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ATC ASSOCIATES INC.

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April 24, 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 April 23, 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, Environmental Technician, 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 time, operational and work practice variability, variations in indoor air quality parameters and sampling and analytical accuracy.

NYC-WTC_000336263

NYC 9/11 Public Portal Document

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

NYC-WTC_000336264

NYC 9/11 Public Portal Document

REAL-TIME ENVIRONMENTAL MEASUREMENTS

ATC collected one hundred and twenty (120) sets of real-time environmental measurements consisting of one hundred and eighteen (118) 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 1:10 P.M.

Temperature

Indoor dry bulb temperature measurements ranged from 66.3 °F to 74.5 °F. Seventy-two (72) of the measurements for indoor temperature were below and forty-six (46) measurements were within the range of 73 to 79°F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during summer conditions. The outdoor temperature range was 48.4 to 49.2°F.

Relative Humidity

The relative humidity indoors ranged from 27.6 percent to 36.6 percent. Twenty-five (25) of the indoor measurements for relative humidity were below and ninety-three (93) measurements were within the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity levels were 28.1 and 31.2 percent.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 105 ppm to 1189 ppm. Eleven (11) measurements were above the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The outdoor (background) CO_2 concentrations were 362 and 420 ppm. Therefore, the maximum acceptable level of CO_2 at this location was 1120 ppm (background level + 700 ppm). The highest concentration (1189 ppm) was measured in room 1006 at 12:50 PM with 30 occupants. 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 ranged from 0 ppm to 1 ppm. These concentrations were below the NPAAQS/ASHRAE guideline of 9 ppm. The outdoor CO concentrations were 1 ppm for all readings.

Respirable Particulates ($PM_{2.5}$)

Respirable particulate concentrations* indoors ranged between 6 $\mu g/m^3$ to 15 $\mu g/m^3$ with an average of approximately 10 $\mu g/m^3$. All of the indoor measurements for $PM_{2.5}$ were below the NPAAQS of 65 $\mu g/m^3$ 24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter and the USEPA recommendation of 40 $\mu g/m^3$ for sensitive individuals and children. The outdoor respirable particulate concentrations were 10 and 16 $\mu g/m^3$.

NYC-WTC_000336265

NYC 9/11 Public Portal Document

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 $PM_{2.5}$ for these rooms concentration ranged from 6 -14 $\mu g/m^3$ with an average of approximately 10 $\mu g/m^3$.

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

TVOC Concentration

TVOCs inside the building were 0.0 ppm for all readings. The outdoor TVOC concentrations were 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. Concentrations of CO and TVOCs, were below applicable standards and guidelines.
2. Seventy-two (72) of the measurements for indoor temperature were below and forty-six (46) measurements were within the range of 73 to 79°F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during summer conditions.
3. Twenty-five (25) of the indoor measurements for relative humidity were below and ninety-three (93) measurements were within the ASHRAE-recommended range of 30 to 60 percent for occupant comfort.
4. Eleven (11) measurements were above the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The highest concentration (1189 ppm) was measured in room 1006 at 12:50 PM with 30 occupants. 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.
5. All of the indoor measurements for $PM_{2.5}$ were below the NPAAQS of 65 $\mu g/m^3$ 24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter and the USEPA recommendation of 40 g/m^3 for sensitive individuals and children.

NYC-WTC_000336266

NYC 9/11 Public Portal Document

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.

Arnel Javal
Senior Project Manager

Reviewed by:

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

Attachment

NYC-WTC_000336267