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May 13, 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  
 292 Greenwich Street  
 New York, New York 10007  
 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 May 10, 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<sub>2</sub>) and carbon monoxide (CO) with a Q-Trak® Model 8551, manufactured by TSI, Inc.

ATC measured concentrations of respirable particulates (PM<sub>2.5</sub>) with a Dust-Trak® Aerosol Monitor Model 8520, manufactured by TSI, Inc.

ATC measured concentrations of Total Volatile Organic Compounds (TVOCs) using a RAE Systems, Inc. MiniRAE® photoionization detector (PID).

Mr. Kevin Fitzpatrick, 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.

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 <sub>2</sub> )            | <700 parts per million (ppm) above background level                       | ASHRAE 62                                                 |
| Carbon Monoxide (CO)                         | 9 ppm                                                                     | ASHRAE 62 (adopted from USEPA NPAAQS)                     |
| Respirable Particulates (PM <sub>2.5</sub> ) | 65 micrograms per cubic meter of air (µg/m <sup>3</sup> ) 24-hour average | USEPA NPAAQS                                              |
|                                              | 40 µg/m <sup>3</sup> 24-hour average                                      | USEPA – recommendation for children/sensitive individuals |
| Temperature                                  | Summer: 73-79°F at 50% RH<br>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-one (51) from inside the school building and nine (9) outdoors. All three floors of the school were surveyed. These results are described below.

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Field data sheets are found in Attachment 1. Readings began at 2:00 P.M. and concluded after 4:15 P.M.

#### Temperature

Indoor dry bulb temperature measurements ranged from 70.3 °F to 76.1°F. Three (3) indoor measurements for temperature were below the range of 73 to 79°F (at 50 percent relative humidity) as recommended by ASHRAE Standard 55-1992 during the summer season. The outdoor temperature measurements ranged from 68.0 to 74.3 °F.

#### Relative Humidity

The relative humidity indoors ranged from 32.5 percent to 50.3 percent. All indoor measurements for relative humidity were within the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity ranged from 28.7 to 52.9 percent.

#### Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 820 ppm to 1648 ppm. Three (3) of the measurements were above the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The maximum outdoor (background) CO<sub>2</sub> concentration was 609 ppm. Therefore, the maximum acceptable level of CO<sub>2</sub> at this location was 1309 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<sub>2</sub> 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<sub>2.5</sub>)

Respirable particulate concentrations\* indoors ranged between 8 µg/m<sup>3</sup> to 50 µg/m<sup>3</sup> with an average approximately 16 µg/m<sup>3</sup>. All measurements collected indoors for respirable particulate concentrations were below the NPAAQS 65 µg/m<sup>3</sup> 24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter. One (1) indoor measurement was above the USEPA recommended concentration of 40 µg/m<sup>3</sup> for sensitive individuals and children. The outdoor respirable particulate concentration ranged from 12 µg/m<sup>3</sup> to 98 µg/m<sup>3</sup> with an average of approximately 23 µg/m<sup>3</sup>.

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

#### TVOC Concentration

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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 building was occupied at the time of the assessment;
- No smoke odor was detected in the building.

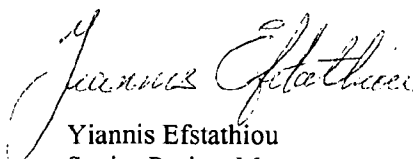
**FINDINGS**

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

1. Concentrations of CO and TVOCs were below applicable standards and guidelines.
2. Three (3) indoor measurements for temperature were below the range of 73 to 79°F (at 50 percent relative humidity) as recommended by ASHRAE Standard 55-1992 during the summer season.
3. All indoor measurements for relative humidity were within the ASHRAE-recommended range of 30 to 60 percent for occupant comfort.
4. All measurements collected indoors for respirable particulate concentrations were below the NPAQS 65  $\mu\text{g}/\text{m}^3$  24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter. One (1) indoor measurement was above the USEPA recommended concentration of 40  $\mu\text{g}/\text{m}^3$  for sensitive individuals and children.
5. Three (3) CO<sub>2</sub> measurements were above the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level.

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.**



Yiannis Efstathiou  
Senior Project Manager

Reviewed by:



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

Attachment