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March 15, 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. 234M
 292 Greenwich Street
 New York, New York 10007
 ATC Project No. 15-19125-0279**

Dear Mr. Orlan:

ATC Associates Inc. (ATC) is pleased to provide this report of indoor air quality (IAQ) measurements collected on March 14, 2002, at the referenced school. The New York City Board of Education (BOE) requested these measurements as part of a program to determine if acceptable indoor air quality is being maintained.

SCOPE OF WORK

ATC conducted this evaluation to assess the basic parameters of temperature, relative humidity, carbon dioxide (CO₂) and carbon monoxide (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 Total Volatile Organic Compounds (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 are based on a visual inspection, real-time environmental measurements and conditions present in the school at the time of the assessment.

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.

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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 (µg/m ³) 24-hour average	USEPA NPAAQS
	40 µg/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

REAL-TIME ENVIRONMENTAL MEASUREMENTS

ATC collected sixty (60) sets of real-time environmental measurements consisting of fifty-one (51) from inside the school building and nine (9) outdoors. All three floors of the school were surveyed. These results are described below.

Field data sheets are found in Attachment 1. Readings began at 2:00 P.M. and concluded after 4:10 P.M.

Temperature

Indoor dry bulb temperature measurements ranged from 70.9 °F to 80.7 °F. Thirty-one (31) measurements were above the range of 68 to 75°F (at 50 percent relative humidity) as recommended by ASHRAE Standard 55-1992 during the heating season (wintertime conditions). The outdoor temperature measurements ranged from 50.3 to 63.1 °F.

Relative Humidity

The relative humidity indoors ranged from 26.3 percent to 31.6 percent. Thirty-six (36) of the measurements were below the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity ranged from 29.8 to 31.6 percent.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 470 ppm to 606 ppm. All of the measurements were within the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The maximum outdoor (background) CO₂ concentration was 421 ppm. Therefore, the maximum acceptable level of CO₂ at this location was 1121 ppm (background level + 700 ppm). The highest measurement was recorded in cafeteria. 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 CO₂ indoors is occupant respiration.

Carbon Monoxide Concentration

Carbon monoxide concentrations indoors were 0 ppm for all readings. These concentrations were below the NPAAQS/ASHRAE guideline of 9 ppm. The outdoor CO concentrations were also 0 ppm.

Respirable Particulates (PM_{2.5})

Respirable particulate concentrations* indoors ranged between 20 µg/m³ to 49 µg/m³. All outdoor and eleven (11) indoor measurements were above the USEPA recommended PM_{2.5} concentration of 40 µg/m³ for sensitive individuals and children. The average PM_{2.5} concentration for the entire school building was approximately 31 µg/m³. This average concentration was below the USEPA recommended concentration for sensitive individuals such as asthmatic people and children. The outdoor respirable particulate concentration ranged from

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46 to 76 $\mu\text{g}/\text{m}^3$ with an average of 53 $\mu\text{g}/\text{m}^3$. One (1) of the outdoor $\text{PM}_{2.5}$ measurement was above the NPAAQS of 65 $\mu\text{g}/\text{m}^3$

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

TVOC Concentration

TVOCs were not detected anywhere inside the building (0.0 ppm). The outdoor TVOC concentration was also 0.0 ppm.

OBSERVATIONS

During this assessment, ATC noted the following:

- The building was occupied at the time of the assessment;
- No smoke odor was detected in the building.

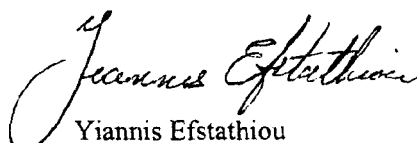
FINDINGS

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

1. Concentrations of CO , CO_2 and TVOCs were within applicable standards and guidelines.
2. One (1) of the outdoor $\text{PM}_{2.5}$ measurement was above the NPAAQS of 65 $\mu\text{g}/\text{m}^3$. All nine (9) outdoor and eleven (11) indoor measurements were above the USEPA recommended $\text{PM}_{2.5}$ concentration of 40 $\mu\text{g}/\text{m}^3$ for sensitive individuals and children.
3. Thirty-six (36) of the measurements of relative humidity were below the ASHRAE recommended range of 30 to 60 percent for occupant comfort.
4. Thirty-one (31) of the temperature measurements were above the range of 68 to 75°F (at 50 percent relative humidity) as recommended by ASHRAE Standard 55-1992 during the heating season (wintertime conditions).

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 211 or 212.

Sincerely,
ATC ASSOCIATES INC.


Yiannis Efstathiou
Project Manager

Attachment

Reviewed by:


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