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September 10, 2002

Mr. Bernard P. Orlan  
Director, Environmental Health & Safety  
New York City Department of Education  
28-11 Queens Plaza North  
Long Island City, NY 11101-4008

**Re: Indoor Air Quality Assessment  
Murray Bergtraum H.S. (M520)  
411 Pearl Street  
New York, New York  
ATC Project No. 15-19125-0351**

Dear Mr. Orlan:

ATC Associates Inc. (ATC) is pleased to provide this report of indoor air quality (IAQ) measurements collected on September 9, 2002 at the referenced school. The New York City Department of Education (DOE) requested these measurements as part of a program to verify that 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).

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

Mark Nakhumovich, 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, CO<sub>2</sub> and CO with a Q-Trak<sup>®</sup> Model 8551, manufactured by TSI, Inc.

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

ATC measured concentrations of TVOCs using a RAE Systems, Inc. MiniRAE<sup>®</sup> 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 date of the survey and may not represent conditions found at other times. The information presented in this report should be used by the DOE 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 62-2001)*, 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

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### REAL-TIME ENVIRONMENTAL MEASUREMENTS

ATC collected fifty (50) sets of real-time environmental measurements consisting of forty-eight (48) in the school building and two (2) outdoors. All floors of the school were surveyed. Field data sheets are found in the Attachment. Readings were collected during school hours. The results are described below.

#### Temperature

Indoor dry bulb temperature measurements ranged from 72.0 to 76.4 °F. Six (6) of the indoor temperature measurements were below the range of 73 to 79 °F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during the summer season. The outdoor temperature measurements were 75.7 and 82.7 °F.

#### Relative Humidity

The relative humidity indoors ranged from 47.9 percent to 76.1 percent. Twelve (12) of the indoor measurements for relative humidity were above the ASHRAE-recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity measurements were 58.4 and 58.7 percent. The high ambient relative humidity likely contributed to the elevated particulate levels reported below.

#### Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 636 ppm to 1396 ppm. One (1) of indoor measurement for CO<sub>2</sub> was above the ASHRAE Standard 62-2001 recommended maximum concentration of <700 ppm above the background level. The average outdoor (background) CO<sub>2</sub> concentration was 681 ppm. Therefore, the maximum acceptable level of CO<sub>2</sub> at this location was 1381 ppm (background level + 700 ppm). 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 1 ppm to 2 ppm. These concentrations were below the NPAAQS/ASHRAE guideline of 9 ppm. The outdoor CO concentrations were 2 ppm and 3ppm.

#### Respirable Particulates (PM<sub>2.5</sub>)

Respirable particulate concentrations\* indoors ranged between 33 µg/m<sup>3</sup> to 96 µg/m<sup>3</sup>. Forty-five (45) of the indoor measurements collected for PM<sub>2.5</sub> were above the USEPA recommended concentration of 40 µg/m<sup>3</sup> for sensitive individuals such as asthmatic people and children. The two outdoor respirable particulate concentrations were 182 µg/m<sup>3</sup> and 65 µg/m<sup>3</sup> with an average of 124 µg/m<sup>3</sup>. The Dust Trak<sup>®</sup> detects volatile aerosol particles and may be affected by elevated humidity and airborne moisture droplets in addition to dust particles.

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

### TVOC Concentration

TVOCs concentrations indoors ranged from 0.0 ppm to 0.1 ppm. The AIHA guideline for odor control is 1 ppm. The outdoor TVOC concentrations were 0.2 ppm and 0.1 ppm.

### OBSERVATIONS

During this assessment, ATC noted the following:

- The building has no central A/C;
- The school was occupied;

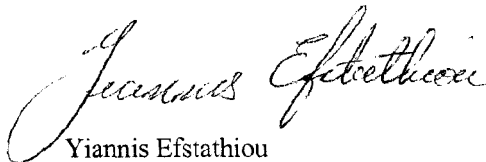
### FINDINGS

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

1. Concentrations of CO and TVOCs were within applicable standards and guidelines.
2. Six (6) of the indoor temperature measurements were below the range of 73 to 79 °F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during the summer season. ASHRAE standards do not apply directly to a naturally-ventilated building.
3. Twelve (12) of the indoor measurements for relative humidity were above the ASHRAE-recommended range of 30 to 60 percent for occupant comfort.
4. Forty-five (45) of the indoor measurements for PM<sub>2.5</sub> were above the USEPA recommended concentration of 40 µg/m<sup>3</sup> for sensitive individuals such as asthmatic people and children and above the NPAAQS of 65 µg/m<sup>3</sup> 24-hour average concentration of particulate matter 2.5 micrometers or less in aerodynamic diameter.
5. One (1) of indoor measurement for CO<sub>2</sub> was above the ASHRAE Standard 62-2001 recommended maximum concentration of <700 ppm above the background level.

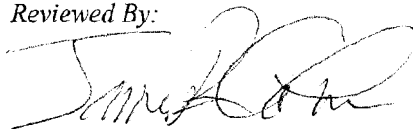
It is our pleasure to provide these indoor air quality services to the New York City Department of Education. If you have any questions about this report, please call (212) 353-8280, extension 211 or 212.

Sincerely,  
ATC ASSOCIATES INC.



Yiannis Efstathiou  
Senior Project Manager

Reviewed By:



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

Attachment