

Indoor Air Quality Report

Performed at:

**North Elementary School
580 Whetstone Hill Road
Somerset, MA 02726**

Prepared for:

**Somerset School Department
625 County Street
Somerset, MA 02726
Attention: Carlos Campos**

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1.0 INTRODUCTION

As requested by the Town of Somerset School Department, MAC Services, LLC (MAC) completed an Indoor Air Quality (IAQ) evaluation of the North Elementary School located at 580 Whetstone Hill Road in Somerset, MA.

Mr. Joseph Cooney, representing MAC Services, LLC, performed the evaluation between August 19th & 20th, 2020. Mr. Cooney is a Senior Environmental Technician with over 12 years of experience in the Environmental Consulting Industry and has completed dozens of Indoor Air Quality assessments in a diverse range of environments including Child Care Facilities, manufacturing facilities, and large retail buildings, as well as residential buildings. Mr. Cooney was assisted by Field Technician's Brendon Cooney and Brent Rezendes. In conducting this evaluation, MAC performed the following tasks:

- Conducted interview with facility personnel.
- Conducted a visual inspection of the specified interior areas to detect any suspect discoloration of building materials.
- Conducted a visual inspection of the Heating and Ventilation air filtration system.
- Measured Relative Humidity and Temperature.
- Utilized instantaneous reading equipment to obtain data measuring oxygen levels (O), carbon monoxide (CO), hydrogen sulfide (H₂S), Lower Explosive Limit (LEL- methane gases) and over 170 Volatile Organic Compounds (VOC) including but not limited to Formaldehyde, Ethyl Benzene, Tetrachloroethylene, Trichloroethylene, Vinyl Chloride, Carbon Dioxide (CO₂) and Naphthalene (smells like mothballs). Data was collected randomly throughout all areas of the building as well as outdoors. Appendix A presents these Direct Reading Environmental Measurements.
- Conducted a Mold Determination Survey.

2.0 FACILITY DESCRIPTION

The space subject to the IAQ evaluation at 580 Whetstone Hill Road in Somerset, MA appears to be generally in good condition with no obvious breaches in building integrity. The North Elementary School consists of a two-story building. The building is approximately 140,000 square feet in total area. The facility is used to educate students in Kindergarten through Fifth Grade.

The building construction is made up of mostly CMU block as well as gypsum board walls with skim coat plaster. Ceilings are a combination of suspended 2' x 2' ceiling tile and gypsum board with plaster on some areas. The floors are mostly 12" x 12" VCT floor tiles. All materials appear to be homogenous in many areas. Ceramic tile is used in the bathrooms. Mostly non-porous materials used throughout the building.

The Heating and ventilation system is made up of multiple Air Handler units located in multiple Fan rooms throughout the building. There is no Air Conditioning.

3.0 OBSERVATIONS AND DISCUSSION

During the survey the individual rooms were kept isolated by closing the doors. The ventilation system continued to function.

There was no building exterior integrity breakdown observed. No visible signs of mold were noted in any of the areas where sampling took place with the exception of the Boy's Locker room. There were no obvious odors detected. There were no areas of plumbing breakdown observed.

Visual inspection of the Heating and ventilation units resulted with the following observations:

- Records of changes were found in some of the doors to the individual units but were inconsistent.
- Most filter cleanliness levels appeared to be acceptable. One exception was the Fan Room #2, G Unit.
- Based on records observed it appears filter changes are made generally 2 to 3 times per year.

3.1 Occupied space

All areas subject to sampling appeared to be unoccupied in general with a few staff personnel scattered throughout the building.

4.0 DIRECT READING ENVIRONMENTAL MEASUREMENTS

MAC performed direct-reading environmental measurements, utilizing a Multi-Rae Five Gas Meter. Measurements were taken outdoors and at numerous indoor locations. MAC measured oxygen levels as well as hydrogen sulfide, LEL (methane gases), carbon monoxide and multiple volatile organic compounds. Measurements were collected over a period of a single day during the regular daytime school hours and obtained in three, (3), separate rounds of collection taken from the same locations each round. There were a total of Sixty-Seven, (67), samples obtained from Twenty-Three, (23), collection stations throughout the interior. The data collected represents the environmental conditions existing at the time of sampling only.

Appendix 'A' presents direct reading environmental measurements obtained during data collection survey on August 19 and 20, 2020 in the specified areas.

4.1 Oxygen

NIOSH (National Institute for Occupational Safety and Health) defines an oxygen deficient atmosphere containing oxygen levels less than 19.5% and an oxygen-enriched atmosphere as containing more than 23.5%.

Individuals exposed to an atmosphere of less than 19.5% oxygen would exhibit decreased ability to work strenuously, impair coordination and may induce symptoms in persons with coronary, pulmonary, or circulatory problems.

MAC measured the Oxygen levels to be consistently at 20.9%.

4.2 Carbon Monoxide (CO)

Carbon monoxide is an odorless, colorless toxic gas produced by the incomplete combustion of solid, liquid and gaseous fuels. Elevated indoor carbon monoxide concentrations may be a result of combustion sources indoors or the introduction of combustion products from outdoors into the indoor air. In the absence of indoor sources, indoor carbon monoxide concentrations are usually less than, or equal to outdoor concentrations. ASHRAE Standard 62-1999 recommends an upper limit for carbon monoxide of 9 ppm as a 24-hour average, and 35 ppm as a 1-hour average.

MAC measured the concentrations of all samples obtained of CO to be below all upper limit thresholds.

4.3 Hydrogen Sulfide (H₂S)

Hydrogen sulfide is the chemical compound H₂S. This colorless, toxic and flammable gas is responsible for the foul odor of rotten eggs and flatulence. It often results from the bacterial breakdown of sulfates in organic matter in the absence of oxygen, such as in swamps and sewers (anaerobic digestion). Hydrogen Sulfide is a highly toxic and flammable gas. Being heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces. Although very pungent at first, it quickly deadens the sense of smell. The OSHA recommended permissible exposure limit (PEL) for hydrogen sulfide is 20 ppm.

MAC measured the concentrations of all H₂S samples obtained to be within acceptable levels.

4.4 Lower Explosive Limit (LEL)

The Lower Explosive Limit of a gas or vapor, is the limiting concentration (in air) that is needed for the gas to ignite and explode. There are two explosive limits for any gas or vapor, the lower explosive limit and the upper explosive limit (UEL). At concentrations in air below the LEL there is not enough fuel to continue an explosion; at concentrations above the UEL the fuel (gas or vapor) has displaced so much air that there is not enough oxygen to begin a reaction. Concentrations of explosive gases are often reported in terms of percent of lower explosive limit (% LEL). The EPA recommends the action level to be greater than 10%.

MAC measured the LEL % concentrations to be below the EPA recommended action level.

4.5 Volatile Organic Compounds (VOC)

MAC measured for multiple VOC's. There were minimal concentrations of any listed VOC's. The list is extensive and can be furnished upon request. Included in this list is Carbon Dioxide (CO₂). VOC's are components which, at room temperature, may be released from materials or products in the form of gases. The EPA calls for concentrations of less than 100 PPM (parts per million) for the Criteria Air Pollutants as a guidance.

MAC measured the VOC concentrations to be below the recommended acceptable levels. Included in the VOC measurements was Carbon Dioxide (CO₂).

4.6 Relative Humidity (RH)

MAC measured for RH in all the targeted areas.

ASHRAE Standard 62.1-2016 recommends that RH levels be maintained to be less than 65% to lessen the likelihood of mold growth while ASHRAE Standard 55-2013 recommends that RH in a occupied space be generally maintained to be less than 80% as it corresponds with acceptable T levels.

MAC measured the indoor RH to be generally less than 60%.

4.7 Temperature (T)

MAC measured for T in all the targeted areas over a time period of approximately 1 hour and 18 minutes.

ASHRAE Standard 55-2013 recommends that for Thermal Environmental conditions for human occupancy comfort purposes, temperature could be from 67 to 82 degrees (F). This range depends on a number of variables including the occupant's age, clothing worn and activity level.

MAC measured the indoor Temperatures to be consistently 70 degrees (F).

5.0 MOLD ASSESSMENT

5.1 Scope of Work

MAC conducted a mold determination survey including a visual inspection and air sampling for the purpose of determining if elevated levels of mold spore activity exist within the specific areas sampled. A sampling strategy was arrived at by targeting areas most likely to have mold growth based on experience. Those areas are generally where plumbing exists, at windows, and basement levels as well as wherever there may be suspect discoloration on ceilings, walls and floors that were detected during the visual inspection.

The results of Fungal air samples are determined by utilizing a comparative analysis with current conditions outdoors at the time of indoor sampling using Industry Standard guidelines for acceptable levels of mold spore activity. In addition to the outdoor sample, additional samples were collected in the following locations:

- Cafeteria
- Kitchen Work Area
- Laundry Room Area
- Food Storage
- Boys Bathroom
- Preschool Speech Room
- Preschool/Kindergarten #2
- Preschool/Kindergarten #3
- Conference Room
- Garage

- Outside Garage
- Top Floor Gym
- Open Area “G”
- Open Area “H”
- Library
- Open Area “A”
- Open Area “B”
- Main Office
- Speech and Specials
- Open Area “C”
- Open Area “F”
- Open Area “E”
- Outdoors

5.2 Discussion

Fungal bio-aerosol monitoring is the sampling of spores from the air onto a media slide. Utilizing a microscope, the spores are then identified at least to genus and counted. Comparisons with outside levels and types indicate whether pathogenic species have been or have become predominate and at what concentration in a particular area.

All mold samples were analyzed by H2O EnviroComp, an EMPAT (Environmental Microbiology Proficiency Analytical Testing) proficient Laboratory located in West Dennis, MA. This evaluation is limited in scope and reflects the levels of fungal contaminants on the day of sampling. Airborne levels of fungal spores will vary naturally and conditions may change in the future which could promote the growth of mold or create other air quality concerns in the interior environment. The industry standard acceptable level of spore counts for most species of mold is generally (1,000 s/cu m). The acceptable level is more stringent for some species of more harmful species such as Chaetomium, (600 s/ cu m) and Stachybotrys (400 s/cu m).

In addition to the threat mold poses against the structural integrity and value of a property, bacterial / fungal magnification or enhancement within a building can lead to a number of health issues. Associated health risks can include respiratory as well as pulmonary symptoms. Some molds produce mycotoxins which can lead to effects on the neurological system. All types of mold are harmful to health to some degree so deciding on action to be taken should not depend on the type of mold rather the overall concentration level of specific mold spores.

The absence of spores and visible colonies does not always insure that no microbiological colonies exist. Colonies may be hidden and spores released sporadically based on environmental conditions, in particular, humidity levels.

The effects of mold spores depend on a number of variables including the pre-existing health of the occupants, the sensitivity level and age of the inhabitants of the space, as well as the type of mold contaminants and concentration levels of mold spore counts. MAC services utilizes several sources of Industry guidelines when interpreting air sample analytical data, including the EPA (Environmental Protection Agency) and IICRC (Institute of Inspections Cleaning and Restoration Certification) organizations.

5.3 Conclusion

The visual inspection did detect evidence of mold growth in the following areas:

- Ceiling tiles in Boy's Locker room
- Ceiling tile in Girls Bathroom off of Cafeteria
- Bathroom off Kitchen, behind coolers

The analytical results showed elevated levels of the *Aspergillus* / *Penicillium* type mold in the following areas:

- Girls Bathroom off Cafeteria, under stained ceiling tiles
- Bathroom off Kitchen, behind coolers

Note: Please see the attached Laboratory Analytical Report in Appendix B

5.4 Recommendation

To avoid mold growth in the future, any water intrusion must be remedied by repairing immediately and drying out any resulting affected areas within 48 hours. Maintaining humidity levels below 65% and regular maintenance of ventilation system filters will also assist in controlling mold spore activity.

Specific recommendations for the North School are as follows:

- Remove all stained ceiling tiles from both the Boy's Locker room and the Girls Bathroom off the cafeteria area.
- All wall and ceiling sections in the Bathroom near the coolers in the Kitchen with suspect discoloration should be removed and the resulting exposed areas treated with an EPA registered Fungicide to kill all non-visible mold growth.
- All work should be completed using Industry Standard protocol for Mold Remediation related to Worker Protection and work area engineering controls. Post Remediation visual inspection and air sampling is recommended. Only an Insured and Licensed Contractor for Mold Remediation should be used to complete the work.

6.0 IAQ CONCLUSIONS

MAC's conclusions and recommendations are based on visual inspections as well as scientific data obtained and presented in this report.

With regards to all non-mold assessment measurements, there is no scientific evidence apparent that would indicate an unhealthy work environment exists as it relates to Indoor Air Quality (IAQ) in the areas referenced in this document at the time sampling was conducted. All measurements acquired were well within acceptable limits of guideline levels including OSHA, NIOSH and ASHRAE. The levels for the measurables were below the detectable limit.

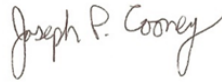
The Heating and Ventilation filter system maintenance and cleaning appeared to be at an acceptable level. Most but not all filters were recently changed and looked appropriately clean. It was unclear, historically, what was changed and when.

7.0 IAQ RECOMMENDATIONS

Continue to maintain the building Heating and ventilation filtration system and document the maintenance activities as they take place. MAC recommends increasing the filter changes to every Three months and always vacuum the filter area do not blow it out. The filter change dates should be recorded, kept in a digital file and checked for completion after each change period using a summary list of all existing units to ensure none are unintentionally missed. One person should be responsible of ensuring all maintenance is being completed and properly recorded for the North school.

Any water intrusion events should be remedied within 48 hours of occurrence.

This report submitted by:



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