

**INDOOR AIR QUALITY  
INVESTIGATION  
at  
Lindenhurst UFSD  
Harding Avenue Elementary School  
2 Harding Avenue  
Lindenhurst, NY 11757**

**For**  
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## TABLE OF CONTENTS

- I INTRODUCTION
- II DISCUSSION
- III AIR SAMPLING
- IV CONCLUSIONS
- V RECOMMENDATIONS

## APPENDICES

- A TEST DATA
- B AIRFLOW AROUND BUILDINGS

## **I. INTRODUCTION**

ECG was retained by the Lindenhurst UFSD to perform an investigation at the Harding Avenue Elementary School, located at 2 Harding Avenue, Lindenhurst, NY. The investigation was prompted by staff complaints of a diesel odor in Classroom 111.

The objective of the site visit was to determine the level of combustion products in Classroom 111. Sheila Bubka, a certified industrial hygienist (CIH), performed the investigation.

## **II. DISCUSSION**

Classroom 111 has had several episodes where flu gasses suspected to be coming from the boiler entered the classroom through air intakes on the uni-vents or other locations. These events occurred when the boiler was using oil rather than gas and when the weather conditions were such that the gases were pushed downward, in a southerly direction toward the classrooms. It is suspected by occupants and school officials that the root cause of the problem is the chimney not being high enough to overcome the building's effect on air flowing above it.

## **III. AIR SAMPLING**

Real-time air monitoring for Carbon Monoxide (CO), Carbon Dioxide (CO<sub>2</sub>), Relative Humidity and Temperature was performed using a TSI 8551 Q-Trac IAQ Monitor. Real-time monitoring for Volatile Organic Compound, Sulfur Dioxide and Nitrogen Dioxide was performed using a MiniRae (see Appendix A for test results). The results of the sampling are described below.

### **A. Carbon Monoxide**

Carbon Monoxide (CO) is a byproduct of incomplete combustion. No carbon monoxide was found during the sampling period.

### **B. Carbon Dioxide**

Carbon Dioxide is an excellent indicator of the relationship between occupancy and ventilation. It has been reported that levels over 1200 parts per million (ppm) are frequently associated with complaints related to building sickness. For occupational exposures, the American Conference of Governmental Industrial Hygienist (ACGIH) allows industrial exposures of 5000 ppm. The Occupational Safety and Health Administration (OSHA) allows occupational exposures up to 5000 ppm. The American Society of Heating and Air Conditioning Engineers (ASHRAE) standard (ASHRAE 62-1981R) suggest a maximum of 1000 ppm or 15 CFM/person in classrooms. This standard merely observes that odors are likely to be acceptable if the space is ventilated at a rate that maintains the CO<sub>2</sub> concentration below 1000 ppm. The State Education Department also has adopted the ASHRAE standard.

The average CO<sub>2</sub> concentration in Classroom 111 was at 542 ppm. The only periods that CO<sub>2</sub> levels were higher than 1200 ppm were at the following times:

- 1/18 from 11:30 AM to 12:30 PM and 2:30 PM to 3:20 PM
- 1/19 at 11:15 AM to 11:30 AM and 2:30 PM to 3:00 PM

The levels found during these periods ranged from 1200 ppm to a maximum of 1693 ppm. These concentrations indicate that an insufficient volume of fresh air is entering the space compared to the number of occupants. ASHRAE and SED Regulations require a minimum of 15 CFM/person of fresh air.

### **C. Temperature & Humidity**

ASHRAE recommends keeping temperatures at a level in which 80% of the occupants will find the environment thermally acceptable called the "comfort zone". The temperature in Classroom 111 was in the low 70's during the occupied time periods.

ASHRAE considers the acceptable range of allowed humidity in an indoor environment to be between 20 and 60 percent for comfort. Very low humidity alone can produce symptoms similar to those associated with chemical exposures. High humidity provides an ideal atmosphere for mold to grow. The relative humidity levels during the occupied hours were between 30 and 40%. The sampling indicated the temperature and humidity levels in Classroom 111 were within the comfort zone.

### **D. Volatile Organic Chemicals**

There were no volatile organic chemicals found during the sampling period

### **E. Nitrogen Dioxide**

Natural gas combustion exhaust contains nitrogen dioxide gas (NO<sub>2</sub>) which can damage lungs. NO<sub>2</sub> is unstable and is usually neutralized or diluted before it pollutes the indoor air.

Levels of NO<sub>2</sub> in Classroom 111 ranged from 0.1 ppm to 0.2 ppm. No standards have been agreed upon for nitrogen oxides in indoor air. ASHRAE and the USEPA National Ambient Air Quality Standards (NAAQS) list 0.053 ppm as the average 24-hour limit for NO<sub>2</sub> in outdoor air. The OSHA standard is 5 ppm for a 15 minute exposure in an occupational setting. The ACGIH TLV is 3ppm for an 8 hour exposure.

The concentrations in the classroom were well below occupational standards and guidelines however these standards are based on the adult "healthy" worker population and not designed for children. The concentration was above the NAAQS. EPA established the NAAQS to protect public health of "sensitive" populations such as people with asthma, children and the elderly.

### **F. Sulfur Dioxide**

The most toxic by-product of oil combustion is sulfur dioxide (SO<sub>2</sub>) which, like NO<sub>2</sub> from gas furnaces, is an acid gas that damages lungs. Fortunately SO<sub>2</sub>, unlike NO<sub>2</sub>, carries a strong odor that makes even small quantities easily detected.

Levels of SO<sub>2</sub> in Classroom 111 ranged from 0.1 ppm to 1.12 ppm. The NAAQS requires SO<sub>2</sub> concentration to be below .14 ppm in any given 24 hour period. The OSHA standard is 5 ppm averaged over an 8 hour work day. The ACGIH recommended exposure limit is 2 ppm over an 8 hour work day

#### **IV. CONCLUSIONS**

The results of air monitoring indicated that all contaminants were below occupational standards and guidelines. The levels of NO<sub>2</sub> and SO<sub>2</sub> were above the NAAQS, which is a standard set for acceptable outdoor air over a 24 hour period. The ambient levels of SO<sub>2</sub> and NO<sub>2</sub> in the Long Island/New York area are below the NAAQS. These results indicate the possibility of NO<sub>2</sub> and SO<sub>2</sub> entering the classroom from combustion sources directly outside or inside the building. The most likely source of these gasses is the boiler exhaust.

#### **V. RECOMMENDATIONS**

In the interim it is recommended that the district change to full time gas for heating and conduct additional monitoring afterward to further evaluate the need for engineering controls.