

INDOOR AIR QUALITY ASSESSMENT MOLD INVESTIGATION

**Miscoe Hill School
148 North Street
Mendon, Massachusetts**



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
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Background/Introduction

At the request of a parent, the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health (BEH) provided assistance and consultation regarding indoor air quality concerns at the Miscoe Hill School (MHS), located at 148 North Street, Mendon, Massachusetts. Concerns of possible mold growth due to chronic water infiltration through roof leaks prompted the assessment.

On August 22, 2011, a visit was made to this building by Cory Holmes, Environmental Analyst/Regional Inspector in BEH's Indoor Air Quality (IAQ) Program. Mr. Holmes was accompanied by Leonard Izzo, Health Agent, Mendon Board of Health; Ken Choiniere, Director of Grounds and Maintenance, Mendon-Upton Regional School District; and for portions of the assessment, Ann Meyer, Principal.

The MHS was built as a one-story red brick building in 1960 that originally served as a middle/high school. A two-story classroom wing was added in 1980. In 1997-1998 the building underwent renovations to serve as an elementary/middle school. Portions of the building are below grade. Windows are openable throughout the building. The roof has reportedly been patched/repared repeatedly as needed over the years. At the time of the assessment school officials reported that funding for replacement of the roof was obtained and that the project was scheduled to commence in April of 2012.

Methods

MDPH staff performed a visual inspection of building materials for water damage and/or microbial growth.

Results and Discussion

Microbial/Moisture Concerns

In order for building materials to support mold growth, a source of water exposure is necessary. Identification and elimination of the source of water moistening building materials is necessary to control mold growth. As reported by Mr. Choiniere and Ms. Meyer, the building is in need of a new roof and has undergone extensive repair/patching over the years. In addition, annual roof inspection and repairs are scheduled each summer prior to school opening to eliminate/reduce water infiltration and prevent/limit water damage. It was also reported that due to heavy snow accumulation over the past winter (2010-2011), the roof was damaged during snow removal. Areas that were most affected were rooms 224 and the library.

Several water-damaged/mold-colonized dropped ceiling tiles were observed in the library along the interior wall adjacent to room 113 (Picture 1). The damage to these tiles appeared to be a result of previous leaks. At the time of the assessment BEH staff recommended that the tiles be removed, sealed in plastic bags for transport and that the area be monitored for further leaks.

Room 224 is currently unoccupied and is reportedly being used as a storage area until the roof is replaced (Picture 2). Room 224 had a musty odor, which is likely due to the combination of moistened carpeting and lack of air exchange, since both the supply and exhaust ventilation were deactivated at the time of the inspection. Also of note was a light staining of ceiling panels which may have been surface mold (Picture 3). These panels are adhered directly to the roof substrate; removal will require destruction of the ceiling tile (unlike dropped ceiling tiles, which can be easily removed/replaced).

Also of note were water-damaged/mold contaminated materials stored in an area known as “the bowling alley”. Items included tables, furniture, cardboard boxes, ceiling tiles and books (Pictures 4 through 6). During periods of high relative humidity (> 70%), condensation can form on the cool surface of the floor wetting the bottom of these materials, which can lead to mold growth. Porous items (e.g., cardboard boxes and paper) should not be stored directly on the concrete floor in order to prevent moistening from condensation (Picture 7).

The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials (e.g., carpeting, gypsum wallboard) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2001; ACGIH, 1989). If not dried within this time frame, mold growth may occur. Once mold has colonized porous materials, they are difficult to clean and should be removed.

BEH staff also noticed that classroom furniture (e.g., bookcases, shelving) and other items were stationed directly against classroom walls. This condition can trap moisture between the object and the wall over the summer where elevated relative humidity conditions (> 70%) can create conditions for mold growth. Classroom furniture and other items should be pulled away from interior walls approximately 2 to 4 inches to allow airflow to prevent this potential for mold growth (Picture 8).

As mentioned previously, portions of the building are below grade. Several classrooms in these areas contain wall-to-wall carpeting, which is generally not recommended in below grade areas (US EPA, 2001). Mr. Choiniere reported that dehumidifiers are employed in these areas to reduce relative humidity as needed. Dehumidifiers have reservoirs designed to catch excess water during operation and should be emptied/cleaned regularly to prevent microbial growth.

Other Indoor Environmental Observations

Ventilation

Fresh air in classrooms is supplied by unit ventilators (univents) (Figure 1). A univent is designed to draw air from outdoors through a fresh air intake located on the exterior wall of the building. Return air is drawn through an air intake located at the base of each unit. Fresh and return air are mixed, filtered, heated and provided to classrooms through a fresh air diffuser located in the top of the unit. Exhaust ventilation is provided by wall-mounted vents. Univent return vents (along the bottom front of the units) and exhaust vents were obstructed by furniture and other items in several classrooms examined (Pictures 9 and 10). In order to function as designed, univents and exhaust vents must be activated and allowed to operate free of obstructions and blockages. Without supply and exhaust ventilation, normally occurring pollutants can accumulate, leading to indoor air quality/comfort complaints.

Conclusions/Recommendations

MDPH guidance on mold remediation and preventing mold growth during summer months is attached as [Appendix A](#) and [Appendix B](#). The MDPH has prepared this guidance to help reduce or minimize exposure opportunities to mold in buildings and to prevent/reduce the migration of remediation-generated pollutants into occupied areas.

In view of the findings at the time of assessment, the following is recommended:

1. Continue with plans to replace school roof. In the interim, maintenance staff should continue to make minor roof repairs and monitor building materials for water damage.

2. Remove/replace water-damaged/mold-colonized dropped ceiling tiles. Seal moldy tiles in plastic bags for transport. Examine the area above and around these areas for mold growth. Disinfect areas of water leaks with an appropriate antimicrobial as necessary.
3. Remove/discard water-damaged/mold-colonized items in the “Bowling alley storage area. Seal moldy materials in plastic bags for transport. For large items (e.g., tables) cover with plastic sheeting and duct tape for transport.
4. Once roof repairs are made, remove carpeting in room 224; consider replacing with a non-porous flooring material (e.g., tile).
5. Clean surface of ceiling panels in room 224 (and any other affected areas) with a vacuum cleaner equipped with a high efficiency particulate arrestance (HEPA) filter using the brush attachment. Once cleaning is complete, seal surface and repaint.
6. Ensure classroom furniture and other items are not placed directly against interior walls; allow approximately 2 to 4 inches for airflow.
7. Continue to operate dehumidifiers in below grade areas with portable dehumidifiers as needed during humid, spring/summer months. Ensure dehumidifiers are cleaned and maintained as per the manufacturer’s instructions to prevent standing water and mold growth.
8. The installation of carpeting is generally not recommended in below grade areas (US EPA, 2001). Consider developing a plan for carpet removal in below grade areas as funds/materials become available.
9. Consult “Mold Remediation in Schools and Commercial Buildings” published by the US Environmental Protection Agency (US EPA, 2001) for more information on mold. This

document can be downloaded from the US EPA website at:

http://www.epa.gov/iaq/molds/mold_remediation.html.

10. Operate all ventilation systems throughout the building (e.g., gym, cafeteria, classrooms) continuously during periods of school occupancy to maximize air exchange.
11. Examine exhaust vent/motor for room 224 for proper operation, make repairs as needed.
12. Remove all blockages from univents and exhaust vents to ensure adequate airflow.
13. Refer to resource manuals and other related indoor air quality documents for further building-wide evaluations and advice on maintaining public buildings. These materials are located on the MDPH's website at <http://mass.gov/dph/iaq>.

References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

US EPA. 2001. "Mold Remediation in Schools and Commercial Buildings". Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. March 2001. Available at: http://www.epa.gov/iaq/molds/mold_remediation.html

Picture 1



Water-Damaged/Mold Colonized Ceiling Tiles in Library

Picture 2



Room 224 Used as Storage

Picture 3



Light Staining of Ceiling Panels in Room 224

Picture 4



Mold Growth on the Underside of Table in “Bowling Alley” Storage Area

Picture 5



Mold Growth on Sides and Underside of Table in “Bowling Alley” Storage Area

Picture 6



Water-Damaged/Mold Colonized Card Catalog Cabinet in “Bowling Alley” Storage Area

Picture 7



Cardboard Boxes and Papers Directly on Concrete Floor in “Bowling Alley” Storage Area

Picture 8



Bookcase near Interior Wall, Note ~ two-inch Space Allowing Airflow behind Bookcase

Picture 9



Univent Return Vent (Bottom Front) Obstructed by Classroom Furniture

Picture 10



Wall-Mounted Exhaust Vent Obstructed by Classroom Furniture