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September 6, 2002

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

**Re: Indoor Air Quality Assessment
P.S. 42M
71 Hester Street
New York, New York
ATC Project No. 15-19125-0342**

Dear Mr. Orlan:

ATC Associates Inc. (ATC) is pleased to provide this report of indoor air quality (IAQ) measurements collected on September 4, 2002 at the referenced school. The New York City Department of Education (DOE) requested these measurements as part of a program to verify that 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).

Total volatile organic compounds (TVOCs) and respirable particulates were also measured.

Mariana Medinets, Environmental Technician 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.

ATC measured temperature, relative humidity, CO₂ 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).

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 date of the survey and may not represent conditions found at other times. The information presented in this report should be used by the DOE 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 62-2001)*, 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 fifty (50) sets of real-time environmental measurements consisting of forty-eight (48) in the school building and two (2) outdoors. All floors of the school were surveyed. Field data sheets are found in the Attachment. Readings were collected during school hours. The results are described below.

Temperature

Indoor dry bulb temperature measurements ranged from 73.3 to 79.9 °F. Nine (9) of the indoor temperature measurements were above the range of 73 to 79 °F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during the summer season. The outdoor temperature measurements were 78.1 and 79.9 °F.

Relative Humidity

The relative humidity indoors ranged from 49.2 percent to 79.3 percent. Thirty-eight (38) of the indoor measurements for relative humidity were above the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity measurements were 71.4 and 78.8 percent. The high ambient relative humidity likely contributed to the elevated particulate levels reported below.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 494 ppm to 819 ppm. All indoor measurement for CO₂ were below the ASHRAE Standard 62-2001 recommended maximum concentration of <700 ppm above the background level. The average outdoor (background) CO₂ concentration was 535 ppm. Therefore, the maximum acceptable level of CO₂ at this location was 1235 ppm (background level + 700 ppm). 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 ranged from 1 ppm to 3 ppm. These concentrations were below the NPAAQS/ASHRAE guideline of 9 ppm. The outdoor CO concentrations were 2 ppm and 4ppm.

Respirable Particulates (PM_{2.5})

Respirable particulate concentrations* indoors ranged between 81 µg/m³ to 315 µg/m³. All of the indoor measurements collected for PM_{2.5} were above the USEPA recommended concentration of 40 µg/m³ for sensitive individuals such as asthmatic people and children. At the time of ATC's site visit there was construction going on outside the building. The two outdoor respirable particulate concentrations were 232 µg/m³ and 312 µg/m³ with an average of 272 µg/m³. The Dust Trak[®] detects volatile aerosol particles and may be affected by elevated humidity and airborne moisture droplets in addition to dust particles.

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

TVOC Concentration

TVOCs concentrations indoors ranged from 0 ppm to 0.8 ppm. The AIHA guideline for odor control is 1 ppm. The outdoor TVOC concentrations were 1.0 ppm and 1.6 ppm.

OBSERVATIONS

During this assessment, ATC noted the following:

- There was construction going on outside the building;
- The building has no central A/C;
- People observed in only few rooms in the building.

FINDINGS

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

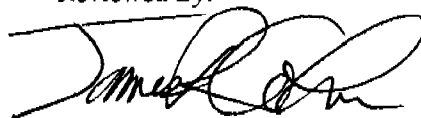
1. Concentrations of CO₂, CO and TVOCs were within applicable standards and guidelines.
2. Nine (9) of the indoor temperature measurements were above the range of 73 to 79 °F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during the summer season. ASHRAE standards do not apply directly to a naturally-ventilated building.
3. Thirty-eight (38) of the indoor measurements for relative humidity were above the ASHRAE-recommended range of 30 to 60 percent for occupant comfort.
4. All of the indoor measurements for PM_{2.5} were above the USEPA recommended concentration of 40 µg/m³ for sensitive individuals such as asthmatic people and children and above the NPAAQS of 65 µg/m³ 24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter. At the time of ATC's site visit there was construction going on outside the building, also the sensitivity of the Dust Trak[®] to high humidity may have influenced these results;
5. One of the outdoor TVOCs measurement was above the AIHA guideline for odor control is 1 ppm.

It is our pleasure to provide these indoor air quality services to the New York City Department 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
Senior Project Manager

Reviewed By:


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

Attachment