

MOLD ASSESSMENT

**Old Mill Pond Elementary School
4107 Main Street
Palmer, Massachusetts**



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
August 2013

Background/Introduction

At the request of Joshua Mathieu, Health Agent, Palmer Board of Health (PBOH), the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health (BEH) conducted an indoor air quality (IAQ) assessment at the Old Mill Pond Elementary School (OMPES), located at 4107 Main Street, Palmer, Massachusetts. The request was prompted by concerns related to mold. On August 21, 2013, a visit was made to the OMPES by Michael Feeney, Director of BEH's IAQ program. He was accompanied by Mr. Mathieu and various Palmer school officials and school board members.

BEH/IAQ staff conducted a limited assessment of the building focused on sources of water vapor/moisture and respiratory irritants. The overall function of the heating, ventilating, and air-conditioning (HVAC) system was not assessed during this visit because the building was largely unoccupied.

The OMPES is a single-level building, which had been originally constructed as a middle school in 1991 (Figure 1). The OMPES is not air-conditioned apart from a few locations with window-mounted air conditioners. Windows are openable throughout the building.

The Palmer Public Schools reportedly hired a contractor to thoroughly clean the school and carpets. This was in response to moisture damage resulting from an extended heat wave in the New England area in early July 2013. During the cleaning, doors in the building were reportedly propped open to facilitate venting of the building. Fans were also used to create airflow. In addition, classroom unit ventilators and exhaust vents were reportedly operating during the cleaning.

Methods

Air tests for temperature and relative humidity were conducted with the TSI, Q-Trak, IAQ Monitor, Model 7565. Surface temperatures of floors were measured with a ThermoTrace infrared thermometer. Moisture content of carpet was measured using a Tramex Moisture Encounter Plus Non-destructive Moisture Detector. BEH/IAQ staff also performed a visual inspection of building materials for water damage and/or microbial growth.

Results

The OMPES houses approximately 600 students in grades pre-K through 4 and has a staff of approximately 50. The tests were taken during summer break with no occupants. Test results appear in Table 1.

Discussion

Microbial/Moisture Concerns

BEH/IAQ staff conducted a visual inspection of the building and found no evidence of water damage attributable to roof or window leaks (such as stained ceiling tiles or damaged wall plaster). In addition, no visible mold growth/contamination was observed nor were musty odors attributed to mold growth detected in classrooms or other areas within the OMPES.

On the day of assessment, the outdoor relative humidity was measured at 75 percent (Table 1). Indoor relative humidity ranged from 49 to 72 percent, which was lower than the outdoor relative humidity. The MDPH recommends a comfort range of 40 to 60 percent for indoor air relative humidity. The indoor relative humidity measurements did not indicate that a

significant source of water vapor existed within the OMPES on the day of assessment. However, according to the American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHARE), relative humidity in excess of 70 percent for extended periods of time can provide an environment for mold and fungal growth in building materials (ASHRAE, 1989).

Of particular note was the condition of flooring in the building. The carpeting was observed to be stained and worn. As reported by school officials, the carpeting was installed in 1991. The Institute of Inspection, Cleaning and Restoration Certification (IICRC), recommends that carpeting be cleaned annually, or semi-annually in soiled high traffic areas (IICRC, 2005). Since the average service time of carpeting in a school environment is approximately eleven years (Bishop, 2002), consideration should be given to planning for the installation of new flooring as funds become available.

Temperatures in the building were measured in a range of 75°F to 81°F (Table 1). The MDPH recommends that indoor air temperatures be maintained in a range of 70°F to 78°F in order to provide for the comfort of building occupants. The dew point was also measured in the building. Dew point is another way of representing humidity; the dew point is the temperature at which the water vapor in the air will start to condense. If a surface in contact with the air has a temperature at or below the dew point, it will collect condensed moisture¹ and become wet. Dew points in the building ranged from 57°F to 68°F (Table 1).

BEH/IAQ staff also conducted surface temperature measurement of floors throughout the building in order to determine whether the floors would be prone to generating condensation. If the floors of the building are properly insulated, the temperature of the interior side of floors would be expected to be close to the indoor temperature. Floor temperatures were measured in a

¹ Condensation is the collection of moisture on a surface with a temperature below the dew point. The dew point is a temperature determined by air temperature and relative humidity. For example, at a temperature of 73° F and relative humidity of 57 percent indoors, the dew point for water to collect on a surface is approximately 57° F (IICRC, 2000).

range of 66° F to 78° F (Table 1), often lower than the corresponding air temperature. All locations had floor temperatures above the corresponding dew point for each area (Table 1), indicating that no condensation would be generated under conditions observed at the time of assessment. However, it is important to note that the floor temperatures measured were often more than 5°F cooler than the corresponding air temperature (Table 1), which can indicate that the floor of the building is being cooled by contact with the ground and may be susceptible to generating condensation during hot, humid weather.

BEH/IAQ staff used a moisture meter to detect whether carpeting was moist in rooms B101 through B103 due to the room locations and low floor temperatures measured there. No detectable levels of moisture were measured in the carpet.

The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2001; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Water-damaged porous materials cannot be adequately cleaned to remove mold growth. The application of a mildewcide to moldy porous materials is not recommended.

Other Concerns

BEH/IAQ staff examined areas in which odors had been reported by occupants. These odors were traced to shelving made from particle board. Frequently, particle board contains a binder called urea-formaldehyde resin. If this material is subjected to hot, humid conditions, the resin becomes unstable and will release formaldehyde vapor. The remaining component of the resin, urea, has a urine-like odor which was noted in a number of classrooms (Table 1).

Moistened particle board will continue to emit the urea odor once the resin has broken down, particularly in hot, humid conditions.

Conclusions/Recommendations

As noted previously, this assessment was limited to sources of moisture/water vapor and respiratory irritants because the building was not at typical occupancy. Upon request, the BEH IAQ Program can return to the building when it is fully occupied and the heating system is activated in order to conduct a complete IAQ investigation. In view of the findings at the time of the visit, the following recommendations are provided:

1. Remove carpeting in the building as needed if hot, humid weather reoccurs this summer. Long-term plans to replace carpeting throughout the building should be made since it is likely to become moistened by condensation and is past its service life.
2. Since the building's cement slab has a temperature that is likely below the dew point in hot, humid weather, serious consideration should be given to installing a non-porous floor covering, such as tile in place of carpeting.
3. Remove particle board furniture from areas with urea odors (Table 1).
4. Employ methods outlined in the document "Preventing Mold Growth in Massachusetts Schools During Hot, Humid Weather" ([Appendix A](#)) to prevent water damage from hot, humid weather.
5. Consider adopting the US EPA (2000) document, "Tools for Schools", to maintain a good indoor air quality environment in the building. This document can be downloaded from the Internet at <http://www.epa.gov/iaq/schools/index.html>.

6. Refer to resource manuals and other related indoor air quality documents for further building-wide evaluations and advice on maintaining public buildings. Copies of these materials are located on the MDPH's website: <http://mass.gov/dph/iaq>.

References

ASHRAE. 1989. ASHRAE Standard: Ventilation for Acceptable Indoor Air Quality. Sections 5.11, 5.12. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Atlanta, GA.

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

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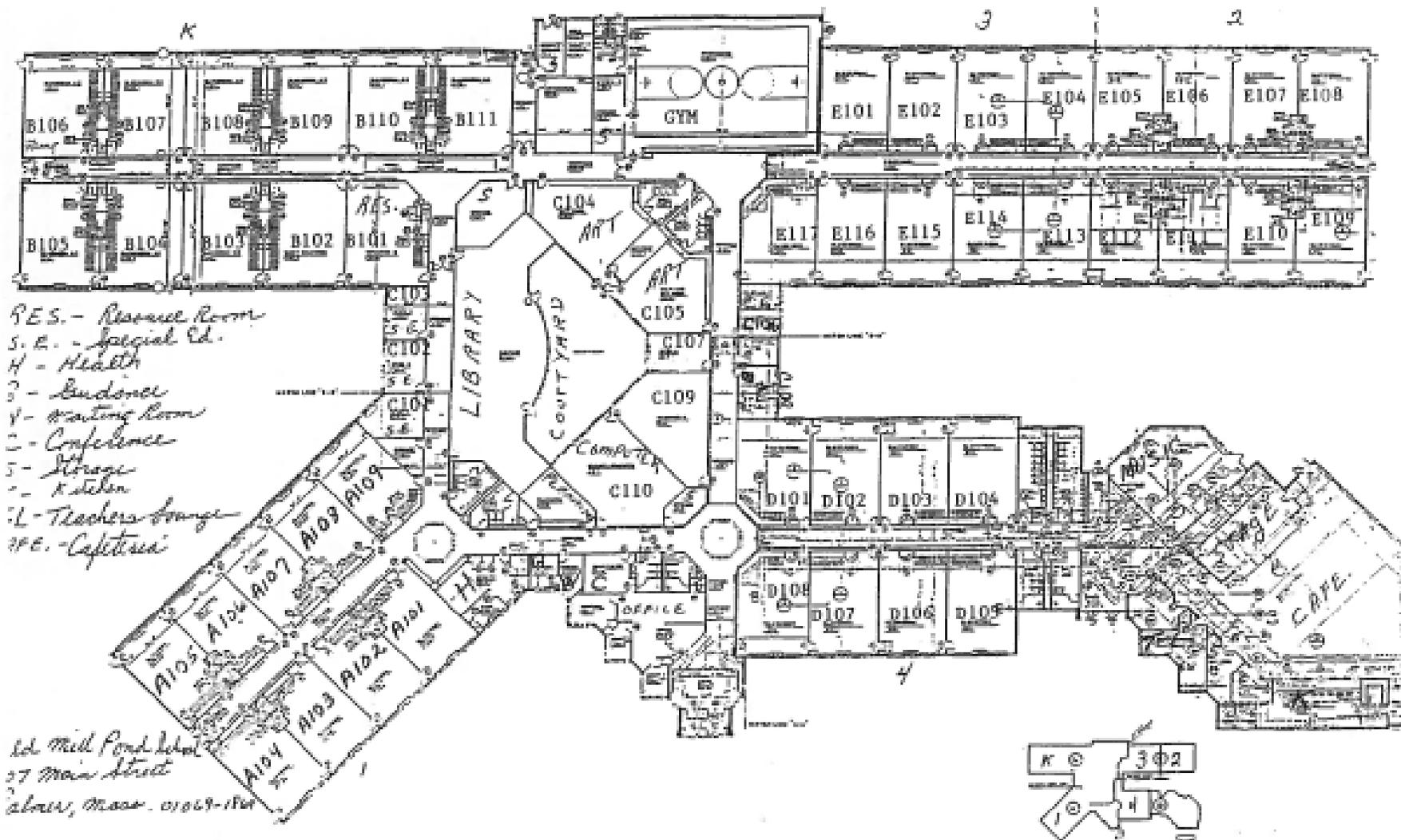
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Figure 1
Old Mill Pond Elementary School



Location: Old Mill Pond Elementary School

Address: 4107 Main Street, Palmer, MA

Indoor Air Results

Date: 8/21/2013

Table 1

| Location/Room | Dew Point (°F) | Temp (°F) | Relative Humidity (%) | Floor Temperature (°F) | Remarks |
|---------------|----------------|-----------|-----------------------|------------------------|---------------------------------------|
| Background | 66 | 74 | 75 | - | Partly cloudy, light breeze (9:30 am) |
| A101 | 65 | 78 | 64 | 75 | |
| A102 | 65 | 78 | 65 | 74 | |
| A103 | 65 | 78 | 64 | 71 | |
| A104 | 65 | 78 | 62 | 72 | |
| A105 | 68 | 79 | 68 | 75 | Urea odor from particle board |
| A106 | 67 | 79 | 68 | 76 | |
| A107 | 67 | 79 | 68 | 77 | |
| A108 | 68 | 78 | 69 | 76 | |
| A109 | 65 | 76 | 69 | 76 | |
| Art | 64 | 79 | 62 | 72 | |
| B101 | 65 | 75 | 72 | 66 | |
| B102 | 65 | 75 | 71 | 66 | |
| B103 | 64 | 75 | 71 | 67 | |
| B104 | 65 | 75 | 71 | 69 | |
| B105 | 64 | 75 | 70 | 70 | |
| B106 | 67 | 76 | 73 | 73 | |
| B107 | 67 | 77 | 70 | 75 | |

Comfort Guidelines

Temperature: 70 - 78 °F

Relative Humidity: 40 - 60%

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Indoor Air Results

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Table 1

| Location/Room | Dew Point (°F) | Temp (°F) | Relative Humidity (%) | Floor Temperature (°F) | Remarks |
|---------------|----------------|-----------|-----------------------|------------------------|-----------------------------------|
| B108 | 67 | 78 | 69 | 77 | |
| B109 | 66 | 78 | 67 | 76 | |
| B110 | 66 | 78 | 66 | 76 | |
| B111 | 66 | 80 | 64 | 78 | |
| C110 | 57 | 77 | 49 | 72 | Window-mounted air conditioner on |
| Cafeteria | 65 | 80 | 65 | 76 | |
| D101 | 67 | 76 | 65 | 73 | Urea odor from particle board |
| D102 | 66 | 80 | 67 | 76 | |
| D103 | 66 | 80 | 66 | 76 | |
| D104 | 66 | 81 | 66 | 76 | |
| D105 | 65 | 79 | 64 | 73 | |
| D106 | 65 | 78 | 65 | 71 | |
| D107 | 65 | 78 | 63 | 71 | Urea odor from particle board |
| D108 | 65 | 78 | 64 | 76 | Urea odor from particle board |
| E101 | 67 | 78 | 68 | 74 | |
| E102 | 66 | 77 | 66 | 75 | |
| E103 | 67 | 79 | 67 | 75 | |
| E104 | 68 | 79 | 68 | 75 | |

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Table 1

| Location/Room | Dew Point (°F) | Temp (°F) | Relative Humidity (%) | Floor Temperature (°F) | Remarks |
|---------------|----------------|-----------|-----------------------|------------------------|-----------------------------------|
| E105 | 67 | 76 | 67 | 76 | |
| E106 | 67 | 79 | 67 | 75 | |
| E107 | 66 | 79 | 66 | 75 | |
| E108 | 67 | 79 | 67 | 75 | |
| E109 | 65 | 78 | 65 | 71 | |
| E110 | 65 | 78 | 65 | 71 | |
| E112 | 65 | 77 | 65 | 70 | |
| E113 | 65 | 77 | 65 | 70 | |
| E114 | 65 | 77 | 65 | 70 | |
| E115 | 65 | 76 | 65 | 70 | |
| E116 | 65 | 76 | 65 | 71 | |
| E117 | 65 | 76 | 65 | 72 | |
| Gym | 65 | 78 | 64 | 75 | |
| Library | 58 | 75 | 66 | 70 | Window-mounted air conditioner on |
| Music | 66 | 81 | 66 | 76 | |
| Staff | 64 | 77 | 65 | 72 | |

Comfort Guidelines

Temperature: 70 - 78 °F

Relative Humidity: 40 - 60%