

INDOOR AIR QUALITY ASSESSMENT

Uxbridge High School
300 Quaker Highway
Uxbridge, Massachusetts
August 2026



Prepared by:
Massachusetts Department of Public Health
Bureau of Climate and Environmental Health
Division of Environmental Health Regulations and Standards

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EXECUTIVE SUMMARY

In April 2026, the Uxbridge Board of Health contacted the Massachusetts Department of Public Health's Bureau of Climate and Environmental Health (DPH/BCEH) because of concerns raised about diagnoses of cancer among staff at Uxbridge High School (UHS). On May 19th, BCEH's Division of Environmental Health Regulations and Standards (EHRS) and Division of Environmental Epidemiology (DEE) met with local health and school officials, including the Superintendent of Uxbridge Public Schools, to learn more about the concerns and discuss next steps. In response, EHRS staff conducted an indoor air quality (IAQ) assessment of UHS on June 4th and DEE staff conducted interviews with concerned individuals to gather detailed information about health, building, or environmental concerns. These interviews were completed at the end of June. This document details the findings of the IAQ assessment and provides specific recommendations based on those results. Once DEE's environmental epidemiologists have completed carefully reviewing the information collected from the interviews and pertinent existing data, those findings will be provided in a separate document.

Any building can have IAQ issues. These issues can worsen through conditions common to marginalized communities (Environmental Justice [EJ] communities) such as inequitable exposure to outdoor air pollution and a greater likelihood of poor building conditions leading to deterioration of IAQ, resulting in higher asthma rates. As part of our assessments, EHRS determines if the building sits in an Environmental Justice community. Based on [2020 census data](#), UHS is not within an EJ community. While pediatric asthma rates are not calculated for high schools, EHRS also notes that the prevalence rate for K-8th grade students living in the town of Uxbridge is 6.2% based on data for the 2024-2025 school year. This rate is statistically significantly lower than the statewide pediatric asthma prevalence rate of 9.8% (MA EPHT, 2026).

The assessment was conducted by evaluating several key elements within the building including: a visual inspection of the heating, ventilation and air conditioning (HVAC) systems, water/microbial damage, cleanliness, point sources of respiratory irritants such as chemicals, and electronic measurements of carbon dioxide (CO₂), carbon monoxide (CO), temperature, relative humidity (RH), small particulate matter (PM_{2.5}), and total volatile organic compounds (TVOC) all taken with a TSI Q-Trak XP monitor. This instrument is

maintained and calibrated according to manufacturer's guidelines. Data is collected in this manner to identify potential asthma triggers, and other environmental factors that can cause indoor air quality symptoms. Please refer to the [Indoor Air Quality Manual](#) on the MDPH website for methods, sampling procedures, and interpretation of results.

As a result of this assessment, there are several key findings:

- Overall, this school, built in 2012, is in very good condition based on the parameters assessed. Efforts should continue to keep the building in good working order.
- Levels of carbon dioxide (a measure of the adequacy of ventilation) in the school were within the EHRS guidance levels in all rooms assessed indicating sufficient fresh air in rooms throughout the school.
- Some small amounts of water damage were noted, believed to be due to leaks through the roof, wind-driven rain, and issues with misuse of restrooms. This school has numerous art, science, and shop areas, most of which are furnished with appropriate task-based ventilation that needs to be used consistently and maintained in good working order.

Based on the results of the assessment, the following primary recommendations are proposed:

- Ensure that the building's HVAC systems are on and operating at all times during occupied periods.
- Use openable windows to supplement fresh air during temperate weather. Ensure all windows are tightly closed at the end of the day or during periods of elevated outdoor relative humidity to avoid condensation/mold issues.
- Replace water-damaged ceiling tiles regularly to eliminate mold growth opportunities and so that new leaks are easily detected.
- Ensure all task-based exhaust systems are kept in good repair and used whenever needed. Consider adding additional dedicated ventilation to locations where laminators, 3D printers, and similar equipment are used.

- Avoid the use of scented products and other non-school-supplied cleaning and sanitizing products in the school.
- Ensure that the HVAC system has been balanced in the last 5 years.

BACKGROUND

Building:	Uxbridge High School (UHS)
Address:	300 Quaker Hwy, Uxbridge, MA 01569
Assessment Requested by:	This IAQ assessment was requested by the Superintendent of Uxbridge Public Schools and the Town of Uxbridge Health Department
Reason for Request:	A response to concerns related to diagnoses of cancer among staff at the school.
Date of Assessment:	June 4, 2026
Massachusetts Department of Public Health/Bureau of Climate and Environmental Health/Division of Environmental Health Regulations and Standards (DPH/BCEH/EHRS) Staff Conducting Assessment:	Ruth Alfasso, Environmental Engineer, and Bharathi-Patimalla-Dipali, Environmental Analyst
Building Description:	UHS is a two-story brick and glass building constructed in 2012. The roof is mostly peaked with some flat sections. The building is located in a wooded setting less than a mile from the Blackstone River.
Windows:	Windows in the building are openable.

RESULTS AND DISCUSSION

The following is a summary of indoor air testing results ([Table 1](#))

<ul style="list-style-type: none"> • Carbon dioxide (CO₂) 	<i>a measure of the adequacy of ventilation</i>	Levels were <u>below</u> the DPH guideline of 800 parts per million (ppm) in all areas surveyed. Note that many windows in the school were open, and members of the senior class had already left for the year, leaving many classrooms with lower occupancy.
<ul style="list-style-type: none"> • Temperature 	<i>a measure of comfort</i>	Temperatures outside were near 90°F during the day, and only a few areas of the school have mechanical cooling. The U.S. Department of Energy recommends 68°F in winter and 78°F in summer as starting points that balance comfort with energy efficiency. Those numbers assume in winter or

		summer, occupants are wearing seasonal appropriate clothing.
• Relative humidity	<i>a measure of comfort and, when in excess for an extended period, a way to reflect the potential for mold and fungal growth</i>	Readings were <u>within or very close to the lower end of</u> the DPH recommended range of 40 to 60% in all areas tested.
• Carbon monoxide (CO)	<i>a product of combustion that can result in acute and long term cardiovascular, respiratory, and neurological symptoms</i>	Levels were <u>non-detectible</u> (ND) in all areas assessed.
• Particulate matter (PM_{2.5})	<i>a way to measure inhalable particle distribution in the air</i>	Concentrations were <u>below</u> the National Ambient Air Quality Standard (NAAQS) of 35 micrograms per cubic meter (go/m ³) in all areas tested.
• Total Volatile Organic Compounds (TVOC)	<i>VOCs are carbon-containing substances that can evaporate at room temperature. Frequently, exposure to low levels of total VOCs (TVOCs) may produce eye, nose, throat and/or respiratory irritation in some sensitive individuals.</i>	Readings of TVOC's were detected only in the woodshop near some recently painted items and paint cans where minimal readings (between ND and less than 1 ppm) were measured. All other readings were <u>non-detectible</u> (ND).

Ventilation and HVAC System Maintenance

Ventilation refers to both the supply of fresh air and the removal of stale air from a room. The introduction of fresh air into an occupied space will dilute normally occurring pollutants that are generated by occupancy and other activities. In addition, a heating, ventilation, and air conditioning (HVAC) system will remove pollutants from a building if operating appropriately.

UHS has mechanical ventilation supplied by multiple large individual air handling units (AHU), most of which are located in mechanical areas above the second floor (Picture 1), and some of which are on flat parts of the roof (Picture 2). These units draw fresh air in from vents to the outside, filter it, and heat it as necessary, before distributing the air to classrooms, offices, and other areas through ceiling-mounted supply vents (Picture 3). Only one of the AHU supplies cooling/air conditioning. This unit supplies the main offices, the auditorium, the library, and several other rooms nearby.

Air is returned to each AHU or exhausted from the building through ceiling-mounted return/exhaust vents (Picture 4). Exhaust vents from locations that produce odors or moisture (e.g., bathrooms) should be directly vented to the outside of the building. It was not determined if all classroom/office exhausts were directly vented outside, or if some were partly recirculated through an AHU.

Ductless air conditioning units, also known as “mini-splits,” provide heating and/or cooling, but do not have a fresh air supply. Several of these units were found in utility spaces such as the IT closet and a computer room (Picture 5). When used in cooling mode, ductless air conditioners produce condensation that needs to be drained with a hose and sometimes a pump. These components should be checked periodically for issues such as blockages when in use and cleaned/repaired, as needed.

Most rooms in the building are equipped with openable windows (Picture 6; Table 1). These windows were in good condition, and many were open during the assessment. Opening windows during temperate weather can supplement other HVAC components and help with temperature/comfort during hot weather in areas without air conditioning. Windows should not be opened during heavy rain, very cold or hot weather, and when outdoor air quality is poor due to outside activities such as lawn maintenance, pollen, or wildfire smoke.

Note that the school has acquired an outdoor air monitor which is located on the roof. This instrument, funded through a Mass DEP Air Sensor Grant Program, is made by Purple Air and measures PM2.5 continuously. Readings from this sensor and others in Uxbridge can be viewed on a web browser ([map of Uxbridge sensors](#)). Information from this sensor can be used to help determine if windows should be closed. Windows should also remain closed when any air conditioning is in use in the room to prevent condensation. Windows should be tightly closed at the end of the day to prevent water damage, pest access, and security issues.

Various task or equipment-based exhaust ventilation units were found in the school. Fume hoods were noted in several science labs. Fume hoods need to be calibrated annually to ensure they work properly and calibration stickers were noted next to most of the fume hoods (Picture 7). One was reported to be out of order and had been blocked from use. In addition, chemicals were stored in a fume hood, which should not occur unless they are currently being used in the science lab (Picture 8).

Other task-based exhausts included an exhaust vent for the kiln in the art room (Picture 9). The shop area is equipped with dust extractors (Picture 10), which remove the wood shavings/dust to a collection vessel outside the building. The dust extraction system was activated during the visit and appeared to be operating. Laser cutters were also equipped with an exhaust vent (Picture 11). All of these types of equipment need to be kept in good repair and used every time the accompanying equipment is activated.

The various types of ventilation components as well as devices that can move/redirect airflow are listed in [Table 2A](#), [Table 2B](#) and [Table 2C](#).

HVAC System Maintenance

- **HVAC equipment in the building was installed when the school was built in 2012.** According to the American Society of Heating, Refrigeration, and Air-Conditioning Engineering (ASHRAE), the service life of this type of unit is 15-20 years, assuming routine maintenance of the equipment (ASHRAE, 1991). Although this would put the building's equipment within its service life now, maintenance of this equipment may get more difficult as it ages and replacement parts are harder to find.

Balancing

To have proper ventilation with a mechanical supply and exhaust system, a system must be balanced to provide an adequate amount of fresh air to the interior of a room while also removing stale air from the room.

It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994).

HVAC Types and Specific Conditions

[\(see Ventilation Pictures\)](#)

Air Handling Units:

- **The DPH IAQ Outreach and Education Unit recommends that filters of at least minimum efficiency reporting value (MERV) 8 or better be used,** if the system can operate with them without adversely affecting function. MERV 8 filters are adequate to filter out pollen, mold, and similar particulates (ASHRAE, 2012).
 - AHUs at this school use filters with a MERV rating of 10 (Picture 12), which will provide improved filtration over MERV 8. Filters are reportedly replaced 4 times a year. Filters should be stored in a clean, dry location, preferably in a closed container, before use.
 - Some supply vents were dusty (Table 1). Dust on vents can become airborne during periods of very dry weather, while high humidity can cause the dust to become damp, causing an environment for potential mold growth.

Classroom exhaust vents:

- **The location of exhaust vents on the ceiling makes them more difficult to test for air draw.** Exhaust vents should be checked periodically to ensure they are operating.
- Some exhaust vents were also dusty.

Task-based exhaust:

- **Lab hoods should continue to be calibrated annually if they are to be used for chemical experiments.** Bottles of chemicals should not be stored in hoods except while being used.
- **All task-based exhaust should be used consistently whenever the applicable equipment is in use** such as the kiln and the wood shop dust collection equipment.
- **The Life Skills room has stoves with hood vents, but it wasn't obvious if these exhaust out of the building or recirculate air in the room.** Cooking can create a variety of odors and particulates, and it is better if vents remove air from the building. If vents recirculate, any filters inside need to be changed periodically.

Water Damage and Moisture Concerns

Molds are found naturally in our environment both indoors and outdoors. Inside, mold growth may occur when items, particularly porous products such as paper or gypsum wallboard, are exposed to moisture. Typical water sources include leaks, floods, and condensation. To avoid mold growth, dry all water-damaged items and affected areas within 24-48 hours and reduce indoor humidity. Some people with chronic respiratory conditions, such as asthma, are more likely to experience health symptoms associated with molds, including allergic reactions and respiratory irritation. Controlling moisture is the key to preventing mold growth and potential health symptoms.

Hot humid summers are becoming more frequent due to climate change. Massachusetts has experienced hot, humid, and rainy summers in 2018, 2021, and 2023. July of 2021 was the wettest ever recorded in Massachusetts, and the three-month period from June through August, known as the meteorological summer, was the fourth wettest on record, according to the National Oceanic and Atmospheric Administration's (NOAA) Centers for Environmental Information (NOAA, 2021). The summer of 2023 was also hot, and wet, being measured as the second rainiest on record (WBUR, 2023). The summers of 2024 and 2025 also had significant stretches of hot, humid weather.

During these hot and wet summers, extended periods of outdoor relative humidity above 70% occurred. Under these weather periods, public buildings experienced extended periods of water vapor exposure from high relative humidity. When exposed to these conditions, porous materials such as gypsum wallboard, cardboard, and other materials may become prone to developing mold colonization, particularly if located in areas that are prone to developing condensation on floors and walls (e.g., below grade space).

Please note that the IAQ Outreach and Education Unit **does not** recommend conducting mold testing in a typical water damage remediation. For details, please consult [Guidance Regarding Testing for Mold in Water-Damaged Public Buildings](#) | Mass.gov
The application of a mildewcide to moldy porous materials is also not recommended.

Water Damage Issues

[\(see Water Damage and Moisture Concerns Pictures\)](#)

- **Water-damaged ceiling tiles were noted in a few areas** (Table 1; Pictures 13 and 14).
 - Some of these are likely caused by roof leaks and leaks through the building envelope during wind-driven rain or due to ice dams. In one area, paint also appeared to be water-damaged (Picture 15).
 - Some of the water damage is reportedly due to misuse of restrooms leading to plumbing leaks. A set of girls' and boys' restrooms on the second floor were blocked off during the assessment due to ongoing issues with misuse and resulting leaks.
 - No characteristic dark or fuzzy staining that indicates mold growth on any materials was found, nor were any musty or moldy odors detected.
 - Water-damaged ceiling tiles should be replaced, and water-damaged paint should be repaired. During replacement of ceiling tiles, the area above should be examined for additional signs of water damage.
- **Plants were noted in a few classrooms, offices, and the library** (Table 1; Picture 16). Plants, soil, and drip pans can serve as sources of mold/bacterial growth. Plants should be properly maintained, over-watering of plants should be avoided, and non-porous drip pans should be used. Some plants were on cardboard or had no drip pans to protect building materials (Picture 17). Plants and drip pans should be inspected periodically for mold growth and cleaned/replaced as needed. Plants should also not be placed near HVAC components or fans as this distributes dust, odors, or pollen throughout the room.
- **There were several full-sized and smaller refrigerators in the building. Food/liquid stains were observed in one** (Picture 18). Spills in a refrigerator can be a source of odors and mold growth.
 - Also note that while these refrigerators are not covered by the food code, it is good practice to have a thermometer in each refrigerator that is visible to ensure refrigerated food temperatures are kept at 5°C (41°F) or less (US FDA, 2022).
 - Some refrigerators were located in carpeted areas (Table 1). Spills or leaks from this equipment can moisten carpeting and lead to damage or odors.
- **Food and food preparation equipment was noted in some classrooms and offices** (Table 1). **Some of the equipment was dirty** (Picture 19). To reduce the potential for pest activity, all food and food items should be stored in closed, pest-proof containers at all times other than active use. Food waste and crumbs should be cleaned up promptly.
- **Safety showers are present in the science labs.** All of them were equipped with a nearby floor drain. Items should not be stored near the safety showers to prevent water damage if the safety showers are activated.

- **Sinks are present in some classrooms, workrooms, and other areas.** Some sinks had cabinets beneath them with items including porous items underneath (Picture 20). The area under a sink is a damp environment, and large amounts of materials, or porous items should not be stored in these cabinets.
- **Sinks and other drains that are not regularly used can have the traps dry out.** This can allow sewer gases into occupied spaces, which can be a source of odors. In addition, during heavy rains, moist air from the sewer can be pushed back into occupied spaces and contribute to high humidity and condensation.
 - Pouring water down drains every week or two will maintain the trap seal.
 - A list of intermittently used drains should be maintained, including those in locker rooms, science labs and mechanical areas, to help ensure drain traps remain wetted and sealed.
 - If fixtures and drains are not going to be used again, they should be properly cut and capped. Temporary solutions also exist to close off piping and drains which can be reversed if the fixtures are needed later.
- **Because this school does not have central air conditioning in most areas, humidity on hot, humid days can build up.** This is both a source of discomfort and provides the potential for condensation on surfaces that are cooler than ambient air. Such surfaces may include floors in contact with the ground, exterior walls in shade or overnight, and cold-water pipes. **In general, any material that is porous and capable of supporting mold growth should not be stored on floors and against walls capable of becoming moistened by condensation.** Such materials include cardboard boxes, cloth, paper, books, soft plastics (e.g., polyurethane), leather, upholstered furniture, and jute or latex-backed carpeting.

Several other conditions on the outside of the building were identified that can contribute to water infiltration issues, which are specified in [Table 3](#) and are listed below.

Mold Growth

Porous materials (e.g., gypsum wallboard, ceiling tiles and carpeting) can be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008).

If porous materials are not dried within this time frame, mold growth may occur.

An exterior evaluation was also conducted to identify potential pathways for water penetration and pest entry. The following issues were noted:

- **Light was noted penetrating through the spaces around a few exterior doors (Picture 21),** which can provide a pathway for odors, fumes, uncontrolled drafts, moisture, and pests into the building.
- **A few trees and shrubs were noted against exterior walls (Picture 6).** The presence of trees prevents the exterior of the building from drying and may clog gutters/roof drains with leaves and other debris. In addition, trees and shrubs next to the building can be a source of pollen and odors to open windows and may provide pest harborage.

Sources of Respiratory Irritants/Possible Asthma Triggers

Asthma is a lung disease that can make breathing difficult. Without careful management of asthma, some individuals can have symptoms, like a tight feeling in the chest, shortness of breath, coughing, or wheezing. Although there is no cure for asthma, individuals with asthma can live healthy, active lives. A safe and healthy environment helps to reduce asthma symptoms.

Comparison of Local and State-wide Asthma Rates for Children in Kindergarten through 8th Grade
(2024-2025 school year/MA EPHT, 2026)

Town of Uxbridge	Massachusetts
6.2% of children have asthma	9.8% of children have asthma

- **Sometimes, learning tools and personal items in a classroom can be a source of irritation.** For example, a bird or insect nest is a great learning tool for students but may harbor microbes and allergens. Similarly, food-based projects can attract pests that carry disease or trigger allergies.
- **Personal products, particularly those with volatile organic compounds (VOCs), including scents, can be a source of respiratory irritation.** VOCs are carbon-containing substances that can evaporate at room temperature. Frequently, exposure to low levels of total VOCs (TVOCs) may produce eye, nose, throat and/or respiratory irritation in some sensitive individuals. **Products noted were dry erase markers, sanitizers, cleaning products, and some fragrance items (Picture 22 and 23; Table 1).** Consult "[Clean Air Is Odor Free](#)" for more information on fragrances in schools and other building.
- **Dust, a common respiratory and eye irritant, can collect on surfaces and items.** Although custodial and maintenance staff perform routine cleaning in classrooms, they may not be able to clean as effectively if classroom items are not picked up or surfaces are cluttered. **Some classrooms and storage areas had an excess of items such as books, craft materials, papers, boxes, and miscellaneous materials (Picture 24).** *Note that some of the excess items in rooms were due to end of the year cleanouts and book returns.*

Even with a properly functioning ventilation system, it is necessary to either eliminate or reduce the use of materials that can be a source of respiratory irritants to prevent symptoms in individuals who have sensitivity to such pollutants.

For guidance on maintaining an asthma-friendly healthy school environment, please consult the MDPH Asthma Prevention and Control Program's [Clearing the Air: An Asthma Toolkit for Healthy Schools](#).

Possible asthma triggers and/or airborne pollutants exist in the building. These are listed below as well as in ([Table 4](#)).

- **Pottery wheels, other ceramics equipment, and a kiln are present in an art room.**
 - Ceramics activities produce fine dust which is difficult to clean. Wet wiping with microfiber cloths may help remove dust without aerosolizing it.
 - The kiln is an electric model and is equipped with an exhaust vent which is used whenever the kiln is in use. Items should not be left near the kiln when it is in operation. Students should not be in the room when the kiln is operating. It was also noted that the exhaust vent in the room with the kiln was dusty and may also be corroded. This should be cleaned periodically and replaced if necessary.
 - Only lead-free glazes and other materials should be used. Bottles of glaze material found in the pottery room were labeled as lead-free.
- **3D printers were found in several classrooms** (Picture 25; Table 1). These appliances can produce fumes, particulates, and odors in use, with toxicity depending on temperature and the types of materials used in the printer (UL, 2026).
 - Most of the printers examined did not have dedicated exhaust ventilation, and some were in rooms without windows. This can allow the fumes from using them to build up.
 - All the 3D printers examined had enclosures designed to reduce the emissions of fumes and particulates into the room.
 - TVOCS and particulates were tested in one room with a 3D printer operating and no elevation of either measurement were noted at the time, however other printers, other printing materials, or other room conditions may have different results.
- **As noted above, there are science labs in the building and chemistry storage areas. The following was noted:**
 - Flammable and acid cabinets were present in at least two prep rooms. All had venting which should go directly outside the building (Picture 26). Flammable and acid cabinets were tightly closed and locked.
 - There were large amounts of different types of chemicals on shelves in prep areas (Picture 27). Shelves were labeled with different chemical families for organization, keeping like items together. Incompatible materials such as those that would react if mixed should not be kept together on chemical storage shelves.
 - All items were in labeled containers. Many of the containers had added markings on them, including dates. If these dates are to indicate when the items were acquired or opened, this is useful information to assist in regular clean-outs of expired products. Some of the dates were almost ten years ago, which may indicate some of the product has exceeded its shelf life.
 - Some items were not in original containers (e.g., the blue solution in a flask shown in Picture 27). This container was covered with parafilm or a similar material. This is not an adequate long-term storage method. However, this flask was clearly labeled.

- Chemical storage should be sorted and cleaned out at least every year to remove expired products, products that show signs of degradation, and items that are no longer used in the program.

- **A wood shop/fabrication area is present in the building.**

- As noted above, there are wood dust collectors at most of the equipment which removes the shavings/wood dust to a collector outside the building.
- The woodshop room was relatively clean with a small amount of wood dust and shavings on the floor. Wood dust and shavings can be irritating to the mucous membranes and skin, shavings on the floor are a slip hazard, and may be a fire hazard.
- Spray painting had recently been conducted in or just outside the room, and there was an odor of paint near the spray booth (Picture 28) where cans of spray paint and recently-painted items were nearby. **Total VOCs in this area were measured between non-detect and less than 1 ppm.** It was reported by the shop teacher that large spray-painting projects are generally conducted outside via the exterior door in the shop room where a covered exterior area is available.

- **Laser cutters and other items are also present in shop areas.** All of these should be equipped with local exhaust, which should be used every time the equipment is used. Manufacturer's safety instructions should also be followed.
- **Printing and laminating equipment were noted in the library and staff workroom areas.** Items such as photocopiers, heavy-duty printers, and laminators are commonly found in schools and typically without direct vented or task-based exhaust. These items can produce fumes and odors, especially if heavily used.
- **Due to the presence of science lab sinks, the school is equipped with an acid waste neutralization tank system located in a utility room on the basement level.** No odors were noted in the room and there was no sign of leaks. Acid waste systems have been a source of odors in other schools. These units need to be properly maintained and monitored for proper function to prevent leaks or odors and protect downstream piping and wastewater treatment.
- **The nurse's area has a wall-mounted Upper-Room Ultraviolet Germicidal Irradiation (UVGI) unit.** This unit was plugged in, but there was no indication if it was operating. [According to the USEPA](#), these units should be installed by a professional. If this unit is used, it should be maintained in accordance with the manufacturer's instructions. Only units that do not produce ozone should be used in occupied indoor environments.
- **Air purifiers were noted in a few areas.** Units using high-efficiency particulate air (HEPA) filters, with or without a carbon filter, are good choices to remove particulates including dust and microbes from indoor air. They should be cleaned and have filters changed as recommended by the manufacturer. For best results, the outlet of the airstream from these units should be in the breathing zone of occupants.

- **A key aspect of maintaining good IAQ is cleaning with the proper materials and equipment.** The school should maintain a catalog of all the cleaning supplies used in the school including the Safety Data Sheets (SDS) for each product. This information is vital in an emergency and can be helpful in preventing overexposure or product interactions. Only school-supplied cleaning products should be used. Products that are brought in from home should not be in classrooms and offices.
- **Plush items (Picture 29) and upholstered furniture were found in some areas of the school.** These items need to be cleaned regularly to remove accumulated dust.
- **Personal fans were also dusty in some areas.** These should be regularly cleaned.
- **A few areas of the building are carpeted and there are area rugs in some rooms (Table 1).** Carpeting has a service life of approximately 10-11 years (IICRC, 2002). Carpeting that is beyond its service life becomes increasingly difficult to clean and may release fibers which can be irritating if airborne. Carpets should be vacuumed regularly with a HEPA-filter equipped vacuum cleaner and cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning, and Restoration Certification (IICRC) recommendations (IICRC, 2012).
 - Only new area rugs should be brought into the school. They should be cleaned regularly and stored rolled-up in a climate-controlled space over the summer.
- **Tennis balls were found cut open and placed on chair legs to muffle noise in a few classrooms (Table 1).** The inside of tennis balls have a natural internal rubber latex bladder, which becomes abraded when used as a chair leg pad. Use of tennis balls in this manner may introduce latex dust into the school environment. Some individuals are highly allergic to latex (e.g., spina bifida patients) (SBAA, 2001). It is recommended that the use of materials containing latex be limited to reduce the potential for symptoms in sensitive individuals (NIOSH, 1997). Latex-free glides should be used for this purpose.

Other IAQ Issues

Radon

Radon is a naturally occurring radioactive gas that seeps into buildings from the surrounding soil and can increase the risk of lung cancer at elevated levels.

The DPH recommends that schools test for radon, Testing should be conducted during the heating season when the school is primarily closed to the outdoors and while school is in session. The testing should be done in a manner consistent with US EPA radon testing guidelines. Radon measurement specialists and other information can be found at www.nrsb.org and <http://aarst-nrpp.com/wp>, with additional information at: <https://www.mass.gov/radon>.

Additional Issues

There were questions asked regarding the presence of fluorescent light bulbs in the building, particularly with regards to disposal. Fluorescent bulbs contain mercury, but while the bulb is intact, there is no potential for release of the material. The facilities staff report no history of broken bulbs. The facility staff reported that fluorescent lights are not known to be used at all in the building, having been replaced by LED lighting. If any fluorescent bulbs remain, the school can contract with a waste management company to properly remove any spent bulbs. In addition, facility staff report that no PCB-containing ballasts are present in the school.

CONCLUSIONS AND RECOMMENDATIONS

Short-term Recommendations – The chart below summarizes the recommendations from the earlier narrative so that they are easy to find and implement.

HVAC System

Description		Helpful links
1.	Use openable windows for additional fresh air during temperate weather. However, care should be taken to <i>avoid opening windows when air conditioning is in use</i> to prevent condensation and mold growth, and during extreme cold to prevent freezing of pipes.	https://www.airnow.gov
2.	The air monitor located on the roof can be used to help determine when windows should be closed. This instrument should be maintained in accordance with manufacturer's instructions.	
3.	Ensure all air handling units are operating during occupied periods.	
4.	Check the function of all exhaust vents now, and periodically during the school year. Repair any vent fans or louvers that are not operating correctly.	
5.	Change filters on air handling units and clean out the interior of the units at least twice a year. If filters are occluded with dust at filter changes, consider increasing the frequency.	

Description		Helpful links
6.	Maintain and service all air handling units as designed by the manufacturer.	
7.	Continue to monitor the building-wide HVAC management system for appropriate functions to ensure adequate fresh air, temperature control, and energy savings.	
8.	Maintain and clean ductless air conditioning units per manufacturers' instructions. Ensure condensation can drain properly to prevent leaks.	
9.	If science lab fume hoods are used, they should be calibrated annually to ensure proper function. Chemicals should not be stored inside the hoods when not in use.	
10.	Task-based exhaust systems for art and shop equipment should be kept in good repair and operated every time the associated equipment is used.	
11.	Air purifiers should be maintained in accordance with manufacturers' instructions, including filter changes and cleaning. Ozone producing units should not be used in occupied indoor areas for indoor air quality purposes.	https://www.epa.gov/indoor-air-quality-iaq/ozone-generators-are-sold-air-cleaners
12.	Germicidal UV equipment (such as that found in the Nurse's office) should be installed, used, and maintained as recommended by the manufacturer or installer.	

Water Damage and Related Issues

Description		Helpful links
13.	Replace water-damaged ceiling tiles and repair water-damaged paint. During replacement, check above the ceiling tile grid for additional water-damaged materials or water sources. If any ceiling tiles appear moldy, use the EPA guidance “Mold Remediation in Schools and Commercial Buildings” to address the mold.	http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide
14.	Maintain plants in good condition, avoid overwatering, and use waterproof drip pans underneath that are cleaned regularly.	
15.	Routinely clean food/liquid stains from refrigerators and ensure they are cleaned out regularly. Consider adding a thermometer to every fridge to ensure correct temperatures.	https://www.fda.gov/media/164194/download
16.	Clean food residues from microwaves, toasters, toaster ovens and any other appliances used to prepare or heat food.	
17.	Keep all food in pest-proof containers and keep them closed when they are not in use.	
18.	Avoid storing porous items or large amounts of items under sinks. Clean the sink cabinets regularly to remove dirt and debris that can be moistened by condensation or sink leaks.	
19.	Ensure any drains that are not regularly used are moistened periodically to keep the drain traps functional. Temporary or permanent methods can be used to cap or seal fixtures and drains that are no longer needed.	
20.	Use the guidance “Increasing Comfort in Non-Air-conditioned Schools” to assist in keeping the school comfortable during hot weather.	https://www.mass.gov/doc/methods-for-increasing-comfort-in-non-air-conditioned-schools/download

Description		Helpful links
21.	If needed, consider using dehumidifiers during periods of humid weather. Ensure they drain properly or are emptied at least daily, and that they are kept clean.	
22.	Avoid storing porous items or other materials on the ground level of the building during summer months in direct contact with floors or exterior walls. Such materials include cardboard, paper, and other porous materials. These materials should be stored up off the floor and away from walls on shelving.	Preventing mold growth in Massachusetts schools during hot, humid weather Mass.gov
23.	Make sure all doors to the exterior are tight-fitting using weatherstripping to prevent water, moisture, odor, fumes, exhaust, drafts, and pest access.	
24.	Remove trees, shrubs, and plants away from the building's exterior walls and windows to allow for better drying of building materials and prevent pollen and odors from being drawn into classrooms.	

Respiratory Irritants/Possible Asthma Triggers

Description		Helpful Links
25.	Reduce exposure to scented products such as diffusers and plug-in air fresheners. Scented items do not remove odors, they only cover them up with different odors. Address odors at the source through adequate ventilation and cleaning.	Clean Air Is Odor Free
26.	Use only school-supplied cleaners to avoid potential product interactions and unknown exposures. Refer to Safety Data Sheets for information about specific products.	
27.	Ensure that task-based exhaust for pottery equipment, laminators, 3D printers, and shop equipment is	

Description		Helpful links
	present, operational, and used every time it is needed.	
28.	Use only lead-free glazes and other materials in the pottery classroom.	
29.	Evaluate chemical storage and safe use procedures in school science labs. Laboratory chemicals should be stored properly, with flammable materials in closed, properly designed and labeled, cabinets. Ensure old and expired products are regularly removed for proper disposal.	https://www.mass.gov/info-details/improper-chemical-storage-or-usage
30.	Take steps to keep the wood shop organized and clean of debris to prevent excess wood dust in the air and physical hazards.	
31.	Maintain and monitor science lab acid waste neutralization system as recommended by the manufacturer.	
32.	Clean plush and upholstered items regularly using damp wiping and HEPA-equipped vacuuming to remove dust and debris.	
33.	Clean dust/debris off personal fans, supply, and return vents periodically.	
34.	Replace cut-open tennis balls with latex free glides, when needed, on chair legs.	
35.	Clean area rugs on a consistent basis and discard when worn out. Store area rugs rolled up in a climate-controlled area during the summer.	
36.	Enforce outdoor anti-idling requirements and post signs to give notice.	The Massachusetts Anti-Idling Law: FAQ
37.	For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced	

Description		Helpful links
	when the relative humidity is low. To control dust, a HEPA filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Encourage staff and students to drink water during the day to help ease some symptoms associated with a dry environment (throat and sinus irritations).	
38.	Due to the large amount and different kinds of lab and workshop equipment in the school (cutters, wood shop, 3D printers), it may be beneficial to engage the services of an Industrial Hygienist. This could assess whether there is appropriate protection for indoor air and other potential hazards. The services provided could include determining the effectiveness of ventilation for tasks, ensuring that the least hazardous materials that meet the needs are used in science and shop areas, and measuring potential exposures during typical activities.	

Radon and general IAQ issues

Description		Helpful Links
39.	Test the school for radon by a certified radon measurement specialist during the heating season when school is in session.	Radon measurement specialists and other information can be found at: www.nrsb.org , and http://aarst-nrpp.com/wp
40.	To learn more about radon, review the DPH's "Radon in Schools and Childcare Programs" factsheet.	https://www.mass.gov/radon
41.	Utilize the US EPA's (2000), "Tools for Schools" as an instrument for maintaining a good IAQ environment in the building.	https://www.epa.gov/iaq-schools
42.	For guidance on maintaining an asthma-friendly healthy school environment, please consult the DPH Asthma Prevention and	https://www.maasthma.org/schooltoolkit

Description		Helpful Links
	Control Program's" Clearing the Air: An Asthma Toolkit for Healthy Schools".	
43.	Include an IAQ component in the school's Wellness Advisory Committee program. An IAQ management plan should be overseen by a committee consisting of an IAQ liaison/teacher representative, a member of maintenance/facilities and a member of administration that conduct regular walk-throughs to identify on-going and/or potential environmental issues both inside and outside the building(s).	
44.	Refer to the IAQ resource manual and other related IAQ documents located on the DPH's website for further building-wide evaluations and advice on maintaining public buildings.	Indoor Air Quality at Mass.gov
45.	Consider installing HVAC sensor technology in UHS to provide continuous monitoring of indoor air parameters (particularly temperature and relative humidity). Sensors should be re-calibrated quarterly or according to manufacturers' specifications and building management software updated as per manufacturers' instructions, industrial standards, and/or change in operating systems. As an example, the following link illustrates how this technology is serving Boston Public Schools to improve air quality (i.e., carbon dioxide, temperature, relative humidity, carbon monoxide, and particulate matter).	COVID-19 Health & Safety Information / Indoor Air Quality Sensor Dashboard (bostonpublicschools.org)

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PICTURES

[\(Click to link back to report\)](#)

HVAC pictures

Picture 1



Air handling unit in a mechanical area above the second floor

Picture 2



Air handling unit on a flat part of the roof

Picture 3



Typical supply vent in a classroom

Picture 4



Typical ceiling-mounted exhaust or return vent

Picture 5



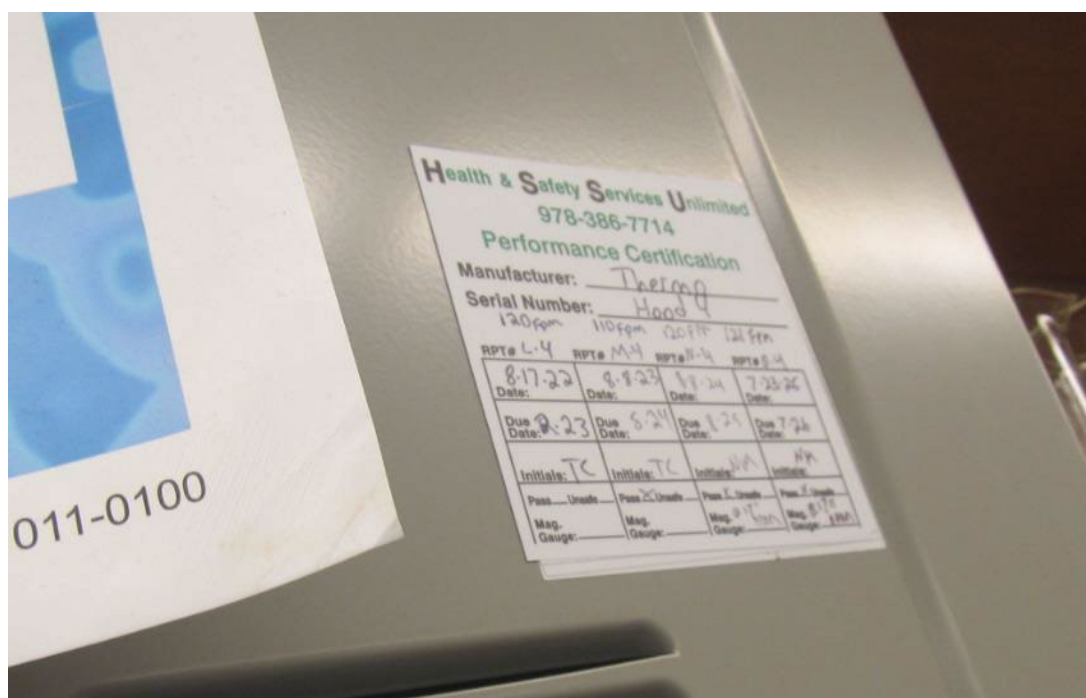
Ductless air conditioner, also known as a mini-split, note condensation drain (white pipes)

Picture 6



Open windows, note trees and bushes next to the building and under windows

Picture 7



Calibration sticker for lab hood

Picture 8



Bottles in a fume hood

Picture 9



Dedicated kiln vent

Picture 10



Example of a dust extractor in the wood shop

Picture 11



Exhaust vent for a laser cutter

Picture 12



Replacement MERV 10 air filters in an AHU room; filters should be stored in an enclosed space

Water Damage and Moisture Concern Pictures

Picture 13



Water-damaged ceiling tile

Picture 14



Water-damaged ceiling tile

Picture 15



Peeling paint that appears to be due to water damage

Picture 16



Plants in the library

Picture 17



Plants in a cardboard box in a classroom

Picture 18



Debris/residue inside a refrigerator

Picture 19



Microwave in need of cleaning

Picture 20



Items stored under a sink, including porous items and potential bleach bottle

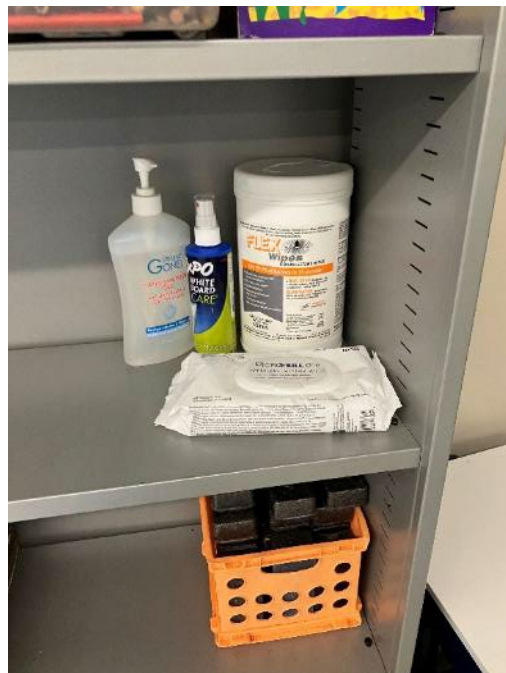
Picture 21



Gap beneath exterior door

Sources of Respiratory Irritant Pictures

Picture 22



Dry erase and sanitizing products

Picture 23



Essential oils in a guidance-area office

Picture 24



Returned books and other items on the floor of a storage area

Picture 25



Two 3D printers in a side room of the fabrication/wood shop area

Picture 26



Flammable and acid cabinets with vents

Picture 27



Chemicals in a science prep area cabinet, note flask on right of upper shelf with inappropriate cover

Picture 28



Painting spray booth in the wood shop, also note the exterior door

Picture 29



Plush item in an office

Table 1

IAQ Testing Results
Uxbridge High School
Uxbridge MA

Table 1 Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m³)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
Background (outside)	405	ND	82	36	3	0.5					Sunny/warm morning, calm parking lot, temperature increasing in the afternoon
B219	550	ND	80	38	2	ND	10	Y 2 open	Y	Y dusty	DEM
B217	701	ND	80	40	3	ND	22	Y	Y	Y	DEM
B210	531	ND	80	38	1	ND	4	Y	Y	Y	Eyewash and safety shower, sinks, DEM, hood (calibrated), gas valves, PF
Science Storage for B210 and B208										Y	Acid and flammable cabinets (locked), fridge, microwave, food
B208	570	ND	80	38	2	ND	14	Y 1 open	Y	Y	Eyewash and safety shower, hood (calibrated), PF on, DEM
Girls Restroom								Y open	Y	Y	
Staff Restroom								N	N	Y	Air freshener spray
B209	546	ND	80	39	2	ND	16	Y 2 open	Y	Y	DEM
B207	544	ND	80	38	2	ND	1	Y	Y	Y	DEM

µg/m³ = micrograms per cubic meter

CT = ceiling tile

ND = non detect

TBs = tennis balls

ppm = parts per million

DEM = dry erase materials

PF = personal fan

WD = water-damaged

Comfort Guidelines

Carbon Dioxide: <800 ppm = preferable

>800 ppm = may be indicative of ventilation problems

Relative Humidity: 40-60%

Table 1
Test Results (continued)...

Table 1 Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m³)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
B205	509	ND	80	38	2	ND	1	Y 2 open	Y	Y	DEM, floor fan – on
B203	597	ND	81	39	1	ND	12	Y	Y	Y	WD CT and WD wall paint (thought to be historic), DEM
B201	549	ND	79	37	ND	ND	1	Y	Y	Y	This room has air conditioning that operates when the lights are on, DEM
B201 Storage								N	Y	Y	Clutter on floor
B301+B301.1 Mechanical Room											Attic walk-in AHU units
B214	442	ND	81	36	2	ND	1	Y no screens	Y	Y	DEM
B212	448	ND	81	36	3	ND	0	Y	Y	Y	DEM, window fans – on, pedestal fan
B215 Staff Room	513	ND	80	37	2	ND	1	Y	Y	Y	Carpeted, printer+copier, fridge, microwaves, sink, couch and sitting booths
B215.3	477	ND	80	36	3	ND	0	N	Y	Y	Carpeted, mini fridge, ceiling tile not in setting
B211 Small Group	484	ND	79	36	2	ND	0	N	Y	Y	Dusty exhaust vent, pedestal fan. air purifier (not on)
B209 Data Closet											Mini split, cardboard on the floor

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									Supply	Exhaust	
B213	442	ND	81	36	3	ND	2	Y open	N	N	DEM
B206	486	ND	82	36	1	ND	1	Y open	Y	Y	DEM, pedestal fan
B204	466	ND	82	37	2	ND	0	Y	Y	Y	DEM
B202	572	ND	83	35	3	ND	14	Y open	Y	Y	DEM
B200	524	ND	83	35	ND	ND	10	Y open	Y	Y	DEM, fake plants, salt crystal lamp
Auditorium upper level											Some carpet
Auditorium Control Room	505	ND	78	38	ND	ND	0	N	Y dusty	Y	Carpet
Restrooms, marked not in use (girls and boys)								N			1 WD CT in boys room
A236	499	ND	79	38	1	ND	25	Y 2 open	Y	Y	DEM, dusty PF
A235	591	ND	80	39	1	ND	2	N	Y	Y	DEM, carpet and plush furniture, fan
A230	421	ND	82	35	3	ND	0	Y open	Y	Y	DEM, sink, cleaning products
A232 Consumer Science	436	ND	81	36	2	ND	7	Y	Y	Y	DEM, multiple sinks and cooking appliances – stove w/vents, microwave, oven, fridge

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Test Results (continued)...

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									Supply	Exhaust	
A230.1 Pantry	420	ND	81	35	ND	ND	0	Y	Y	Y	Food storage, fridge, washer, dryer, sink and microwave
A234	504	ND	81	33	2	ND	15	Y open	Y	Y	DEM, pedestal fan, paint peel above the DEM board
Attic 301.1											3 air handling units, roof access – roof drains look good
C241 Art	528	ND	81	38	2	ND	2	Y	Y	Y	WD CT, DEM, pottery equipment and dust, plants, sink
C243 Art	615	ND	81	40	2	ND	12	Y	Y	Y	DEM, sinks, 3D printer – on, TBs on chair legs
Kiln Room (off C243)							0	N	Y	Y	Kiln is electric, and vented outdoors, not on, general exhaust vent is dusty and rusted
C247	530	ND	81	40	3	ND	7	Y 1 open			PFs, items hanging from ceiling
C240.3 Storage Closet											Cluttered floor
C245	480	ND	82	37	1	ND	2	Y open	Y	Y	DEM
Attic											Trip hazards noted in the attic space, water spigot
Roof Access											Purple Air monitor
D153 Studio	580	ND	77	42	ND	ND	0	Y	Y	Y	Computers, large printer

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Test Results (continued)...

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									Supply	Exhaust	
D151	564	ND	76	41	ND	ND	0	N	Y	Y	Carpet
D155 Fabrication	460	ND	78	44	ND	ND-<1 ppm	0	Y and door	Y	Y	Paint odor (paint cans and recently painted materials), light visible under exterior door, wood shop equipment, most with task-based wood dust capture, some wood dust on floor
3D Printer Area (off D155)		ND			4	ND	0	N	Y	Y	One 3D printer is on
D156	524	ND	82	36	1	ND	0	Y open	Y	Y	DEM, sewing and pressing tools
D154	443	ND	81	39	3	ND	1	Y open	Y	Y	DEM, 3D printer, door to the exterior
D152 Ensemble closet											Storage
C142		ND	80	40	ND	ND	3	Y	Y	Y	Fridge has evidence of spill, lunch area
Cafeteria	588	ND	79	41	ND	ND	30-40	Y and doors	Y	Y	
Library	608	ND	76	40	1	ND	5	Y and doors	Y	Y	Carpeted, has air conditioning, plants, items hanging from ceiling, books
A130.1	606	ND	75	44	1	ND	0	Y 1 open	Y		Guidance suite, essential oils, food, area rug and carpet
A130.3	619	ND	74	42	ND	ND	0	Y	Y	Y	Carpet, food, fridge, HS

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									Supply	Exhaust	
A130 Staff Area								N	Y		Sink, fridge, microwave – dirty, area is carpeted
A130.6	621	ND	74	45	ND	ND	2	N	Y	Y	DEM, markers
A130.7	642	ND	74	45	ND	ND	1	N	Y	Y	Carpet
A 131	502	ND	76	43	2	ND	0	N	Y	N	Fridge
B102 Nurse	586	ND	75	43	1	ND	0	Y	Y	Y	Not carpeted, fridge, microwave, exam rooms
B104	637	ND	78	44	1	ND	20	Y 2 open	Y	Y	DEM
B106 Science	506	ND	80	41	4	ND	2	Y 1 open	Y	Y	Lab hood with bottles inside, DEM, sinks, gas valves
B106.1 Science Prep						ND		N	Y	Y	Chemical storage, flammable and acid cabinets – vented, sinks, other items
B108 Science	491	ND	81	40	7	ND	0	Y 1 open	Y	Y	Hood that appears out of order/not used, DEM, gas valves, PF
B110	581	ND	80	40	6	ND	11	Y 1 open	Y	Y	PF - on, plant, DEM
B112	566	ND	80	41	6	ND	23	Y 1 open	Y	Y	DEM, small room
B115	528	ND	81	41	7	ND	12	Y 1 open	Y	Y	PF on, DEM

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									Supply	Exhaust	
D1 Music	462	ND	79	40	2	ND	0	Y	Y	Y	Instruments, no air conditioning, radiators
Practice Ensemble Room	445	ND	79	39	1	ND	1	N	Y	Y	DEM, items
Practice 1	447	ND	79	39	2	ND	1	N	Y		
Practice 2	451	ND	80	38	2	ND	1	N	Y	Y	Piano
Stage	462	ND	79	40	1	ND	1	N	Y	Y	
A135.2 School Store								N			Concessions room – locked, dishwasher, fridge, microwave, sink, food
Gym	516	ND	81	38	1	ND	20-30	Y and door	Y	Y	Gap under exterior door
Gym Storage							0	N			Mats, balls, other equipment
135.1 IT closet							0	N			2 ductless air conditioners
Locker Rooms	452						0	N	Y	Y	No water damage, showers, toilets and sinks (includes girls, boys, and both team locker rooms)
A001 Exercise Room		ND	78	38	1	ND	1	Y	Y	Y	DEM, mats, weight equipment
A002 Exercise Room	449	ND	79	36	1	ND	1	Y	Y	Y	Wood floor

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									Supply	Exhaust	
B101.1 Library Office	724	ND	75	38	ND	ND	0	N	Y	Y	Carpeted
B101.2 Library Work Room	542	ND	74	43	3	ND	1	N	Y	Y	Carpeted, 2 doors – 1 into the library and other into the hallway
B101.3 Media Lab	577	ND	77	39	ND	ND	1	N	Y	Y	Carpeted, virtual reality glasses, laptop etc. storage
A130 Guidance Career Center	634	ND	76	40	ND	ND	4	N	Y	Y	Carpeted, mini fridge, microwave, printer+copier
A130.8 Records	526	ND	74	41	ND	ND	0	N	Y	Y	Closet – filing cabinets
A130.5 Office	586	ND	74	43	ND	ND	1	Y	Y	Y	Carpeted, fan
B103	487	ND	78	40	2	ND	0	Y	Y	Y	DEM
B105	464	ND	77	42	1	ND	0	Y	Y	Y	DEM, fragrant products, plants, cleaning products
B107 Staff Dining	456	ND	80	40	3	ND	0	Y	Y	Y	Printer+copier, toaster, fridge, microwave, sitting booths
B109 Life Skills	579	ND	80	36	14	ND	7	Y	Y	Y	DEM, decorative cloth hanging, fragrant products, plants, fridge, microwave, stove w/ vents, oven, dishwasher (out-of-order)
B111	492	ND	80	40	2	ND	1	Y	Y	Y	DEM, carpeted, pedestal fan, sink
B113	580	ND	80	40	5	ND	13	Y	Y	Y	DEM, plants

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PF = personal fan

WD = water-damaged

Comfort Guidelines

Carbon Dioxide: <800 ppm = preferable

>800 ppm = may be indicative of ventilation problems

Relative Humidity: 40-60%

Table 1
Test Results (continued)...

Table 1 Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m³)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
A135.3 Athletic Director	553	ND	80	40	1	ND	1	N	Y	Y	
A026 Meter Room											pH control and acid pumps, sewer discharge pump for basement fixtures
A020 Trainer Room	410	ND	85	31	1	ND	1	N	Y	Y	Ice machine, athletic supplies storage, office space, sink
A007 Girls Lockers Room Staff Area	396	ND	82	32	2	ND	0	N	Y	Y	microwave
A009 – Showers	405	ND	83	32	1	ND	0	N	Y	Y	
Main Office	708	ND	76	38	1	ND	1	Y	Y	Y	Carpet, plants
Staff Lunch	694	ND	75	39	ND	ND	0	Y	Y	Y	Fridge, microwave, sink, photocopier, not carpeted
B100.2 Main Office – Conf. Room	647	ND	77	38	ND	ND	1	N	Y	Y	DEM, carpeted
B100.3 Principal's Office	615	ND	75	40	ND	ND	0	N	Y	Y	DEM, carpeted
B100.1 Asst. Principal's Office											In-use

µg/m³ = micrograms per cubic meter

CT = ceiling tile

ND = non detect

TBs = tennis balls

ppm = parts per million

DEM = dry erase materials

PF = personal fan

WD = water-damaged

Comfort Guidelines

Carbon Dioxide: <800 ppm = preferable

>800 ppm = may be indicative of ventilation problems

Relative Humidity: 40-60%

Supply Ventilation
Types and/or Components

[\(Click to link back to report\)](#)

Table 2A

Equipment Present in Building (X = Yes)	Type of Heating/Cooling Ventilation Equipment	Fresh Air Supply (X = Yes)	Type of Location(s)	Air Filters Installed MERV Rating (1-15, U*) (X = Yes)	Comments
	Univents				
X	Rooftop Air Handling Units	X		10	
	Outdoor, Ground-Installed Air Handling Units				
X	Attic/Crawlspace Air Handling Units	X		10	
	Ceiling-Mounted Air Handling Units (including inside plenum)				
	Basement/Crawlspace-Installed Air Handling Units				
	Mechanical Room-installed Air Handling Units				
	Fan Coil Units				
	Window-Mounted Air Conditioners				
	Wall Louver-Controlled Gravity Air Supply				
X	Windows	X	Most rooms		In good condition
	Fan in window (blowing in)				
	Built in wall fan (switched)				
	Heat recovery ventilator unit				
	Energy recovery ventilator unit				
	Chilled Beam				
	Passive combustion supply vent in basement/boiler room				

*U = Filter Rating underdetermined due to inaccessibility during building visit

[\(Click to link back to report\)](#)

Exhaust Vents
Types and/or Components

Table 2B

Equipment Present in Building (X = Yes)	Type of Exhaust Ventilation Equipment	Ducted To Outdoors (X = Yes)	Type of Location(s)	Comments
X	Rooftop Motors/Fans	X		
	Unit Exhaust			
X	Ceiling Return Vent		Most areas	
	Ceiling Return Vent, Plenum			
	Wall Return Vent			
X	Stove Hood	Not known	Life Skills and Consumer Science rooms	
X	Restroom Exhaust Vent			
	Photocopier Exhaust Vent			
	Garage			
X	Chemical Hood(s)	X	Science rooms	
X	Locker Rooms			
X	Showers			
	Lock up Cells			
	Clothes Dryers			
	Gas Water Heaters			
	Furnace-Flue to Chimney			
	Furnace/Boiler direct vent or power vent (no combustion air supply)			
X	Kiln, Pottery		Art room	Electric kiln with vents to outside
	Dark Room			
	Generator Room			
X	Wood Shop Dust Collector		Most equipment in shop room	
X	Spray Paint Booths		Shop area	
	Fan in window (blowing out)			

Free Standing Equipment that Circulates or Filters Air

Table 2C

Equipment Present in Building (X = Yes)	Type of Equipment	Type of Location(s)	Comments
X	Floor Fans, pedestal	Various areas	
X	Portable fans	Various areas	Some dirty and dusty
X	Air Purifier (HEPA, other)	Some classrooms	Clean/replace filters on regular basis
	Floor heaters, portable		
X	Refrigerators, Cold Beverage Vending Machines	Break rooms and some offices	Clean food/liquid spills
	Radiator, wall-mounted		
	Radiator, floor-mounted		
	Passive vents (Wall/Door)		

Water-Damaged Materials in Building

[\(Click to link back to report\)](#)

Table 3

Found in Building X = Yes	Water-Damaged Materials, Building Components or Stored Materials	Location	Visible Microbial Growth? X = Yes	Musty odor detected? X = Yes	Comments
	Books-other bound materials				
	Brick walls – broken, missing mortar				
	Brick walls – blocked weep holes				
	Cardboard boxes				
	Carpet tiles				
	Carpet - Area rugs				
	Carpet wall-to-wall				
	Ceiling tiles - affixed directly to ceiling surface				
	Ceiling tiles - bowing-in suspended ceiling				
	Ceiling tiles - water-stained in splined ceiling				
X	Ceiling tiles - water-stained in suspended ceiling	Various	No		
	Chairs - laminated				
	Cloth				
	Countertops (around sinks)				
	Curtains				
	Dust/debris within AHU, uninvent, HVAC, chilled beam units, etc. (WD through condensation, humidity, or leaks)				
	Efflorescence (i.e., mineral deposits)				
	Engineered woods - particleboard, plywood, Masonite				
	Flooring – loosened tiles				
	Flooring - wooden				
	Furniture - laminated				
	Furniture - upholstered				
	Gypsum wallboard - ceiling				
	Gypsum wallboard - restroom wall				
	Gypsum wallboard - interior wall				
	Gypsum wallboard – located on exterior wall				
	HVAC drain pan – lack of draining				
	HVAC filters				

Table 3
Water-Damaged Materials in Building
(continued)

Found in Building X = Yes	Water-Damaged Materials, Building Components or Stored Materials	Location	Visible Microbial Growth? X = Yes	Musty odor detected? X = Yes	Comments
	Insulation- attic (paper-backed)				
	Insulation - inside air handling unit				
	Insulation - on pipe(s) fiberglass				
	Insulation - on pipe(s) other/plaster-like material				
	Insulation - wall cavity				
	Insulation - ceiling plenum				
	Modular furniture - walls/cloth partitions				
	Musical instrument cases				
	Plaster ceilings				
	Plaster walls				
	Records/files				
	Refrigerator - door gasket				
	Refrigerator - drip pan				
	Refrigerator - Interior surfaces				
	Room divider - ceiling-mounted, sliding				
	Sink backsplash				
	Tables - laminated				
	Wallpaper				
	Wood - attic/ <u>roof</u> materials				
	Wood - floor joists in basement ceiling				
	Wood - wall framing				
	Wood - window sills				
	Wood - window-mounted air conditioner framing				
X	OTHER: wall paint	One room	No		

Table 4

Identification of Asthma Triggers by Outreach and Education Unit
During Building Assessments and Recommendations to Reduce or Eliminate from the
Indoor Environment

WHAT ARE ENVIRONMENTAL ASTHMA TRIGGERS?

Asthma triggers are any chemical, pollutant, or allergen that can make your asthma worse.

Asthma triggers can also be strong chemical smells, dust, or pets. Your asthma triggers may be different from those of other people. Not all asthma triggers affect people the same way. Environmental asthma triggers are found both indoors and outdoors. DPH link: [Asthma and Your Environment \(mass.gov\)](https://www.mass.gov/info-details/asthma-and-your-environment)

[\(click to link back to report\)](#)

Table 4

Condition Present X = Yes	Possible asthma symptom-inducing environmental pollutant	Recommendation to reduce or eliminate the pollutant
X	Water Damage and/or Mold (allergen)	Identify water source and repair to eliminate. Clean non-porous materials. Remove and replace porous materials susceptible to mold growth. Perform regular water damage assessments as a tool to ensure timely mitigation as needed. Use NIOSH water damage assessment protocol as a guide: NIOSH water damage assessment guideline .
	Moistening of building components during hot, humid weather (>2 days in length) (mold, allergen)	Remove materials not dried in <2 days in a manner consistent with US EPA Mold Removal in Commercial Buildings guideline . Use dehumidification in occupied basement areas and other areas with chronic dampness.
X	Vegetation against exterior of building (water damage-mold)	Remove all vegetation preventing building exterior drying. Remove all vegetation capable of falling onto a building or depositing debris onto the roof.
	Personal humidifiers (lack of proper maintenance) (pollutant and allergen)	Clean and maintain properly. Use distilled water to eliminate metal and water treatment odors. Maintain hydration by increasing water consumption.
X	Drains: Floor drains, Sink drains (abandoned use) Water bubblers (abandoned use)	If in use, pour water into drain at least twice a week. If not in use, seal the drain with an appropriate material in accordance with Massachusetts Plumbing Code (248 CMR 10.00).
	Live Animals (turtles, gerbils, birds, rabbits, etc.)	Ensure cleanliness or remove animals from the location.
	Improperly maintained aquariums and terrariums (allergen)	Maintain such equipment properly to eliminate odor. Discontinue use.

Table 4
Identification of Asthma Triggers by IAQ Outreach and Education Unit
During Building Assessments and Recommendations to Reduce or Eliminate from the
Indoor Environment

Condition Present X = Yes	Possible asthma symptom-inducing environmental pollutant	Recommendation to reduce or eliminate the pollutant
X	Plants and flowers (allergen and mold)	Keep indoor plants well maintained and not overwatered. Monitor for signs of mold and pests. Ensure water for cut flowers does not become stagnant. Ensure dried plant material is free of odors, mold, and pests and handled carefully If asthma risks are high, eliminate plants and flowers.
	HVAC system moisture issues (mold, allergen)	Consult ASHRAE's minimum standards for HVAC maintenance and inspection of commercial HVAC systems (https://www.ashrae.org/technical-resources/bookstore/standards-180-and-211).
	HVAC system contaminant issues (allergen)	Consult ASHRAE's minimum standards for HVAC maintenance and inspection of commercial HVAC systems (https://www.ashrae.org/technical-resources/bookstore/standards-180-and-211).
	Indoor swimming pool odors outside of swimming pool (mold, chemical)	Maintain and operate pool HVAC systems to vent odors from building. Ensure locker room exhaust vents are operating during building hours. All doors leading to pool should be rendered airtight and be closed.
X	Pollen (allergen)	Recommend installation of MERV 8 or better filters if HVAC engineer confirms HVAC system can be so equipped without adversely affecting function. Cut grass after hours. Cut grass in a pattern to direct clippings away from exterior wall. Remove trees and shrubs from in front of windows and air intakes.
X	Dry air	Maintain hydration. Avoid overheating of air.
	Dust mites (allergen)	Recommendation to remove non-official upholstered furniture, area rugs, pillows, cushions, etc. Cleaning with use of HEPA-filtered vacuum cleaner. Eliminating clutter, storing items in dust and moisture-proof containers, and regularly removing dust through wet wiping.

Table 4
Identification of Asthma Triggers by IAQ Outreach and Education Unit
During Building Assessments and Recommendations to Reduce or Eliminate from the
Indoor Environment

Condition Present X = Yes	Possible asthma symptom-inducing environmental pollutant	Recommendation to reduce or eliminate the pollutant
	Pests, including rodents and cockroaches (allergen)	Use of integrated pest management (IPM) guidelines, including: <ul style="list-style-type: none"> • Proper disposal of food containers • Proper storage of food products in airtight containers • Elimination of use of food as art projects • Remove pest harborages/clutter • Regular monitoring for pests EPA IPM guideline link
X	Latex-containing materials	Remove tennis balls from furniture legs.
X	Fragrances (chemical)	Eliminate point sources, such as: <ul style="list-style-type: none"> • Plug-in air fresheners • Aroma/oil reed diffusers • Scented sprays • Discontinue use of other scented materials • Consult DPH fragrance guideline: Clean air is odor-free
X	Strong smells from /use of Chemicals (such as cleaning products) (chemical)	Use building-issued cleaning products. Use products in accordance with manufacturer's instructions including dilution, application, and ventilation. Avoid using products that are stronger than needed for the situation.
	Strong odors from new building materials (carpeting/furniture) (chemical)	Use low VOC-emitting materials. Air out materials (outside or in unoccupied area) prior to installation.
	Tobacco smoke Secondhand Smoke (pollutant)	Eliminate tobacco smoking. Seal all shared wall penetrations.
X	Products with a strong odor such as paint, perfume, hairspray, air fresheners, bug-spray, laminators, candles, wax melters, dry erase markers and other VOC-containing products (chemical)	If essential: <ul style="list-style-type: none"> • Provide proper exhaust ventilation to eject aerosolized product directly outdoors. • Avoid/reduce use during occupied hours. If not necessary, remove and eliminate.
	Vehicle exhaust (pollutant)	Enforce anti-idling regulations and post signs to give notice. Relocate vehicles away from fresh air intakes. Require vehicles to park face-in at building walls. Close doors to prevent vehicle exhaust from entering occupied spaces. idling-faq

Table 4
Identification of Asthma Triggers by IAQ Outreach and Education Unit
During Building Assessments and Recommendations to Reduce or Eliminate from the
Indoor Environment

Condition Present X = Yes	Possible asthma symptom-inducing environmental pollutant	Recommendation to reduce or eliminate the pollutant
	Vapors and or fumes from gas, oil, or kerosene stoves (pollutant)	Operate stove hood when stove in use. Install stove hood if not present. Ensure equipment is in good working order.
	Ozone (pollutant)	Eliminate use of ozone generating equipment.
	Window Air Conditioners (if not properly maintained) (allergen)	Equip with proper filter and clean periodically. Clean drip pans. Install in window with weathertight, non-mold-growth sustaining material.
X	Pottery (pollutant)	Do not operate kiln during occupied hours. Operate kiln with exhaust system activated. Seal all seams and holes in kiln vent. Ensure kiln exhaust discharge terminates outdoors.
X	Carpeting (allergen)	Clean carpeting in a manner consistent with IICRC standards, including regular vacuuming with a high efficiency particulate air (HEPA) filtered vacuum in combination with annual cleaning or semi-annual cleaning in soiled high traffic areas.
X	Sweeping/dusting vs HEPA vacuuming/wet wiping (allergen or pollutant)	Refrain from using feather dusters or brooms. Utilize HEPA vacuums and wet wiping to minimize aerosolizing particulate matter.
	Lack of adequate air exchange/mechanical ventilation	Make repairs as necessary and ensure all HVAC system components are operating continuously when building is occupied.
X	Lack of local exhaust at source of pollution (vocational shop activities, kitchen exhaust hood) (all)	Recommend installation of exhaust ventilation to direct pollutants directly outdoors.
	Renovating buildings while occupied (chemical)	Use all SMACNA guidelines for Renovation While Buildings Are Occupied. For information, visit https://www.mass.gov/service-details/construction-and-renovation-generated-pollutants-in-occupied-buildings .
X	Chemistry program chemical storage (chemical)	Repair (if needed) and operate chemical storeroom vents appropriately. Reduce or eliminate unneeded or overstocked chemicals. Store all chemicals in a manner to separate incompatible chemicals. Keep chemical storerooms clean.
X	Photocopiers/duplicating machines	All machines should have dedicated exhaust vents or be used in a well-ventilated area.