

ODOR INVESTIGATION

**East Middle School
464 Centre Street
Brockton, Massachusetts**



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
March 2012

Background/Introduction

Based on an anonymous complaint, the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health (BEH) provided assistance and consultation regarding indoor air quality (IAQ) at the East Middle School (EMS) located at 464 Centre Street, Brockton, Massachusetts. The assessment was prompted by complaints of odors, headaches and exacerbation of asthma symptoms resulting from the application of roofing materials.

Mr. George Bezreh, Facilities Director, Brockton Public Schools, reported to MDPH/BEH staff that the entire roof at EMS was laid down over the February vacation period. On the morning of March 2, 2012, Cory Holmes, Environmental Analyst/Inspector in BEH's IAQ Program conducted an assessment at the EMS. At the time of the MDPH assessment, detail work including flashing around the perimeter of the building remained to be done.

Methods

Air testing for total volatile organic compounds (TVOCs) was conducted using a Thermo Environmental Instruments Inc., Model 580 Series Photo Ionization Detector (PID).

Results/Discussion

Total Volatile Organic Compounds

MDPH/BEH reviewed the material data safety sheets (MSDS') for the roofing materials, which contain volatile organic compounds (VOCs) including isocyanates, a family of chemicals that can produce sensitization in exposed individuals. VOCs are organic compounds that have the ability to evaporate at room temperature. Frequently, exposure to low levels of total VOCs

(TVOCs) may produce acute eye, nose, throat and/or respiratory irritation in some sensitive individuals. In an effort to determine whether measurable levels of VOCs were present, MDPH/BEH staff conducted air monitoring for TVOCs.

Ambient TVOC levels were taken outside the building, upwind and away from likely potential VOC sources. Measurements were also conducted throughout each floor of the building. Outdoor TVOC concentrations were non-detectable (ND). However, odors were detected and TVOC readings were elevated in several areas inside the school, most notably the music room, which measured 19 parts per million (ppm). At the time of the assessment, MDPH/BEH staff recommended that students in that room be relocated to the auditorium, which contained no measureable levels of TVOCs.

Other areas of note were the gymnasium and administrative area, which includes the main office, guidance and nurse's suite. Measurements in these areas ranged from 5.9 to 8.3 ppm (Table 1). Slight readings ranging from 1 to 3 ppm were detected in 1st and 2nd floor hallways. At the time of the assessment, BEH staff recommended that exterior doors and windows be opened and stand-up fans be utilized to enhance air exchange. MDPH/BEH staff took measurements in a number of classrooms on each floor of the building. For the most part, areas were ND for TVOCs. In some areas, doors were open and odors from the hallway (likely originating from the administrative wing) were infiltrating into classrooms (Table 1). Please note, that TVOC air measurements are only reflective of the indoor air concentrations present at the time of sampling.

The air testing conducted by MDPH/BEH staff would indicate that acute health effects, if any, associated with short-term exposure to this product would have occurred during/shortly

after application of the roofing compound. Any symptoms would be expected to have resolved after exposure to the vapors produced by the product ceased.

Conclusions/Recommendations

At the time of the assessment, odors related to roofing materials were present and elevated levels of TVOCs were measured in several areas where roofing compounds had recently been applied. It was reported by BPS officials that they would contact their roofing contractor in order to coordinate any additional work on Fridays after school hours and during unoccupied periods, if possible. It is important to note that any renovation project is a dynamic process; therefore, it is important to have measures in place to promptly deal with issues that are likely to arise. Appendix A of this report is MDPH guidance document “Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings”. The MDPH has prepared this guidance document in order to prevent/reduce the migration of renovation-generated pollutants into occupied areas.

In view of the findings, several of the following recommendations to address concerns at the EMS were given at the time of the assessment, and are reiterated below along with other recommendations to improve air quality:

1. Continue with plans to schedule any current or future applications of these materials or similar compounds during extended unoccupied periods (e.g., Fridays after school/weekends, school vacation).
2. Relocate occupants in the music room to the auditorium until roofing compounds cure and odors dissipate. This procedure should be applied for other areas of the building

during the course of the project if necessary; particularly for sensitive individuals such as those with asthma and/or other respiratory issues.

3. Open exterior doors and windows in the gymnasium and administrative area and use stand-up fans to create air exchange until roofing compounds cure and odors dissipate.
4. Keep classroom doors shut and ensure univents and exhaust vents are operating (if operable) as designed. If not operating, make repairs as necessary.
5. Use openable windows in conjunction with mechanical ventilation to increase air exchange. Care should be taken to ensure windows are properly closed at night and weekends to avoid the freezing of pipes and potential flooding. In addition, because airborne compounds related to roofing materials may be heavier than air, windows should only be opened when outside odors./contaminants are not present.
6. Ensure Material Safety Data Sheets (MSDS) are obtained for all materials used during renovations and keep them in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act (MGL, 1983).
7. Consult MSDSs regarding any material applied to the affected area during renovation(s) including any sealant, carpet adhesive, tile mastic, flooring and/or roofing materials. Provide proper ventilation and allow sufficient curing time as per the manufacturer's instructions concerning these materials.
8. Communicate project schedules to all affected parties through meetings, emails and/or other forms of notification prior to commencement of work and throughout the duration of the project.

Table 1

Location/ Room	TVOCs (*ppm)	Windows Openable	Ventilation		Remarks
			Supply	Exhaust	
Background	ND				Wind/Weather conditions: rainy/cloudy clearing to mostly sunny with scattered clouds, winds NNE 5-8 mph
1 st Floor Admin Area Hallway	6.3				
Guidance	5.9	Y	N	N	
Nurse's Office	6.3	Y	Y	Y	Ventilation not operating, windows shut
100	ND	Y	Y	Y	Exhaust not operating, windows shut
101	ND	N	Y	Y	
104	ND	Y	Y	Y	Exhaust off, windows shut
105	ND	Y	Y	Y	Ventilation not operating, windows shut
108	ND	Y	Y	Y	Door open
112	ND	Y	Y	Y	
118	ND-1	Y	Y	Y	Door open
1 st floor hallway	2-3				
Music Room	19	Y	Y	Y	Ventilation not operating, windows shut, class relocated to auditorium

TVOCs = total volatile organic compounds

ppm = parts per million

ND = non detect

Location: East Middle School

Address: 464 Centre Street, Brockton, MA

Indoor Air Results

Date: March 2, 2012

Table 1 (continued)

Location/ Room	TVOCs (*ppm)	Windows Openable	Ventilation		Remarks
			Supply	Exhaust	
Auditorium	ND	N	Y	Y	
Gym	8.3	N	Y	Y	Ventilation not operating, exterior doors shut
Cafeteria	2.3	Y	Y	Y	Ventilation not operating, windows shut
200 (office)	3.3	Y	N	N	Windows shut
203	ND-0.8	Y	Y	Y	Door open
208	ND	Y	Y	Y	Exhaust off
214	ND	Y	Y	Y	Exhaust off
2 nd floor hallway	1-3				Odors migrating via hallways up stairwell
Library	ND	Y	Y	Y	

TVOCs = total volatile organic compounds

ppm = parts per million

ND = non detect

Appendix A



BUREAU OF ENVIRONMENTAL HEALTH Indoor Air Quality Program Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings

November 2006

Among the most serious indoor air quality health issues is the potential exposure to construction/renovation-generated pollutants in occupied buildings. The renovation of occupied buildings provides a number of potential exposure opportunities to pollutants. Demolition of the building materials can provide exposure to mold, asbestos, lead, bird waste and other respiratory irritants. The application of tile adhesive, roofing materials, paints and other products used during renovations provide point sources of volatile organic compounds (VOCs) and other irritating chemicals. Contractors frequently use fossil fueled construction and heating equipment in indoor areas undergoing renovations. Combustion products (e.g. carbon monoxide) can migrate into occupied areas. The impact of construction/renovation pollutants on occupied areas can be evaluated through air monitoring for VOCs, airborne particles and products of combustion. Preventing and/or minimizing exposure to construction/renovation-generated pollutants is essential to reduce indoor air-related symptoms in building occupants.

In 1999, the State Department of Education (DOE) amended their regulations to require that state funded construction projects follow established guidelines to prevent exposure of building occupants to construction/renovation pollutants. Subsequently, Chapter 208 of the Acts of 2004 transferred responsibility for the School Building Assistance Program from the DOE to the Massachusetts School Building Authority (MSBA). On September 6, 2006, the MSBA enacted regulations that require that schools receiving funds under the program for construction or renovation projects must confer with the most current edition of the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 963 CMR 2.04(2)(c),(d).

The MDPH has prepared this guidance in order to prevent/reduce the migration of renovation-generated pollutants into occupied areas and their potential impact on indoor air quality. The MDPH suggests that the following steps be taken on any renovation project within a public building.

Physical Isolation of Occupied Areas from Renovation Areas

Renovations of buildings should be separated from occupied areas by constructing temporary physical barriers. These barriers are typically constructed of plywood and polyethylene plastic built in or over passageways between the construction area and the occupied spaces.

Appendix A

Construction barriers should be sealed with polyethylene plastic and duct tape on the construction side as well as the occupied side to provide a dual barrier. Inspection of these barriers should be conducted daily prior to commencement of construction activities to ensure integrity. A log of the location and condition of each barrier should be maintained in a log book.

Other migratory pathways for pollutants to move between construction and occupied areas should be examined and sealed. These migratory pathways may include but are not limited to:

- Crawlspace
- Electrical outlets and light switches in shared walls
- Pipe and electrical conduits between walls
- Ventilation system ductwork
- Holes in interior walls and/or spaces above interior walls and roof/floor decking (e.g., spaces above ceiling tile systems).

Outdoor construction-generated pollutants can migrate indoors under various conditions. The following are recommendations to reduce migration of *outdoor* pollutants to the indoor environment:

- Seal around exterior doors with weather stripping and door sweeps to prevent infiltration of outdoor construction-generated pollutants.
- Cover with tarps any dirt/debris piles in close proximity to the building or wet down dirt/debris to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.
- Temporarily deactivate the HVAC system during construction generating high amounts of outdoor pollutants. If activity is longer than one day, alternative means of ventilation should be provided for the impacted areas. If not feasible, relocation of activities in these areas should be considered.

The Use of Pressurization/Depressurization Techniques

Construction sites should be isolated and depressurized compared with occupied areas to control for renovation pollutants. To achieve depressurization, use fans to draw air away from occupied areas. Use of the existing supply ventilation system to introduce fresh outside air into occupied space should be used to increase air pressure in occupied areas adjacent to construction activities. In order to assess whether depressurization has occurred, air pressure monitoring (using a micromanometer) to measure air pressure differential between occupied space and construction areas should be used. Monitoring should be done daily at each barrier to ensure appropriate pressurization. Results of the location, dates and results of air pressure monitoring should be kept in a log book. No construction work should occur in areas immediately adjacent to occupied areas if:

- Depressurization is not achieved,

Appendix A

- Air pressure monitoring has not been done that day, or
- Odor/construction related complaints have been made by occupants in adjacent areas.

Operation of the Existing Ventilation Systems

Precautions should be taken to avoid the *re-entrainment* of construction-related materials into the building's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities and contingency plans to maintain adequate supply of fresh air and temperature must also be developed and implemented to maintain building occupant safety and comfort. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring systems are isolated from contaminated environments, sealing ventilation openings with plastic and using filters with a higher dust spot efficiency where needed.

Administrative Management to Prevent Exposure to Construction Generated Pollutants

Various administrative actions can also prevent occupant exposures to construction/renovation-generated pollutants. The following measures should be used to prevent, eliminate or reduce occupant exposure to construction-generated pollutants:

- Schedule projects that produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.
- Develop a notification system for building occupants to report construction/renovation related odors and/or dust problems to the building administrator. These concerns should be relayed to the contractor in a manner to allow for a timely remediation of the problem.
- Disseminate scheduling itinerary to all affected parties; this can be done in the form of meetings, newsletters or weekly bulletins.
- Notify occupants about construction activities that may be conducted in close proximity to their work areas. In certain cases, HVAC equipment for areas adjacent to construction activities may need to be deactivated and windows closed periodically to prevent unfiltered air and vehicle exhaust from entering the building. For this reason, prior notification(s) should be made.
- If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.
- Keep Material Safety Data Sheets (MSDS) for all construction materials used during renovations in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act.

Appendix A

Control/Reduction of Pollutants in Occupied Areas

Frequently, renovations include the replacement of components of the HVAC system, rendering windows as the only source of fresh air. In this environment, removal of normally occurring pollutants as well as construction-generated pollutants must be enhanced to reduce exposure.

The following recommendations are made to reduce exposure under these circumstances:

- Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This should include daily cleaning of occupied areas during the course of renovation work generating dust, fumes and other particulate materials.
- Consider increasing the number of personnel or work hours for existing staff (e.g., before school) to provide increased cleaning of dirt/dust accumulation in occupied areas due to construction/renovation activities.
- Control for dusts by using a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping/mopping of all surfaces.
- Cover with tarps any dirt/debris piles (indoors and outdoors) in close proximity to the building or wet down dirt/debris (outdoors) to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.

Inspection upon Request

The Massachusetts Department of Public Health, Bureau of Environmental Health, Indoor Air Quality Program, is available to inspect a public building upon receipt of a written request for inspection from and in cooperation with the appropriate government agency.

QUESTIONS

If you have any questions concerning these guidelines, please contact:

Massachusetts Department of Public Health
Bureau of Environmental Health, Indoor Air Quality Program
250 Washington Street, 7th Floor
Boston, MA 02108
Phone: (617) 624-5757 Fax: (617) 624-5777

Document Reviewed: August 2008