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ATC ASSOCIATES INC.

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October 19, 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 High School (M477)
345 Chambers Street
New York, New York 10007
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 18, 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 (CO_2) 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, CO_2 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 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 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 ($\mu g/m^3$)	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

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SAMPLING RESULTS

REAL-TIME ENVIRONMENTAL MEASUREMENTS

ATC collected one hundred and five (105) sets of real-time environmental measurements consisting of one hundred and three (103) 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 79.0 °F. Eight (8) measurements 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 1st, 2nd, 4th, 5th and 6th floors. The outdoor temperature range was 51.4 to 60.9 °F.

Relative Humidity

The relative humidity indoors ranged from 24.0 percent to 45.1 percent. Seventy-four (74) measurements were below the ASHRAE's recommended range of 30 to 60 percent for occupant comfort. These readings were collected throughout the school building. The outdoor relative humidity range was 24.0 to 48.0 percent.

Carbon Dioxide Concentration

Carbon dioxide concentrations indoors ranged from 419 ppm to 2498 ppm. Ten (10) CO_2 measurements were above the ASHRAE Standard 62-1999 recommended maximum concentration of <700 ppm above the background level. The outdoor (background) CO_2 concentration was 349 ppm. Therefore, the acceptable level of CO_2 at this location was 1049 ppm (background level + 700 ppm). Rooms with high CO_2 levels were found on the 2nd, 3rd, 4th, 5th, 6th, 7th and 10th floors. 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_2 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 ppm.

Respirable Particulates

Respirable particulate concentrations indoors ranged between 4 $\mu g/m^3$ and 26 $\mu g/m^3$. All concentrations were below the NPAAQS/ASHRAE guideline of 50 $\mu g/m^3$ (annual average concentration of particulate matter 10 micrometers or less in aerodynamic diameter). The outdoor respirable particulate concentration range was 9 to 14 $\mu g/m^3$.

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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 231, 233, 638 & 1004;
- 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 visual inspection of the occupied spaces and real-time measurements, the following findings are presented:

1. Concentrations of CO, TVOCs and respirable particulates were within applicable standards and guidelines.

2. Ten CO_2 measurements were above the range recommended by ASHRAE 62-1999. All others were below the recommended maximum concentration.

3. Eight temperature measurements, on the 3rd, 8th and 9th floors, were slightly below the range recommended by ASHRAE 55-1992.

4. Seventy-four relative humidity measurements were below 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 or relative humidity in some rooms to be uncomfortable. The elevated CO2 levels indicate the need for increase outdoor air.

RECOMMENDATIONS

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

- Keep CO_2 levels and temperatures within established guidelines by using adequate 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.

Andreas C. Andreou
Senior Project Manager

Reviewed by:

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

Attachments

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