Cardno ATC
Shaping the Future

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December 26, 2012

Mr. Bernard P. Orlan
Director, Environmental Health & Safety
New York City Department of Education
44-36 Vernon Boulevard
Long Island City, NY 11101

Subject: **Limited Indoor Air Quality Assessment**
P.S. 288 K
2950 West 25th Street
Brooklyn, NY 11224

Dear Mr. Orlan:

CARDNO ATC is pleased to provide this report of limited Indoor Air Quality (IAQ) Assessment conducted on December 26, 2012 at the above referenced school. The New York City Department of Education (DOE) requested this assessment to evaluate the air quality in the school subsequent to hurricane Sandy. CARDNO ATC was accompanied by the custodian during the assessment.

SUMMARY

According to the school's custodian, the school's basement was flooded during the hurricane Sandy. The oil tank was rupture. The water flooded the 1st floor up to 1 foot. Flooded water was pumped out. The basement and cross base were cleaned. All water damage / wet furniture and supplies were discarded. The heat was supplied to the school with temporary boiler, while electricity is connected to Con Ed lines. The IAQ testing in the school was acceptable at the time of the assessment.

SCOPE OF WORK

CARDNO ATC conducted this evaluation to assess the indoor air quality in the school, in accordance with the attached work order. CARDNO ATC measured general IAQ and comfort parameters of temperature, relative humidity, carbon monoxide (CO), and carbon dioxide (CO_2) using a Q-Trak model 7565x indoor air quality meter, manufactured by TSI, Inc. Total volatile organic compounds (TVOC) concentrations were measured using a mini-RAE photoionization detector, equipped with a 10.6 eV

lamp, manufactured by RAE Systems. Concentrations of particulate matter, with an aerodynamic diameter of 10 micrometers (PM_{10}) were measured using a DustTrak aerosol monitor, also manufactured by TSI. Relative moisture contents of building materials were tested using a DELMHORST® moisture meter.

EVALUATION CRITERIA

Currently, no regulatory agency (e.g. OSHA, EPA) has promulgated standards for indoor air quality parameters in non-industrial buildings, such as offices and schools. For the real-time data collected, ATC uses the guidelines cited in the following publications:

- *Thermal Environmental Conditions for Human Occupancy (*ASHRAE 55-2004), American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE);
- *Ventilation for Acceptable Indoor Air Quality* (ASHRAE 62.1-2004);
- *Industrial Hygienists Guide to Indoor Air Quality Investigations (1993)*, American Industrial Hygiene Association (AIHA);

Temperature and Relative Humidity
Table 1 presents recommended temperatures ranges intended to provide thermal comfort for 80% of occupants in a typical office space, as defined in the Standard.

Table 1. Acceptable Temperature Ranges at Indicated Relative Humidity

Typical Office Space Activity, Adopted From ASHRAE 55-2004		
Relative Humidity	**Temperature: Cooling Season**	**Temperature: Heating Season**
10%	77-83°F	71-78°F
20%	76-82°F	70-78°F
30%	76-82°F	69-77°F
40%	76-81°F	69-77°F
50%	75-80°F	68-76°F
60%	75-78°F	68-75°F
70%	- -	67-73°F

ASHRAE 55-2004 does not provide recommendations for maintaining indoor relative humidity within a specific range; however, ASHRAE 62.1-2004 indicates a recommended maximum relative humidity level of 65% in indoor environments equipped with air-conditioning systems with dehumidification technology.

Carbon Monoxide, Particulate Matter and Total Volatile Organic Compounds
Carbon monoxide (CO) usually originates from outside the building from such sources as automotive traffic and loading docks. Internal sources include cigarette smoke, boilers and furnaces. The most common sources of PM_{10} in indoor air are cigarette smoke, internal combustion engines, wood stoves, incinerators (smoke drawn in through HVAC systems) and the abrading of building materials. The EPA National Primary Ambient Air Quality Standards (NPAAQS) for CO and PM have been adopted and

presented in ASHRAE 62.1-2004 as the recommended limits for generally accepted indoor air quality conditions. In addition to the recommended limits, significant short-term increases of CO should not be noted indoors at any time.

Total volatile organic compounds (TVOC) include a wide variety of organic compounds, which may exist in the indoor air. Concentrations of TVOC measured in indoor air are often significantly higher than outdoors. Some potential sources of TVOC indoors include fragrances, cleaning products, and biological activities. Concentrations of TVOC in non-industrial indoor environments are usually orders of magnitude below any regulatory levels. However, some TVOCs may be present above their human odor thresholds (e.g., perfumes, cleaning solutions). Table 2 lists the target guidelines for CO, PM_{10}, and TVOC.

Table 2. Target indoor air quality guideline concentrations of carbon monoxide (CO), PM_{10}, and total volatile organic compounds (TVOC).

Parameter	Target Level	Agency or Organization
CO	9 part per million (ppm) 8-hour average 35 ppm 1-hour average	ASHRAE 62 (adopted from USEPA NPAAQS)
PM_{10}	150 micrograms per cubic meter of air ($\mu g/m^3$) 24-hour average	ASHRAE 62 (adopted from USEPA NPAAQS)
TVOC	1 ppm	AIHA

USEPA NPAAQS = United States Environmental Protection Agency National Primary Ambient-Air Quality Standard
AIHA = American Industrial Hygiene Association (AIHA).

Carbon Dioxide

CO_2 is normal constituent in the air, and is also a product of human respiration. During periods of occupancy, CO_2 levels indoors will rise above the normal background level. ASHRAE 62.1-2004 prescribes recommended CO_2 concentration limits based on space size, use (e.g., general office, classroom, etc.), and occupancy level. The Standard does not specifically define a recommended maximum CO_2 concentration in an occupied space, however, Appendix C of ASHRAE 62.1-2004 suggests CO_2 concentrations should be maintained near or below 700 parts per million (ppm) above background (outdoor) levels during steady state conditions.

Meeting one, some, or all of the listed values does not assure that acceptable indoor air quality will be achieved at all times. In addition to the listed evaluation criteria, ATC assesses the site for evidence of visible mold and water damage.

SAMPLING RESULTS

On December 26, 2012 ATC observed the general conditions and collected thirty eight (38) sets of measurements of general IAQ and comfort parameters in randomly selected rooms in the school. One set of readings were collected outdoors for comparison reasons. The tested parameters results were acceptable at the time of the assessment. See attachments for IAQ field report.

FINDINGS & OBSERVATIONS

During the site visit, conducted on December 26, 2012 CARDNO ATC noted the following:

- The school is three stories and a basement. The school is naturally ventilated;
- Electricity and heat were restored in the school by temporary generator and boiler;
- The school's rooms have plaster walls;
- The plaster walls in the1st floor rooms were 0.0 %to 100% wet up to 1 feet when tested for moisture contents;
- No mold growth was observed in the assessed locations,
- Restoration activities like painting, replacing floor tiles, general cleaning activities were taking place in the school during the visit;
- A mixed odor of painting, waxing, and cleaning products was detected in working areas of the 1st floor. Also construction dust was also observed in working areas and hallway of the 1st floor;
- The IAQ testing parameters were acceptable in the school for occupancy at the time of the assessment ;
- The outdoors measurements were within the normal values.

RECOMMENDATIONS

Based on the findings, CARDNO ATC recommends:

- Cleaning working areas and hallways subsequent to the completion of restoration work;
- Increase Natural / mechanical ventilation in the working areas to dissipate any odor;
- In the 1st floor, if any discoloration occurs, mold growth was suspected, and / or unusual odor was detected, inform authorities for professional evaluation.

Limitations

The results of this survey represent conditions found on the date of the survey and may not represent conditions found at other times. Additionally, this assessment was limited with respect to the specific parameters indicated above and should not be construed to be a comprehensive evaluation or a definitive representation of conditions within the school. The information presented in this report is intended to be used as a guide to evaluate the need for further investigation or the need for modifications to current microbial control activities.

CARDNO ATC provided these services consistent with the level and skill customarily exercised by members of the profession currently practicing under similar conditions. This statement is in lieu of other statements either expressed or implied. This report is intended for the sole use of the Department of Education (DOE).

The intent of the report is to aid the building owner, architect, construction manager, general contractors, and potential demolition and abatement contractors in locating fungi growth (mold). This report is not intended to serve as a bidding document nor as a project specification document. The actual site

conditions and quantities should be verified. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of other users, and use or re-use of this document, the findings, conclusions, or recommendations is at the risk of said user. Although a reasonable attempt has been made to identify suspect fungi (mold) in the areas identified, the inspection techniques used are inherently limited in the sense that only full demolition procedures will reveal all building materials of a structure and therefore all areas of potential fungal growth.

Additionally, the passage of time may result in a change in the environmental characteristics at this site. This report does not warrant against future operations or conditions that could affect the recommendations made. The results, findings, conclusions, and recommendations expressed in this report are based only on conditions that were observed during CARDNO ATC's inspection of the Site.

It is our pleasure to provide these consultative services to the New York City Department of Education. If you have any questions about this report, please contact me at (212) 353-8280, extension 298.

Sincerely,

Wagdi Abdelshahid
Industrial Hygienist
for Cardno ATC
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Email: wagdi.abdelshahid@cardno.com

Enc: Attachments

File: 015.19125.1518

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ATTACHMENT 1

IAQ FIELD REPORT DECEMBER 26, 2012

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INDOOR AIR QUALITY FIELD REPORT

CLINT NAME: NYC Department Of Education (DOE)
PROJECT NAME: P.S. 288K
PROJECT ADDRESS: 2950 W 25th St, Brooklyn, NY 11224

DATE: 12/26/12
PROJECT NO: 19125-1518

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	TVOCs (ppb)	Respirable Particulates (µg/m³)
Hallway 1st Floor	67.7	26.0	536	0.0	65	23
Room 151	68.9	24.7	556	0.0	42	18
Exit 2 Foyer	69.7	24.4	579	0.0	58	16
Room 103	71.9	21.7	599	0.0	84	82
Room 105	72.8	20.0	577	0.0	62	64
Room 107	73.0	21.2	528	0.0	44	23
Room 109	73.8	20.1	564	0.0	42	14
Exit 3 Foyer	72.9	19.5	571	0.0	113	61
Cafeteria wax	72.1	18.1	590	0.0	214	43
Teacher Lounge wax	68.6	23.1	549	0.0	211	24
Room 154 MEN locker	68.9	26.1	562	0.0	114	26
Room 139	70.9	28.4	589	0.0	345	28
G.O 145	71.0	25.7	538	0.0	82	14

Signature: [signature]. Date: 12/26/12

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DATE: 12/26/12
PROJECT NO: 19125-1518

Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	TVOCs (ppb)	Respirable Particulates (µg/m³)
stair D	69.3	21.9	556	0.0	16	32
Hallway 2nd Floor	68.9	29.8	668	0.0	15	28
Room 245	69.0	30.4	731	0.0	12	14
Auditorium	68.6	31.5	569	0.0	14	16
Room 247	69.1	30.4	519	0.0	9	12
Room 251	69.5	29.9	501	0.0	0.0	11
Room 203	69.8	29.1	496	0.0	0.0	14
Room 207	70.4	27.6	497	0.0	0.0	10
Room 215	70.7	25.9	566	0.0	0.0	9
GYM	68.0	26.9	865	0.0	0.0	12
Room 219	68.2	25.0	530	0.0	0.0	10
Room 223	68.6	26.0	501	0.0	0.0	9
Library 229	69.1	31.9	557	0.0	0.0	14

Signature: _____. Date: 12/26/12

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Location	Temperature (°F)	Relative Humidity (%)	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	TVOCs (ppb)	Respirable Particulates (µg/m³)
staircase C	68.5	30.9	516	0.0	0.0	11
Room 323	67.8	33.9	487	0.0	0.0	9
Room 317	67.9	30.5	514	0.0	0.0	12
Room 309	68.2	31.1	531	0.0	0.0	12
Room 305	69.9	30.3	496	0.0	0.0	8
Room 303	70.1	29.5	517	0.0	0.0	14
stair case A	70.2	29.6	520	0.0	0.0	12
Room 353	70.0	28.6	551	0.0	0.0	12
Room 349	70.2	29.3	552	0.0	0.0	11
Room 345	69.7	28.9	506	0.0	0.0	14
Room 339	69.6	28.7	540	0.0	0.0	9
Room 333	69.9	32.5	505	0.0	0.0	11
outdoors	37.2	25.6	480	0.0	0.0	56

Signature: [signature]. Date: 12/26/12