



104 East 25th
 New York, New York 10010
 www.atc-enviro.com
 212.353.8200
 Fax 212.353.8300

February 4, 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
 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 February 1, 2002, at the referenced school. The New York City Board of Education (BOE) requested these measurements to evaluate air quality in the school building prior to re-occupancy.

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 (PM_{2.5}) were also measured.

Mr. Jimmy Choy, 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, 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).

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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. 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 (50) inside the school building and ten (10) outdoors. All three floors of the school were surveyed. Field data sheets are found in the Attachment. Readings began at 11:00 A.M. and concluded after 3:00 P.M. The results are described below.

Temperature

Indoor dry bulb temperature measurements ranged from 61.9 °F to 68.3 °F. Only two (2) 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 44.0 to 50.8 °F.

Relative Humidity

The relative humidity indoors ranged from 33.0 percent to 45.2 percent. All measurements were within the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity range was 43.9 to 47.6 percent.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 512 ppm to 1202 ppm. All CO₂ measurements were below the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The maximum outdoor (background) CO₂ concentration was 545 ppm. Therefore, the maximum acceptable level of CO₂ at this location was 1245 ppm (background level + 700 ppm). Seven indoor locations had CO₂ levels greater than 1000 ppm with few or no occupants. The highest reading (1202 ppm) was in Room 311 which had 10 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. The school building during ATC's assessment was not occupied.

Carbon Monoxide Concentration

Carbon monoxide concentrations indoors were 0-1 ppm for all readings. These concentrations were below the NPAAQS/ASHRAE guideline of 9 ppm. The outdoor CO concentration range was 0-2 ppm.

Respirable Particulates (PM_{2.5})

Respirable particulate concentrations* indoors ranged between 19 µg/m³ to 60 µg/m³. All measurements were below the NPAAQS of 65 µg/m³ 24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter. Thirty-seven (37) were below the USEPA recommended concentration of 40 µg/m³ for sensitive individuals / children. The average PM_{2.5} concentration for the entire school building was approximately 35 µg/m³. The outdoor respirable particulate concentration range was 53 to 90 µg/m³.

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- * 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 by staff at the time of the assessment;
- There was a lot of activity (e.g. moving) in the building;
- No smoke odor was detected in the building.

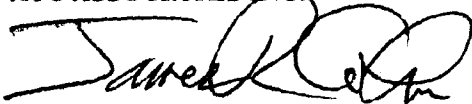
FINDINGS

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. All measurements of PM_{2.5} were below the NPAAQS of 65 ug/m³; Thirteen (13) measurements were above the EPA recommended level of 40 ug/m³;
3. All indoor measurements of relative humidity were within the ASHRAE-recommended range of 30 to 60 percent for occupant comfort;
4. All but two (2) temperature measurements were below the range of 68 to 75° F (at 50 percent relative humidity) 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 261 or 212.

Sincerely,
ATC ASSOCIATES INC.



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

Attachment