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October 12, 2001

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 H.S. (M477)
345 Chambers St.
New York, New York
ATC Project No. 15-19125-0246**

Dear Mr. Orlan:

ATC Associates Inc. (ATC) is pleased to provide this report of an indoor air quality (IAQ) assessment conducted on October 11, 2001, at the referenced school. The New York City Board of Education (BOE) requested this assessment 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.

Tenzin Namgyal and Wagdi Abdelshahid, Industrial Hygienists, 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 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 assessments were 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 air contaminant concentrations, 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 Board of Education 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	USEPA NPAAQS (as cited in ASHRAE 62)
Respirable Particles (PM ₁₀)	50 micrograms per cubic meter of air (µg/m ³)	USEPA NPAAQS (as cited in ASHRAE 62)
Temperature	Summer: 73-78.5°F at 50% RH Winter: 69-76°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

SAMPLING RESULTS

REAL-TIME ENVIRONMENTAL MEASUREMENTS

ATC collected ninety-six (96) sets of real-time environmental measurements consisting of ninety-four (94) in the school building and two (2) outdoors. These results are described below. Field data sheets are found in Attachment 1.

Temperature

Indoor dry bulb temperature measurements ranged from 70.3 °F to 80.3 °F. Forty-two measurements (44%) were above the range of 69 to 76°F (at 50 percent relative humidity) recommended by ASHRAE Standard 55-1992 during the heating season (wintertime conditions). These readings were on the 6th, 7th, 8th, 9th and 10th floors. The outdoor temperature range was 69.0 to 71.4°F.

Relative Humidity

The relative humidity indoors ranged from 48.3 percent to 61.9 percent. The 61.9% level was in Room 305, all other measurements were within ASHRAE's recommended range of 30 to 60 percent for occupant comfort. The outdoor relative humidity range was 51.2 to 59.9 percent.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 449 ppm to 1830 ppm. Fourteen (14) CO₂ measurements were at or above the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The outdoor (background) CO₂ concentration was 365 ppm. Therefore, the acceptable level of CO₂ at this location was 1065 ppm (background level + 700 ppm). Rooms with high CO₂ levels were found on all floors except the 9th floor. 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 were 0 – 1 ppm for all readings. These concentrations were below the NPAAQS/ASHRAE guideline of 9 ppm. The outdoor CO concentration was 0 – 2 ppm.

Respirable Particulates

Respirable particulate concentrations indoors ranged between 18 µg/m³ and 43 µg/m³. All concentrations were below the NPAAQS/ASHRAE guideline of 50 µg/m³ (annual average concentration of particulate matter 10 micrometers or less in aerodynamic diameter). The outdoor respirable particulate concentration range was 33 to 42 µg/m³.

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TVOC Concentration

TVOC concentrations indoors were 0.0 ppm for all readings. These concentrations were below the AIHA guideline of 1 ppm for non-industrial buildings. The outdoor TVOC concentration was also 0.0 ppm.

OBSERVATIONS

During this assessment, ATC noted the following:

- All the windows in the building were closed, except for windows in Rooms 736 & 833;
- The interior of the building appeared clean and free of dust and debris;
- The building was occupied at the time of the assessment;
- A smoke odor was detected in the main entrance lobby. The same odor was detected outdoors.

FINDINGS

Based on the visual inspection of the occupied spaces and real-time measurements, the following findings are presented:

1. Measurements of relative humidity and concentrations of CO, TVOCs and respirable particulates were within applicable standards and guidelines.
2. Fourteen CO₂ measurements were above the range recommended by ASHRAE 62-1999. All others were below the recommended maximum concentration.
3. Forty-two temperature measurements, on the 6th – 10th floors, were above the range recommended by ASHRAE 55-1992.

CONCLUSION

Based on our observations and measurements, ATC concludes that the assessed locations were suitable for occupancy at the time of ATC's investigation. Some individuals may find the temperature in some rooms to be uncomfortable.

RECOMMENDATIONS

Based on the findings and conclusions above, ATC recommends the following:

- Keep CO₂ levels and temperatures within established guidelines by using adequate ventilation;
- Dissipate odors through increased natural/mechanical ventilation;
- Conduct timely follow-up monitoring/inspection to ensure that recommendations were effective.

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It is our pleasure to provide these indoor air consultative 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.

A handwritten signature in black ink, appearing to read 'James R. Cohn', is written over a horizontal line.

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

Attachments