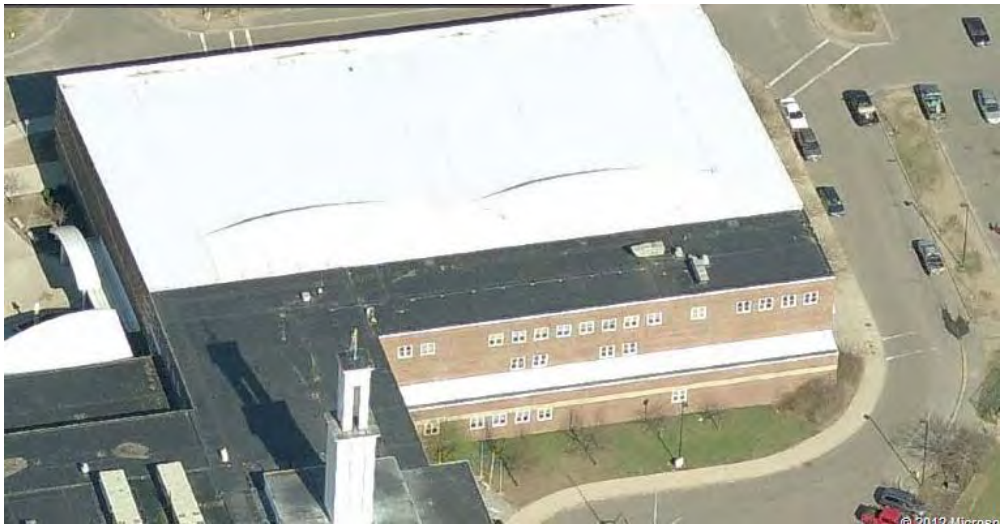
INDOOR AIR QUALITY INVESTIGATION

Gloucester High School
Ceramic Program and Administrative Office
32 Leslie O Johnson Road
Gloucester, 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 Brian Tarr, Financial Director for Gloucester Public Schools, the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health (BEH) conducted an indoor air quality (IAQ) assessment at Gloucester High School (GHS), 32 Leslie O Johnson Road, Gloucester, Massachusetts. This request was prompted by health concerns in specific areas of the building. On January 12, 2012, Michael Feeney, Director of BEH's IAQ Program, made a visit to GHS to conduct an assessment. Mr. Feeney was accompanied by Ruth Alfasso, Environmental Engineer/Inspector in the BEH IAQ program.

A few selected areas of interest, including the pottery studio and space containing the guidance and MCAS offices were examined during this visit; a full IAQ assessment of this building was conducted by the BEH IAQ program in 2007, with a report released in August 2008 which can be found at: http://www.mass.gov/eohhs/docs/dph/environmental/iaq/2008/gloucester-high-school-2008.pdf. An earlier targeted assessment was conducted in 2004, with a report released in March 2005. This report can be found at: http://www.mass.gov/eohhs/docs/dph/environmental/iaq/2005/gloucester-hsago.pdf.

Methods

Air tests for airborne particle matter with a diameter less than 2.5 micrometers were taken in selected areas with the TSI, DUSTTRAK™ Aerosol Monitor Model 8520. BEH staff also performed visual inspection of building materials for water damage and/or microbial growth.

Discussion

Clay Arts Room

The BEH IAQ program was asked to examine the clay arts program room and offer suggestions to control dusts and improve indoor environmental conditions in this area. The room was examined after the end of a wheel throwing[1] class, while end-of-day cleanup activities were being conducted.

Ventilation in the Clay Classroom

The clay art room is equipped with supply and exhaust ventilation as a part of the general heating, ventilation and air conditioning (HVAC) system of the school. It is also equipped with openable windows. The kiln room is separated from the rest of the art room by a door and contains two operable kilns, which were not in use at the time of the visit. The kilns are equipped with a large exhaust vent hood (Picture 1) operated by a switch. The exhaust from this vent goes directly to the outside. When turned on, the exhaust fan appeared to be noisy with minimal draw of air. It was also observed to be intermittently spinning, which can indicate a loose or slipping fan belt. In order to remove heat, gases, water vapor, and particulates generated by the use of the kiln, this fan needs to be repaired and operating. Of note is corrosion on the supports of the suspended ceiling in the kiln room, which may indicate that kiln pollutants were not being removed by the kiln hood exhaust system with the kilns firing. The kiln exhaust should operate at all times the kiln is in use and for a period following use.

In addition, it was noted that both a supply vent and exhaust vent from the building's general HVAC system were located in this room (Picture 2). The presence and operation of

[1] Wheeling throwing means use of a pottery wheel to make pottery.

these vents would tend to compromise the effectiveness of the kiln exhaust ventilation and may either: 1) pressurize the room to drive aerosolized kiln waste products into the clay art classroom, or 2) entrain waste products from the use of the kiln into the general building exhaust where they can be transmitted to other areas. There was also a missing portion of ceiling tile in this room, which may allow kiln waste products to enter the ceiling plenum and impact other areas. It is recommended that both the supply and exhaust vents of the general ventilation systems in the kiln room be disconnected and sealed. In addition, to allow the kiln hood exhaust ventilation to operate, the kiln room door should be undercut by several inches, allowing space for air to flow from the classroom beneath the door to the exhaust hood.

Moisture Considerations in the Clay Classroom

Activities that take place in this classroom include wheel throwing of clay. The pottery wheels are located next to the exterior wall of the classroom (Picture 3). It was noted that there were stains and signs of water that had splashed on this wall from pottery wheel use, including areas near electric outlets (Picture 4). Water can infiltrate the wall material, leading to damage and mold growth. It can also compromise the electrical outlets, leading to a shock or fire hazard.

It is recommended that either the pottery wheels be moved to an area as to not impact walls, or that the walls be covered with a plastic wallboard material to the level of the bottom of the windows to protect the wall surface. Electrical outlets should be moved up the wall out of the splash zone, or be replaced with ground-fault circuit interrupter (GFCI) outlets to protect against shorting-out due to dampness.

The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials 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 and discarded.

Particulate Considerations in the Clay Classroom

The US EPA has established National Ambient Air Quality Standards (NAAQS) for exposure to particulate matter. Particulate matter is airborne solids that can be irritating to the eyes, nose and throat. The NAAQS originally established exposure limits to particulate matter with a diameter of 10 μm or less (PM10). According to the NAAQS, PM10 levels should not exceed 150 micrograms per cubic meter ($\mu g/m^3$) in a 24-hour average (US EPA, 2006). These standards were adopted by both the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and the Building Officials and Code Administrators International (BOCA) (ASHRAE, 1989; BOCA, 1993). Since the issuance of the ASHRAE standard and BOCA Code, US EPA established a more protective standard for fine airborne particles. This more stringent PM2.5 standard requires outdoor air particle levels be maintained below 35 $\mu g/m^3$ over a 24-hour average (US EPA, 2006). Although both the ASHRAE standard and BOCA Code adopted the PM10 standard for evaluating air quality, MDPH uses the more protective PM2.5 standard for evaluating airborne particulate matter concentrations in the indoor environment.

Particulates were measured at several times and locations in the room over a fifteen-minute period during this visit, and ranged from 20 to 35 $\mu g/m^3$. Outdoor PM2.5 concentrations the day of the assessment were measured at 5 $\mu g/m^3$. While particulate levels were at or below the NAAQS standard, the PM2.5 levels measured suggest that clay use and cleaning activities increased the particulate level in the room,.

A variety of cleaning activities were observed including clay waste that was being removed from tables and other surfaces using sponges, and wet mopping which appeared to be ineffective at removing residue (Picture 5). Clay particles are composed in part of silica, which can harm the lungs when inhaled long term (US CPSC, 2012). Clay can also harbor mold and other microorganisms.

Clay studios should be cleaned often with a wet mop, wet-vacuum or a vacuum equipped with a high efficiency particulate arrestance (HEPA) filter (UMASS Dartmouth, 2012). Microfiber cleaning cloths and mops, which have a very high surface area of small fibers, can also be effective at containing and removing dusts from surfaces; they are recommended for use in hospitals and schools for infection control and may be useful in controlling other dusts (Rose, L. and Westinghouse C., 2010). Dry sweeping or use of an ordinary vacuum cleaner can increase the amount of airborne particulates and should not be used.

Activities which directly increase the amount of particulates in the air, such as dry sanding of fired clay or breaking up of dry clay for reuse should be minimized and only done with appropriate personal protective equipment and exhaust ventilation operating. The door to the classroom should also remain closed whenever possible to prevent migration of clay dusts into the hallway.

Office Area

The BEH IAQ program was asked to evaluate conditions in office spaces including the guidance and MCAS offices. The occupants had concerns regarding ventilation and mold and possible impacts on health. The following conditions were noted:

- Supply and exhaust vents in this area had accumulated dust/debris (Picture 6). Supply vents, exhaust vents and univent diffusers should be cleaned to prevent re-aerosolization of dust when equipment is activated.
- Walls had accumulations of dark material in some locations (Picture 7). This material may be accumulated dust or surface mold. BEH staff readily removed the residue using an alcohol wipe, indicating the material was likely accumulated dust, dirt and other debris on the painted surface of the wall and not mold colonization of the gypsum wallboard. Thorough cleaning of this material is recommended as soon as it is noted.
- There were signs of historical water damage as discussed in the 2005 MDPH report, which addressed moisture issues in the administrative offices. One of the recommendations in that report was to: "Install fire doors at the open end of the offices' hallway to establish a closed air-conditioning zone." (MDPH 2005). These doors were present at the time of the 2012 visit, however they were locked open. These doors were installed to prevent unconditioned moist air from entering the air-conditioned office spaces and providing condensation to moisten building materials. While the doors are not required for operation during the heating season, care should be taken to utilize them properly when the air conditioning in the offices is on.

Conclusions/Recommendations

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

1. Make the following modifications/repairs to the kiln room:

a. Ensure that the mechanical systems for the exhaust hood are operational. Make sure the vent is turned on at all times the kiln is in operation and for a period of time afterwards;

b. Remove or seal the general supply and exhaust vent in the kiln room. Supply make-up air for the room by undercutting the door from the classroom into the kiln room by 3 to 4 inches; and

c. Replace missing/damaged ceiling tiles.

2. Move the pottery wheels away from the wall sufficiently far to prevent splashing on wall materials. Alternatively, protect the wall using plastic sheeting and move the electrical outlets up the wall out of the splash zone. Replace standard outlets with GFCI outlets to prevent shock/electrocution and fire hazards.

3. Improve cleaning and dust control in the clay classroom through the following:

a. Activities which directly increase the amount of particulates in the air (such as dry sanding of fired clay or breaking up of dry clay for reuse) should be minimized and should only be done with appropriate personal protective equipment;

b. Ensure all supply and exhaust ventilation is working and turned on whenever the classroom is in use;

c. Consider acquiring a HEPA vacuum cleaner for this room;

d. Consider a trial use of microfiber cleaning cloths to capture dust on surfaces;

e. Using whichever method is chosen, remove as much clay residue from surfaces as possible to prevent reaerosolization of the material in subsequent classes; and

f. Close art room doors whenever possible to prevent migration of clay dusts into the hallway.

4. Clean personal fans, univent air diffusers, return vents and exhaust vents in the administrative offices, as well as the art rooms, periodically of accumulated dust/debris.

5. Clean walls and floors of accumulated dust, soils and debris.

6. Continue to address any remaining recommendations made in the 2005 and 2008 MDPH reports on this building. These reports and other related indoor air quality documents are located on the MDPH's website and can be found at: http://mass.gov/dph/iaq.

References

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Picture 1

Kilns with exhaust hood

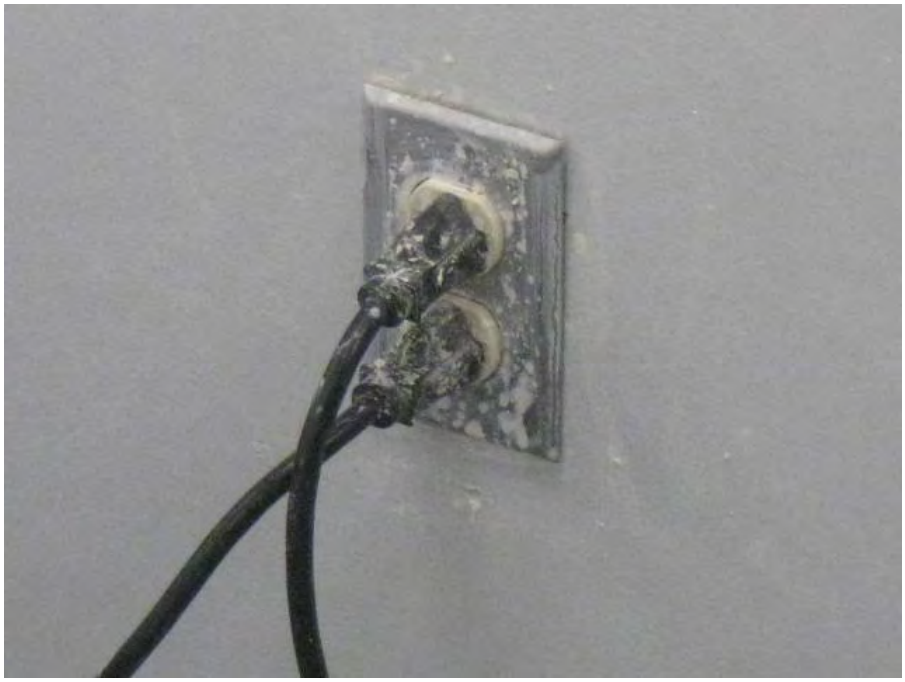
Picture 2

Supply and exhaust vent (arrows) from general HVAC system in kiln room

Picture 3

Location of pottery wheels next to wall

Picture 4



Evidence of splashing on wall and electrical outlets

Picture 5

Residue from clay on counters and surfaces (note conventional mop bucket on left)

Picture 6

Dust/dirt accumulation on exhaust vent in MCAS office

Picture 7

Dirt or surface mold on wall in Administrative area