INDOOR AIR QUALITY ASSESSMENT

Community Action Head Start
Friends Meeting House
124 Friend Street
Amesbury, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
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Background/Introduction

At the request of John Cuneo, Executive Director for Community Action Inc., the Bureau of Environmental Health Assessment (BEHA) conducted an evaluation of indoor air quality at the Community Action Head Start Facility, located in the basement of the Friends Meeting House (see cover) at 124 Friend Street, Amesbury, MA. This assessment was conducted due to concerns of microbial growth on building materials (e.g. gypsum wallboard, wood trim) related to water damage from a previous flood.

Cory Holmes of BEHA's Emergency Response/Indoor Air Quality (ER/IAQ) program, conducted this assessment on April 16, 2002. Mr. Holmes was accompanied by Richard Lynch, Associate Director for Community Action Inc. General air monitoring was not conducted because the facility was unoccupied at the time of the assessment.

As reported by Mr. Lynch, the basement was flooded as a result of heavy rainfall (approximately 3-4 years ago). A contractor was hired to clean and dry the carpeting. Shortly after, a french drain was installed in the stairwell directly in front of the basement door (see Pictures 1 & 2) to prevent flooding. No flooding has been reported since the drain was installed. Although work was conducted to clean and dry carpeting, gypsum wallboard (GW) remained wet, resulting in mold growth in the mechanical room.

Methods

Visual inspection of GW was conducted. Water content of GW was measured with Delmhorst, BD-2000 Model, Moisture Detector with a Delmhorst Standard Probe. Air tests for temperature and relative humidity were taken with the TSI, Q-Trak, IAQ Monitor, Model 8551. Test results are shown in Table 1.

Results/Discussion

In order for building materials to support mold growth, a source of water exposure is necessary. Identification and elimination of water moistening building materials is necessary to control mold growth. GW with increased moisture content over normal concentrations may indicate the possible presence of mold growth. Identification of the location of GW with increased moisture levels can also provide clues concerning the source of water supporting mold growth. In an effort to ascertain moisture content of GW and wood trim, samples were taken in areas directly impacted by water damage (with the exception of the mechanical room where microbial growth was apparent) as well as a number of non-effected areas for comparison. As discussed, water content of GW was measured by BEHA staff with a Delmhorst, BD-2000 Model, Moisture Detector with a Delmhorst Standard Probe. The probe was inserted into the surface of GW on walls and in wooden trim. The Delmhorst probe is equipped with three lights as visual aids to determine moisture level. Readings which activate the green light indicate a sufficiently dry moisture level (0 - 0.5%), those that activate the yellow light indicate borderline conditions (0.5 – 1.0%) and those that activate the red light indicate elevated moisture content (> 1%).

A number of moisture measurements were taken of GW at varying heights (i.e. three feet, two feet, and six inches above the floor respectively), as well of baseboards/wooden wall trim near floor level. Visual inspection suggested substantial mold growth of GW inside the mechanical room approximately 6-12 inches above the floor on all four walls (see Picture 3). (As indicated by written correspondence from John Cuneo, the microbial growth was sampled by a consultant and verbally reported as S*tachybotrus* [CAI, 2002]).

As previously discussed, the flooding was reported to be an isolated incident and had occurred three to four years prior to this assessment. During the assessment, no standing water or other moisture sources were noted. Wall to wall carpeting was reportedly removed in the fall of 2001. Wood trim at floor level had dark staining in a number of areas (see Pictures 4 & 5), which appeared to be water damage and/or possible mold growth. In addition, the mechanical room was being used for storage of a number of porous items such as tissue paper and cardboard boxes (see Picture 6), which if wet can also provide mediums for microbial growth.

Moisture content of GW in the classroom adjacent to the mechanical room measured from 0.8 to 1.02 percent. While moisture readings measured by BEHA staff outside the mechanical room suggests dampening by a source of moisture, this is most likely a result of lack of ventilation and increased humidity as opposed to direct contact with floodwaters. As stated previously, the building has not been occupied for a number of weeks, therefore, the air-handling unit (AHU) has not been operated to circulate air. Without dilution and removal by the AHU, indoor air pollutants can accumulate (e.g. odors and moisture) and be absorbed by porous building materials (e.g. GW and carpeting).

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials be dried with fans and heating within 24 hours of becoming wet (ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Once mold growth has occurred, disinfection of these materials may be possible, however since GW is a porous surface, disinfection is likely to be ineffective.

On previous assessments concerning GW mold growth, BEHA personnel have consulted with Dr. Harriet Burge, Chairperson of the Microbiology Department at the Harvard School of Public Health. The reoccurrence of mold growth on GW after the application of bleach is common. Bleach consists of sodium hypochlorite in a 5 percent concentration mixed with water. Mold colonization of GW can penetrate through its entire structure. When applied to moldy GW, the water of the bleach solution penetrates into the moldy GW, but the sodium hypochlorite remains on the surface. The sodium hypochlorite disinfects the surface mold that it comes in contact with on the GW surface, but not the mold beneath the surface. The additional water added to the subsurface mold fuels a spurt in growth, which increases mold colonization of the GW. As a result, mold colonies appear on the surface of treated GW shortly after application of bleach (personal communication, Burge, 1999).

Conclusions/Recommendations

In view of the findings at the time of the inspection, the following recommendations are made:

1. Remove and replace all mold contaminated GW in the mechanical room as well as mold colonized/water damaged wooden trim along floors in the entrance hallway. This measure will remove actively growing mold colonies that may be present. This work should be conducted at a time when occupants are not present in the area. Contain the area where contaminated materials are removed to prevent the spread of dust and mold spores. It is recommended that the AHU in the mechanical room as well as the hallway door leading into the classroom be sealed with plastic sheeting and duct tape; and that local exhaust ventilation be employed to place the mechanical room under negative pressure to prevent mold spores and associated materials from migrating into adjacent areas.
2. Once work is completed, ensure that the area is thoroughly cleaned and disinfected with an appropriate antimicrobial. Dust and particulates resulting from renovation efforts should be vacuumed with a high efficiency particulate arrestance (HEPA) filtered vacuum cleaner.
3. Inspect porous items stored in the mechanical room and discard if moldy.

4. Once mold contaminated GW is removed from the interior of the mechanical room, examine the interior of the wall cavity for water damaged building materials and mold growth. If additional water damaged building materials are colonized with microbial growth, remove. Disinfect areas of water leaks/microbial growth with an appropriate antimicrobial.
5. Once repairs are completed, change filters and operate mechanical ventilation system 48-72 hours prior to reoccupation.
6. Continue to monitor drainage system for proper function, report any flooding/water damage to building owner for prompt remediation

References

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

Burge. 1999. Personal Conversation with Dr. Harriet Burge, Harvard School of Public Health. December 13th, 1999.

Community Action Inc. 2002. Written correspondence from John Cuneo, Executive Director, Community Action Inc. to Michael Feeney, Chief, Emergency Response Indoor Air Quality Program, Bureau of Environmental Health Assessment, Massachusetts Department of Public Health. Dated March 27, 2002.

SMACNA. 1995. IAQ Guidelines for Occupied Buildings Under Construction. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

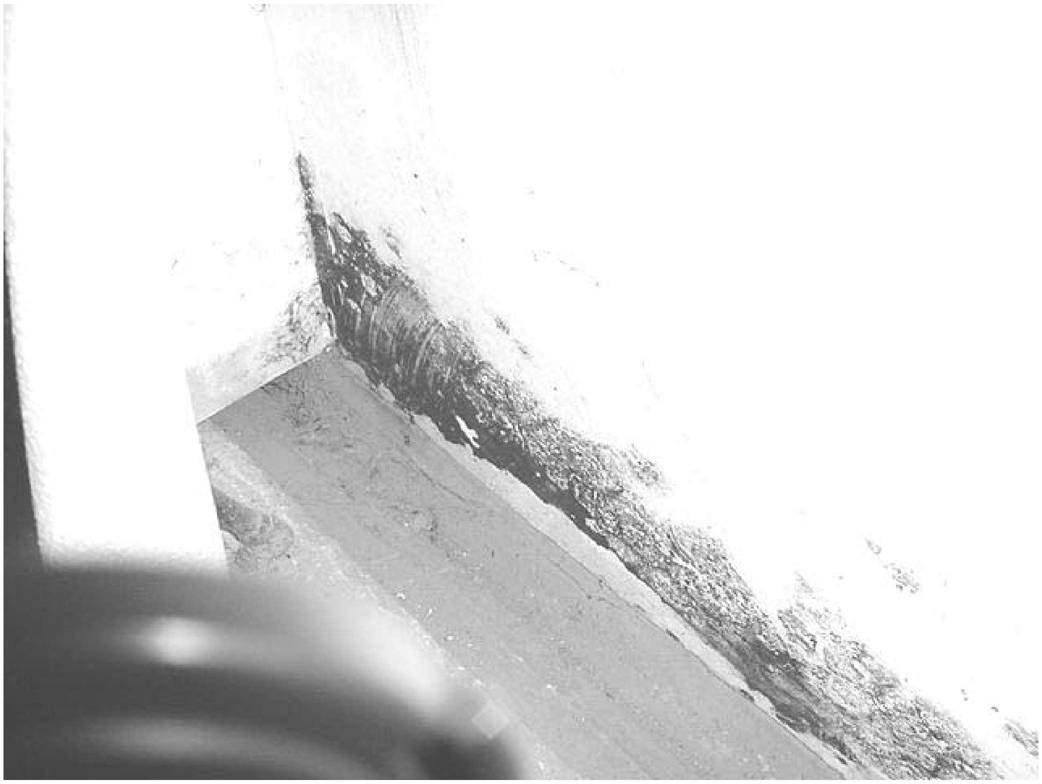
Picture 1

Entrance to Basement Head Start, Where Flooding Occurred

Picture 2

French Drain Installed to Prevent Flooding of Basement

Picture 3



Visible Mold Colonies on GW in Mechanical Room

Picture 4

Water Damaged Wood Trim

Picture 5

Water Damaged Wood Trim

Picture 6

Porous Materials Stored in Mechanical Room

Table 1
Amesbury Community Action Head Start, April 16, 2002
Gypsum Wallboard Moisture Content Sampling Results

Area	Temperature (^{o} F)	Relative Humidity (%)	Measured Wallboard Moisture Concentration (%) 6" Above Floor	Measured Wallboard Moisture Concentrat ion (%) 24" Above Floor	Measured Wallboard Moisture Concentration (%) 36" Above Floor
Background (Outside)	73	60			
Classroom	71	58	0.96-1.02	.82-.96	.80-.84
Entrance Way	72	59	1.55 (wood trim)	.98	.84
Office	70	59	.72	.90	.84