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ATC ASSOCIATES INC.

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February 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
Stuyvesant High School (M477)
345 Chambers Street
New York, New York 10007
ATC Project No. 15-19125-0246

Dear Mr. Orlan:

ATC Associates Inc. (ATC) is pleased to provide this report of indoor air quality (IAQ) measurements collected on February 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 (CO_2) and carbon monoxide (CO).

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

Herant Antonyan, 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.

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).

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

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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 one hundred and twenty-one (121) sets of real-time environmental measurements consisting of one hundred and nineteen (119) in the school building and two (2) outdoors. All ten floors of the school were surveyed. These results are described below.

Field data sheets are found in Attachment 1. Readings began at 8:00 A.M. and concluded after 1:40 P.M.

Temperature

Indoor dry bulb temperature measurements ranged from 68.3°F to 73.8°F. All of the measurements were within the range of 68 to 75°F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during the heating season (wintertime conditions). The outdoor temperature range was 46.1 to 47.8 °F.

Relative Humidity

The relative humidity indoors ranged from 23.1 percent to 26.7 percent. All of the measurements were below the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity levels were 36.8 and 37.3 percent.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 518 ppm to 1148 ppm. All of the CO_2 measurements were below the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The outdoor (background) CO_2 concentrations were 529 and 534 ppm. Therefore, the maximum acceptable level of CO_2 at this location was 1234 ppm (background level + 700 ppm). 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.

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 0 to1 ppm.

Respirable Particulates ($PM_{2.5}$)

Respirable particulate concentrations* indoors ranged between 8 $\mu g/m^3$ to 19 $\mu g/m^3$ with an average of approximately 14 $\mu g/m^3$. None of the measurements 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 or the USEPA recommendation of 40 $\mu g/m^3$ for sensitive individuals and children. The outdoor respirable particulate concentrations were 31 and 35 $\mu g/m^3$.

In addition to higher efficiency rating filters on their HVAC units, portable High Efficiency Particulate Air (HEPA) purifiers were placed in Rooms 327, 333, 638 and 740. The $PM_{2.5}$

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concentration range for these rooms was 10 - 16 $\mu g/m^3$ with an average of approximately 13 $\mu g/m^3$.

* 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 interior of the building appeared clean and free of dust and debris;
- 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. Measurements of temperature and concentrations of respirable particulates, CO_2, CO and TVOCs, were within applicable standards and guidelines.
2. All of the measurements of relative humidity were below the ASHRAE recommended range of 30 to 60 percent for occupant comfort.

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.

Yiannis Efstathiou
Project Manager

Reviewed by:

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

Attachment

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