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March 22 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
 High School for Leadership & Public Service (M894)
 90 Trinity Place
 New York, New York 10006
 ATC Project No 15-19125-0290**

Dear Mr Orlan

ATC Associates Inc (ATC) is pleased to provide this report of indoor air quality (IAQ) measurements collected on March 21 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).

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 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

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H S for Leadership & Public Service (M894)ATC Project No 15 19125 0290**REAL TIME ENVIRONMENTAL MEASUREMENTS**

ATC collected one hundred and thirty seven (137) sets of real time environmental measurements consisting of one hundred and twenty eight (128) in the school building and nine (9) outdoors. All fourteen floors of the school were surveyed. Field data sheets are found in the Attachment. Readings began at 10 17 A M and concluded after 6 03 P M. The results are described below.

Temperature

Indoor dry bulb temperature measurements ranged from 65.2 °F to 79.2 °F. Ninety six (96) indoor measurements for temperature were above and thirty one (31) 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 55.7 °F to 60.9 °F.

Relative Humidity

The relative humidity indoors ranged from 25 percent to 34.2 percent. Ninety nine (99) of the indoor measurements for relative humidity were below and twenty nine (29) were within the ASHRAE recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity range was 25.1 to 29.9 percent.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 436 ppm to 1233 ppm. One of the indoor measurements for CO₂ was above the ASHRAE Standard 62 1999 recommended maximum concentration of <700 ppm above the background level. The outdoor (background) CO₂ concentration was 468 ppm. Therefore the maximum acceptable level of CO₂ at this location was 1168 ppm (background level + 700 ppm). The highest reading (1233 ppm) was measured in room 815 at 2 42 PM with 38 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 CO₂ indoors is occupant respiration.

Carbon Monoxide Concentration

Carbon monoxide concentrations indoors ranged from 1 ppm to 2 ppm. These concentrations were below the NPAAQS/ASHRAE guideline of 9 ppm. The outdoor CO concentrations ranged from 3 ppm to 5 ppm.

Respirable Particulates (PM_{2.5})

Respirable particulate concentrations* indoors ranged between 11 µg/m³ to 41 µg/m³ with an average 18 µg/m³. All of the indoor measurements for PM_{2.5} were below the NPAAQS of 65 µg/m³ 24 hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter. One (1) of the one hundred thirty seven (137) instantaneous indoor readings was above the USEPA recommended concentration of 40 µg/m³ for sensitive individuals such as asthmatic people and children. The outdoor respirable particulate concentrations ranged from 71 µg/m³ to 96 µg/m³ with an average of 87 µg/m³. All of the outdoor measurements were above the NPAAQS of 65 µg/m³ 24 hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter and the USEPA

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recommended concentration for sensitive individuals such as asthmatic people and children of 40 $\mu\text{g}/\text{m}^3$

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

TVOC Concentration

The TVOCs concentrations were 0 ppm inside the building These concentrations were below the AIHA guideline for odor control of 1 ppm The outdoor TVOC concentration was also 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 Ninety six (96) indoor measurement for temperature were above and thirty one (31) 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)
- 3 Ninety nine (99) of the indoor measurements for relative humidity were below and twenty nine (29) were within the ASHRAE recommended range of 30 to 60 percent for occupant comfort
- 4 One of the indoor measurements for CO₂ was above the ASHRAE Standard 62 1999 recommended maximum concentration of <700 ppm above the background level The highest reading (1233 ppm) was measured in room 815 at 2 42 PM with 38 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 CO₂ indoors is occupant respiration
- 5 All of the indoor measurements for PM_{2.5} were below the NPAAQS of 65 $\mu\text{g}/\text{m}^3$ 24 hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter One (1) of the one hundred thirty seven (137) instantaneous indoor readings was above the USEPA recommended concentration of 40 $\mu\text{g}/\text{m}^3$ for sensitive individuals such as asthmatic people and children All of the outdoor measurements were above the NPAAQS of 65 $\mu\text{g}/\text{m}^3$ 24 hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter and the USEPA recommended concentration for sensitive individuals such as asthmatic people and children of 40 $\mu\text{g}/\text{m}^3$

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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 336 or 212

Sincerely

ATC ASSOCIATES INC

A handwritten signature in black ink, appearing to read 'Arnel Java', is positioned above the printed name.

Arnel Java
Senior Project Manager
Attachment