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ATC ASSOCIATES INC.

600 West Cummings Park, Suite 6500
Woburn, Massachusetts 01801-6350
www.atc-enviro.com
781.932.9400
Fax 781.932.6211

February 8, 2002

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: Indoor Air Quality Assessment
P.S. 89M
201 Warren Street
New York, NY 10282
ATC Project No. 15-19125-0297

Dear Mr. Orlan:

ATC Associates Inc. (ATC) is pleased to provide this report of indoor air quality (IAQ) measurements collected on February 7, 2002, at the referenced school. The New York City Board of Education (BOE) requested these measurements to evaluate air quality in the school building prior to re-occupancy.

SCOPE OF WORK

ATC conducted this evaluation to assess the basic parameters of temperature, relative humidity, carbon dioxide (CO_2) and carbon monoxide (CO).

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

ATC measured concentrations of respirable particulates ($PM_{2.5}$) with a Dust-Trak® Aerosol Monitor Model 8520, manufactured by TSI, Inc.

ATC measured concentrations of TVOCs using a RAE Systems, Inc. MiniRAE® photoionization detector (PID).

Mr. Jimmy Choy, Industrial Hygienist of 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.

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The assessment was 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 BOE 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
	40 $\mu g/m^3$ 24-hour average	USEPA – recommendation for children/sensitive individuals
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

USEPA = United States Environmental Protection Agency
NPAAQS = National Primary Ambient-Air Quality Standard
AIHA = American Industrial Hygiene Association

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REAL-TIME ENVIRONMENTAL MEASUREMENTS

ATC collected eighty (80) sets of real-time environmental measurements consisting of eight (8) outdoors and thirty-two (32) inside in the morning (A.M.) and the same number of readings in the afternoon (P.M.). All five floors of the school were surveyed. The field data sheets are found in the Attachment. Readings began at 8:05 A.M. and concluded after 4:00 P.M. The results are described below:

Temperature

Indoor dry bulb temperature measurements ranged from 63.5°F to 75.3°F (A.M.) and 66.9°F to 73.0°F (PM). In the morning, two (2) measurements were above and six (6) were below the range of 68 to 75°F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during the heating season (wintertime conditions) while in the afternoon seven (7) measurements were below the same recommended range. The average outdoor temperature was 39.7°F (A.M.) and 52.9°F (P.M.).

Relative Humidity

The relative humidity indoors ranged from 15.4 to 25.4 percent (A.M.) and 26.5 to 37.1 percent (P.M.). Fifteen (15) measurements collected in the afternoon were within the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. All other readings were below the recommended range. The outdoor relative humidity averaged 42.3 percent (A.M.) and 36.0 percent (P.M.).

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 520 to 1019 ppm (A.M.) and 535 to 999 ppm (P.M.). All CO_2 measurements collected were below the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The outdoor (background) CO_2 concentrations averaged 494 ppm (A.M.) and 537 ppm (P.M.). Therefore, the maximum acceptable level of CO_2 at this location was 1237 ppm (background level + 700 ppm). The highest indoor level was measured in Classroom 504. Levels above the recommended maximum do not indicate a health risk. Carbon dioxide measurements are used as an indicator of available outdoor air. The primary source of CO_2 indoors is occupant respiration. The 2nd and 3rd floors of the school building were not occupied during ATC's assessment.

Carbon Monoxide Concentration

Carbon monoxide concentrations indoors ranged from 0 to 1 ppm. These concentrations were below the ASHRAE guideline of 9 ppm. The outdoor CO concentration was 0 ppm.

Respirable Particulates ($PM_{2.5}$)

Respirable particulate concentrations* indoors ranged from 21 $\mu g/m^3$ to 42 $\mu g/m^3$ (A.M.) and 30 $\mu g/m^3$ to 78 $\mu g/m^3$ (P.M.). Six indoor measurements collected in the afternoon were above the NPAAQS of 65 $\mu g/m^3$ 24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter. The average $PM_{2.5}$ concentration* for the entire school

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building was approximately 32 $\mu g/m^3$ (A.M.) and 52 $\mu g/m^3$ (P.M.). One (1) A.M. and thirteen (13) P. M. indoor measurements were above the USEPA recommended concentration of 40 $\mu g/m^3$ for sensitive individuals such as asthmatic people and children. The outdoor respirable particulate concentration averaged 54 $\mu g/m^3$ (A.M.) and 99 $\mu g/m^3$ (P.M.).

* The measurements made during this assessment were instantaneous readings, the NPAAQS is a 24-hour average.

TVOC Concentration

TVOCs were not detected (0.0 ppm) anywhere inside or outside the building.

OBSERVATIONS

During this assessment, ATC noted the following:

- The interior of the building appeared clean and free of dust and debris;
- Custodial personnel started buffing the floors after classes finished for the day;
- The school was partially occupied (I.S. 89) at the time of the assessment;
- No smoke odor was detected in the building.

FINDINGS

Based on the real-time measurements, the following findings are presented:

1. Concentrations of CO_2, CO and TVOC were within applicable guidelines;
2. Six (6) of the $PM_{2.5}$ measurements collected in the afternoon were above the NPAAQS of 65 $\mu g/m^3$. One (1) $PM_{2.5}$ measurement collected in the morning and thirteen (13) collected in the afternoon were above the USEPA recommended $PM_{2.5}$ concentration of 40 $\mu g/m^3$ for sensitive individuals and children.
3. In the morning, two (2) measurements of temperature were below and six (6) measurements were above the recommended range. In the afternoon, seven (7) measurements of temperature were below the recommended range;
4. Fifteen (15) indoor measurements of relative humidity in the afternoon were within the ASHRAE recommended range of 30 to 60 percent for occupant comfort. All other measurements were below the recommended range.

It is our pleasure to provide these indoor air quality services to the New York City Board of Education. If you have any questions about this report, please call (212) 353-8280, extension 261 or 212.

Sincerely,
ATC ASSOCIATES INC.

Andreas C. Andreou
Senior Project Manager

Attachment

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