$ MEASUREMENTS

ATC placed three Dust Trak® aerosol monitors at different locations to record $PM_{2.5}$ levels for 24 hour periods. The instruments logged dust levels every 60 seconds. Table 5 shows the locations, minimum, maximum and average concentrations. One instrument, located in the playground, stopped recording after 6 hours.

TABLE 5
24-HOUR $PM_{2.5}$ CONCENTRATIONS (mg/m^3)

LOCATION	DURATION	MINIMUM	MAXIMUM	AVERAGE
Outdoors - Playground	5 hrs 57 min.	0.008	0.040	0.015
Hallway by cafeteria	24 hours	0.010	0.034	0.020
Roof by air intake	24 hours	0.007	0.031	0.015

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The 24-hour average indoor $PM_{2.5}$ concentration (converted to micrograms per cubic meter) was 20 ug/m^3. The average outdoor concentration, as measured on the roof, was 15 ug/m^3. Both values are below the NPAAQS for $PM_{2.5}$ of 65 ug/m^3 (24-hour average). Copies of the test summaries and graphs that were downloaded at the end of each sampling session are provided as Attachment 2.

FINDINGS

Based on the visual inspection of the occupied spaces and real-time measurements, the following findings are presented:

1. Measurements of concentrations of CO, TVOCs and respirable particulates were below recommended maximums.

2. Temperature and relative humidity measurements and CO_2 concentrations were below the ASHRAE-recommended ranges, however the building was unoccupied.

3. H_2S, NO and SO_2 were not detected.

4. NO_2 was detected at similar levels indoors and outdoors.

CONCLUSION

Based on our observations and measurements of the specified parameters, ATC concludes that the indoor air quality at the assessed location was acceptable at the time of ATC's investigation.

It is our pleasure to provide these indoor air consultative services to the New York City Board of Education. If you have any questions about this report, please contact me at (212) 353-8280, extension 212

Sincerely,
ATC ASSOCIATES INC.

James R. Cohn, CIH, CSP
Regional Manager
Industrial Hygiene Division

Attachments

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