INDOOR AIR QUALITY ASSESSMENT

Lynch Elementary School
10 Brantwood Road
Winchester, MA

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
March 2018

Background

Building:	Lynch Elementary School (LES)
Address:	10 Brantwood Road Winchester, MA
Requested by:	Jen Murphy, Winchester Health Department
Reason for Request:	Health concerns and general indoor air quality (IAQ)
Date of Assessment:	February 1, 2018
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Jason Dustin, Environmental Analyst/Inspector, IAQ Program Ruth Alfasso, Environmental Engineer/Inspector, IAQ Program
Building Description:	The school is a brick and concrete building with two courtyards and a flat roof. It was built in 1961.
Windows:	Windows are openable in most areas of the building

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

Results

Note that this building was previously assessed by the BEH/IAQ Program several times between 2000 and 2003. Reports from those visits are available on request.

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were above 800 parts per million (ppm) in about half of the areas assessed indicating that occupied rooms need more fresh air.
- ***Temperature*** was slightly below the recommended range of 70°F to 78°F in about two thirds of all areas assessed.
- ***Relative humidity*** was below the recommended range of 40% to 60% in all areas as is typical during the heating season in the Northeast.
- ***Carbon monoxide*** levels were non-detectable (ND) in all indoor areas assessed.

- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 micrograms per cubic meter ($\mu g/m^3$) in all occupied areas.
- ***Total volatile Organic Compounds (TVOC)*** levels tested in the building were ND**.**

Discussion

Ventilation

A heating, ventilating, and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals.

Fresh air in classrooms is supplied by unit ventilators ("univents", Picture 1). Univents draw air from the outdoors through a fresh air intake located on the exterior wall of the building (Picture 2) and return air through an air intake located at the base of the unit. Fresh and return air are mixed, filtered, heated or cooled and provided to rooms through an air diffuser located in the top of the unit (Figure 1). In many areas items were on top or in front of univents (Pictures 1, 3 and 4; Table 1), which can block air circulation. Note that in many areas, particularly along one of the courtyards, the univent fresh air intakes were deliberately blocked to prevent infiltration of cold outside air due to temperature control problems (Picture 2). Other univents may have had air intake louvers closed. This will limit the amount of fresh air available in these classrooms.

In common areas such as the gym and cafeteria, fresh air is supplied by air handling units (AHU) located on the roof. Fresh air is conditioned as needed and ducted to ceiling-mounted supply vents.

Exhaust is provided by motors on the roof ducted to exhaust vents on the walls of classrooms (Picture 5). Many exhaust vents were also found not to be drawing air (Table 1) which indicates that the motors are not operating and need to be activated or repaired. Note that many of the exhaust vents were partially or fully obstructed by items and furniture (Picture 6; Table 1) which will prevent them from operating efficiently. In addition, many classroom

exhaust vents are located near hallway doors; with doors open the vents can draw air from the hallway instead of the classroom.

To maximize air exchange, the MDPH recommends that both supply and exhaust ventilation operate continuously during periods of occupancy. In order to have proper ventilation with a mechanical supply and exhaust system, the systems must be balanced to provide an adequate amount of fresh air to the interior of a room while 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).

Additional heating is supplemented by radiators. These should be kept free of blockages and items that may give off odors when heated. Temperature control was reported as an issue by some occupants. Without univents, exhaust vents, and radiators operating free of blockages during occupied periods, temperature control can become more difficult. One univent was found to be blowing cold air despite the room temperature being below 70°F (Table 1), which was reported as typical by the occupant. The windows in classrooms are original to the building, and are single pane, uninsulated, and in some cases are no longer well-fitted into the frames or are missing gaskets and caulking (Picture 7; Table 1) which can be a source of cold air and drafts in the winter and heat during warmer weather. Window issues were reported during the previous reports in the early 2000s, but it does not appear that any significant corrective action on them was taken. Poorly-insulated, poorly-sealed windows are also a source of water leaks and condensation.

Many classrooms were equipped with window-mounted air conditioners (WAC) for cooling during the summer. These units are in windows year-round and gaps through or around the units may also be a source of cold or unconditioned air and moisture (Picture 8). These units may be used to supplement fresh air during temperate weather by setting them to “fan only” mode.

Microbial/Moisture Concerns

Water-damaged ceiling tiles were observed in some classrooms (Pictures 9 and 10; Table 1). Most of these reportedly stem from roof leaks. While the roof was reportedly replaced in 2006, it has still been a source of problems for the school and repairs are reportedly ongoing. Ceiling tiles in most of the building are of a type that is structural and thick which makes them

difficult to remove and replace. Roof and HVAC system leaks have also moistened other materials such as wooden cabinets (Picture 11).

Flooding has been reported in several areas of the school, including the gym and the lower level hallway. Areas were reportedly remediated with assistance from a flooding restoration contractor at the time these occurred. Repeated moistening of carpeting due to ineffective drying after cleaning was also reported by occupants. Note that carpeting is present in many areas of the school that are on slab or below grade. Wall-to-wall carpeting is not recommended in schools in general, and particularly in areas that are subject to condensation due to being in contact with the ground or below-grade. Repeated moistening of carpeting can lead to microbial growth, odors, and the deterioration of carpeting which may release irritating fibers.

At the time of the visit, an occupant reported a very recent pipe leak in the art room, which had resulted in moistening of walls, furniture and other materials (Picture 12). Other water damage in the art storage room was also of concern due to the large amounts of supplies stored in this area. An old sump pump or similar mechanism was observed in the art area (Picture 13). It was reportedly long disused, but it was not known if the item had been properly sealed and deactivated. Breaches in the casing of this unit could be a source of odors and microbial contamination if it is not properly sealed and deactivated.

The United States Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials be dried within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur.

Classroom sinks in a few areas had gaps in the backsplash, which can lead to water damage to the material beneath. Some also had porous materials such as paper towels stored in the cabinets. The area under the sink is a damp environment where condensation or leaks can moisten stored materials. In one room, several classroom sinks were covered with a plastic mat and are reportedly never used (Picture 14). In another classroom, a sink was found to be dripping and could not be completely shut off. The drain of a water fountain in the hallway was clogged and not draining completely which could lead to an overflow.

Plants were observed in classrooms and offices (Picture 15; Table 1). Plants should be well maintained, not overwatered and kept away from the airstream of ventilation equipment to prevent odors, water damage, and pests. An aquarium containing a turtle was found in another

classroom (Picture 16); the water was murky and the aquarium looked like it needed cleaning. Aquariums, terrariums and similar items need to be kept clean to avoid odors and microbial growth.

There are many refrigerators in the building. Refrigerators need to be cleaned out regularly to prevent microbial growth and odors. The gasket of an old fridge in the staff breakroom was colonized with mold; this should be cleaned with an antimicrobial solution, or replaced if it cannot be cleaned effectively or no longer seals completely.

Doors to the outside were observed to have gaps and be missing weather stripping (Picture 17). This can allow moisture, unconditioned air and pests into the building. An examination of the outside of the building was conducted to identify potential sources of water penetration. Shrubs were noted growing close to the building exterior, including directly in front of a window air conditioner (Picture 18) which can hold moisture against the walls and be a source of pollen and debris into the building. This and other tree/plant roots may penetrate the building foundation, creating and widening cracks (Picture 19). Over time, these conditions can undermine the integrity of the building envelope and provide a means of water entry into the building via capillary action through foundation concrete and masonry (Lstiburek & Brennan, 2001). The freezing and thawing action of water during the winter months can create cracks and fissures in the foundation. Other signs of exterior deterioration were also observed, including in concrete next to the foundation (Picture 20), and rust along the edges of windows (Pictures 2 and 18). All these breaches may provide a means for moisture and pests to enter the building

Other Conditions

Although levels of TVOCs were non-detectable at the time of the assessment, products were observed that might be sources of TVOCs and irritation to the eyes, nose and respiratory system. Hand sanitizers, cleaning products, air fresheners and dry erase materials were observed in classrooms and offices (Pictures 21 and 22; Table 1). The use of these products, particularly scented products, should be minimized and used only in areas of adequate ventilation.

In a few areas, tennis balls had been sliced open and placed on table/chair footings to reduce noise (Picture 23; Table 1). Tennis balls are made of a number of materials that are a source of respiratory irritants. Constant wearing of tennis balls can produce fibers and lead to off-gassing of VOCs. Tennis balls are made with a natural 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 in buildings to reduce the likelihood of symptoms in sensitive individuals (NIOSH, 1997; NIOSH, 1998).

A univent in the lower level was found with melted crayons or other materials on it (Picture 24). This area also had a plastic odor, which is likely from the heating of the material on, and likely inside, the univent. Univents should be cleaned of this material as soon as possible.

In some areas, items were observed on the floor, windowsills, tabletops, counters, bookcases and desks (Pictures 25 and 26). Stored items provide a source for dusts to accumulate and make it difficult for custodial staff to clean. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up. In many classrooms and hallways, fabric or paper was used as curtains to cover shelving or create areas with more privacy (Picture 27). Hanging fabric, and items hanging from the ceiling or walls can become a source of collected dusts and microbial growth if moistened. These may also be a fire hazard.

Dust was observed on personal fans (Picture 28), exhaust vents (Picture 29) and radiators (Picture 30). This can be reaerosolized when the equipment is used.

Univents and AHUs have filters that should be changed on a regular schedule 2-4 times a year. Univent cabinets should also be vacuumed out during filter changes. It is recommended that univents and AHUs be outfitted with pleated filters of a Minimum Efficiency Reporting Value (MERV) of 8 or higher, which are adequate in filtering out pollen and mold spores (ASHRAE, 2012). In addition, filters should be changed 2-4 times a year or in accordance with the manufacture's recommendations. There were also air purifiers in use in the building. These have filters that should be cleaned or changed regularly in accordance with manufacturer's instructions. Window air conditioner filters should also be cleaned, at least twice a year before and after the cooling season, but more frequently if needed. Inadequate or dirty filters can become a source of dust, odors and microbes to the indoor environment and may harm the effectiveness of ventilation and filtration equipment.

There was a pet hamster in a cage in one classroom. Pets and pet equipment needs to be cleaned regularly to prevent odors and the distribution of allergens.

Both wall-to-wall carpeting and area rugs were present in the LES. The Institute of Inspection, Cleaning and Restoration Certification (IICRC), recommends that carpeting be cleaned annually (or semi-annually in soiled high traffic areas) (IICRC, 2012). Some rugs were found soiled, worn or with lifted edges (Pictures 31 and 32), which can be a tripping hazard. If area rugs cannot be cleaned due to age and condition, they should be replaced. Upholstered furniture (such as Picture 33) should also be cleaned regularly in accordance with IICRC recommendations and discarded when they become too worn or soiled to effectively clean.

Note that the Environmental Protection Agency (EPA) conducted a National School Radon Survey in which it discovered nearly one in five schools had "…at least one frequently occupied ground contact room with short-term radon levels above 4 [picocuries per liter] pCi/L" (US EPA 1993). The BEH/IAQ Program therefore recommends that every school be tested for radon, and that this testing be conducted during the heating season while school is in session in a manner consistent with USEPA 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: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/radon.

Conclusions/Recommendations

Based on the observations made during the visit, the following is recommended:

1. Operate the HVAC system to provide for continuous fresh air ventilation during occupied hours. Unblock all univent air intakes when possible to allow for a fresh air supply to each classroom.
2. Ensure univents can supply heat when needed.
3. Ensure univents are not blocked by furniture or items on top or along the front so that they may operate effectively.
4. Use openable windows to supplement fresh air during temperate weather. Ensure all windows are closed tightly at the end of each day. Also ensure that windows are closed when WAC are in operation to prevent condensation.
5. Ensure all exhaust vents are operating continuously during occupied periods. Reactivate or repair vent motors. Consider developing a plan to check the motors and draw of air from exhaust vents periodically.

6. Remove furniture and items from in front of exhaust vents and close classroom doors for best exhaust function.
7. Adopt a system to report and track maintenance issues such as broken univents, leaks and plumbing issues so that concerns can be reported by the staff that observe them, and maintenance staff can report when the issues have been resolved.
8. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
9. 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 when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).
10. Ensure that gaps in the building envelope such as with missing window caulking, missing weather stripping and gaps around WAC are appropriately sealed.
11. Develop a plan to replace windows in the building with modern, insulated, and tightly-fitted materials. This will greatly improve temperature control and reduce heating costs.
12. Replace water-damaged ceiling tiles once leaks are repaired. Inspect the area above the stained tiles for water damage or odors and remediate or clean as necessary.
13. Continue with efforts to ensure the roof is watertight.
14. Remove or remediate/clean other water-damaged materials such as the wooden cabinets shown in Picture 11. Avoid storing porous materials in areas with known or likely water leaks (e.g., next to poorly-sealed windows, under sinks).
15. Make plans to remove carpeting from below-grade areas of the school and any other carpeting with a history of water damage.
16. Render the backsplashes of sinks watertight using caulking. Ensure sinks can be shut off completely and that drains on sinks and water fountains are kept clear to avoid overflows.
17. Ensure drains on disused sinks and unused floor drains are moistened periodically to prevent the traps from drying out. If sinks are no longer needed, consider plans to have them removed and properly capped.

18. Determine the function and condition of the unit in the art room shown in Picture 13 and ensure it is properly disconnected, deactivated and sealed to prevent moisture and odors from entering occupied areas.
19. Ensure plants are well maintained and not overwatered. Keep them away from the airstream of ventilation equipment.
20. Properly maintain any aquariums, terrariums and similar items to prevent odors and microbial growth.
21. Ensure all refrigerators are cleaned out regularly. Clean gaskets of debris and mold staining with an antimicrobial solution or replace as needed.
22. Seal gaps in the building envelope to reduce infiltration of water and potential pest intrusion.
23. Remove trees and shrubs from within five feet of the edge of the building and especially around air intakes and windows.
24. Develop a plan to renovate the exterior of the building including repairing deteriorated concrete and cracks in the foundation.
25. Reduce or eliminate the use of air fresheners, scented cleaners, hand sanitizers and dry erase materials to reduce irritation.
26. Replace tennis balls on chair/table footings with latex-free glides.
27. Clean the melted crayons/plastic from univents.
28. Consider reducing the amount of stored materials to allow for more thorough cleaning. Clean items regularly with a wet cloth or sponge to prevent excessive dust build-up.
29. Avoid hanging items from the ceiling to reduce dust accumulation.
30. Ensure that fabrics used as curtains are washed regularly; check fire safety regulations to ensure this practice is not in conflict with fire codes.
31. Ensure pet cages are kept clean to prevent odors and allergens.
32. Clean radiators, vents and fans regularly to remove dust build up that may lead to odors when heated.
33. Clean or change filters on air purifiers and WAC in accordance with manufacturer's instruction or more often if needed.
34. Regularly HEPA vacuum remaining carpeting/area rugs and clean carpeting at least once per year according to IICRC recommendations (IICRC 2012). Consider replacing any

carpeting that is beyond its service life. In below-grade areas, consider using non-porous flooring instead of carpeting when flooring is replaced.

35. Consider setting up a balancing schedule to have the HVAC system balanced every five years.

36. Ensure filters for AHUs are of a pleated variety, Minimum Efficiency Reporting Value (MERV) dust-spot efficiency 8 or higher, which are adequate in filtering out pollen and mold spores (ASHRAE, 2012). Filters should be changed 2-4 times a year or in accordance with the manufacture's recommendations.

37. The school should be tested 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.

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

References

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Picture 1

Unit ventilator (univent), note items in front blocking return vent

Picture 2

Univent air intakes below windows covered with plywood or plastic, note rust and deterioration of window frames

Picture 3

Items on top of univent

Picture 4

Items and furniture in front of univent

Picture 5

Classroom exhaust vent, note proximity to hallway door

Picture 6

Items blocking exhaust vent

Picture 7

Windowpane duct-taped into frame

Picture 8

Gaps around window air conditioner and external portions exposed to the elements

Picture 9

Water-stained ceiling tiles

Picture 10

Water-stained ceiling tile

Picture 11

Water-stained wood on cabinet

Picture 12

New water stains on wall in the art area due to recent pipe leak

Picture 13

Old, disused pump or related item

Picture 14

Disused sink, covered with plastic

Picture 15

Plant without drip pan and with leaves/debris

Picture 16

Turtle in murky water in classroom

Picture 17

Gap beneath door to outside

Picture 18

Plant next to foundation and window air conditioner

Picture 19

Old plant stems and deteriorated brick, stone and concrete along base of foundation

Picture 20

Deteriorated concrete at outside edge of building

Picture 21

Pop-up air freshener

Picture 22

Cleaning and sanitizing products

Picture 23

Tennis balls used as chair glides

Picture 24

Melted crayons/plastic on and in univent

Picture 25

Classroom items

Picture 26

Classroom items including items hanging from walls

Picture 27

Fabric curtains

Picture 28

Dusty personal fan

Picture 29

Dust on exhaust vent

Picture 30

Dust on radiator

Picture 31

Worn carpeting with debris

Picture 32

Area rug with lifted edges

Picture 33

Upholstered furniture

Location: Lynch Elementary School **Indoor Air Results**

Address: 10 Brantwood Road, Winchester, MA **Table 1** **Date: 2/1/2018**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
Background	365	ND	38	31	12	ND	-	-	-	-	Cloudy, raw
Waiting area main office	1127	ND	66	30	6	--	5	Y	Y	Y	WAC – covered outside, plants, area rug
Nurse	777	ND	69	23	7	--	2	Y	Y	Y	WD CT in restroom, old CT, WAC
A. Christopher	854	ND	71	20	7	--	1	Y	Y	Y	PF, carpeted, DEM
Aharanium	1324	ND	68	23	4	--	19	Y	Y	Y obst	Carpet worn in some areas, WACs, UF and beanbags
Art	887	ND	66	26	11	ND	1	N	Y	Y	NC, area rig, leaks in pipes in both storeroom and kiln room recently, old leaks in center of room. Papers and items in storage
Assistant Principal	786	ND	70	21	7	--	3	Y	Y	Y	Carpeted
Back of stage area	787	ND	68	20	3	--	0	N	N	N	
Cafeteria	645	ND	68	21	6	ND	Class just left	Y and doors	Y	Y	

µg/m^3 = micrograms per cubic meter
ppm = parts per million
ND = non detect
TVOC = total volatile organic compounds
AF = air freshener
AI = accumulated items
AP = air purifier
CP = cleaning products
CT = ceiling tile
DEM = dry erase materials
DO = door open
HS = hand sanitizer
NC = not carpeted
Obst = obstructed
PC = photocopier
PF = personal fan
TB = tennis balls
UF = upholstered furniture
UV = univent
WAC = window air conditioner
WD = water-damaged
HS = hand sanitizer

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferable
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Lynch Elementary School **Indoor Air Results**

Address: 10 Brantwood Road, Winchester, MA **Table 1 (continued)** **Date: 2/1/2018**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
Custodian's office	570	ND	78	19	5	--	0	N	Y	N	Door to boiler room, ajar, WD40
Gym	582	ND	66	24	7	ND	24	N	Y	Y	Reported historic sewer backup remediated by Service Master
Gym Storage	648	ND	67	22	7	--	0	N	N	N	Concrete floor, plastic items
Library	764	ND	68	21	4	ND	15	Y	Y	Y	Carpet, WAC
Ms. Pine	922	ND	70	21	5	ND	18	Y	Y	Y	Area rugs, HS, DEM, housekeeping issues/dusty radiators
Oskin	754	ND	71	20	8	--	0	N	Y	y	Stained ceiling tiles near heater
Principal	640	ND	70	19	6	--	0	Y	Y		WAC, area rug
School psychologist								Y	Y		Locked
Speech	786	ND	67	23	7	ND	0	N	Y	Y	Skylight with water stains.

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Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
Staff RR										Y on	
Teacher's lunch	1163	ND	69	24	4	ND	6	Y	N	N	Carpet, food odors
Unisex RR	1235	ND	70	26	7	ND	0	N	N	Y on	
5 (McMahan)	1028	ND	69	23	6	ND	18	N	Y	Y	Carpet, CP
16	1144	ND	68	24	5	ND	7	N	Y	Y	MT
101	884	ND	70	22	6	--	19	Y	Y	Y off	Carpet and area rug, plants, DEM
103	1046	ND	71	23	4	ND	14	Y	Y	Y	Area rugs, CP, DO, HS, AF, PF
105	1246	ND	69	23	6	ND	19	Y	Y	Y	Area rug, DEM, CP
106	1245	ND	69	23	14	ND	22	Y	Y	Y	Carpet, DEM, PFs, HS/CP, WD CT, chalk, items and plants on UV

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									Supply	Exhaust	
109	621	ND	68	19	6	--	3	Y	Y	Y obst	Area rug, broken window (no gasket sealing, taped up), HS, CP, WAC, WD CT and wood cabinet
110	737	ND	70	19	9	--	7	Y	Y	Y	WAC, UF and beanbags, area mat and rugs
111 (Rogers)	987	ND	68	21	5	ND	17	Y	Y	Y	Old carpet, HS, UF/pillows, exhaust blocked
112	1051	ND	70	22	9	--	0	Y	Y	Y obst	Area rug, dusty PF, DEM, AI/ items hanging from ceiling
114	987	ND	70	22	4	ND	4	Y	Y	Y	Past mouse issues in closet, exhaust vent has been intermittently broken, area rugs, chalk, DEM, sink – drips and backsplash open
115	835	ND	69	28	8	--	11	Y	Y	Y	Carpet, sink, UF, AF
116	642	ND	68	19	5	--	1	Y	Y	Y	Plant, area rugs, fridge and microwave, emergency door, housekeeping issues/dusty

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Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferable
> 800 ppm = indicative of ventilation problems
Temperature: 70 - 78 °F
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Location: Lynch Elementary School **Indoor Air Results**

Address: 10 Brantwood Road, Winchester, MA **Table 1 (continued)** **Date: 2/1/2018**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
117	958	ND	68	22	6	--	19	Y	Y	Y	Door to outside, UV hanging from ceiling, TBs, area rugs, DEM, microwave
118	1175	ND	68	24	7	ND	20	Y	Y	Y	NC, area rugs, HS, CPs
120	1047	ND	68	22	5	--	19	Y	Y	Y off	DEM, WAC, area rug, vent blows cold air
121	936	ND	70	21	2	ND	18	Y	Y	Y	Musty carpet, previous closet flood, reported active leak
122	710	ND	68	19	2	ND	3	N	Y	Y	Ceiling-mounted UV ducted fresh air, gym mats, UF, fabric bean bags, fuel like odor
122 office	682	ND	68	18	3	ND	3	N	Y	Y	Carpet, HS
123	849	ND	70	19	5	--	1	Y	Y	Y	Carpeting – reportedly improperly dried after cleaning, plants, area rug, AP, CP
124	781	ND	68	21	5	--	2	Y	Y	Y	AP, area rugs, WD CT,

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Location: Lynch Elementary School **Indoor Air Results**

Address: 10 Brantwood Road, Winchester, MA **Table 1 (continued)** **Date: 2/1/2018**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
125	792	ND	69	21	8	---	16	Y	Y	Y on	Area rugs, items on UV, DEM
126	909	ND	70	22	7	--	20	Y	Y	Y on	Salt lamp, WD CT (roof leaks reported), plant
127	1080	ND	71	25	7	ND	19	N	Y	Y	Carpet, UV Fresh air blocked
128		ND	69	23	6	--	20	Y	Y	Y off	Area rugs, DEM, HS, items hanging from ceiling
129	785	ND	67	20	6	--	0	Y	Y	Y	Small classroom, DEM, TBs, fridge and coffee, CP
153	659	ND	70	19	5	--	1	Y	Y	Y	WAC, DEM, carpet, HS
160 (Music)	1022	ND	69	23	3	ND	16	N	Y	Y	Former amphitheater sealed with raised floor, sound insulation panels on walls
165	967	ND	70	20	3	ND	4	N	Y	Y	NC

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									Supply	Exhaust	
Planning room between 110 and 111								N	N		Window to hallway has WD wood cover and frame, sink, restroom, old fridge with stained gasket
Lower Level											
Small office	675	ND	70	21	8	--	0	Y	Y	Y	Food odors, WAC – casing dirty, microwave and fridge
Speech	618	ND	69	18	6	--	0	Y	Y	Y	HS, pop up AF, carpet
Back hallway	540	ND	68	19	7	--	0	N	N	N	Area rug
Preschool storage	642	ND	69	18	5	--	0	N	N	N	Concrete floor, AI
Second side of storage											Concrete floor, AI, PC
Donlon	771	ND	68	23	11	--	0	Y	Y obst	Y off	TBs, odor – melted crayons?, NC, area rug, microwave and fridge
Casey	727	ND	68	21	7	--	1	Y	Y	Y	Area rugs, WAC, microwave and fridge

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Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
Wilkerson	632	ND	69	21	5	--	0	Y	Y	Y off	Area rugs, scented oils, HS, WAC, plant
Ms. Alison	663	ND	69	21	6	--	6	Y	Y	Y	DEM, area rug
22	721	ND	69	19	6	--	8	Y	Y	Y	Area rugs, UF
23	534	ND	68	19	6	--	0	Y	Y	Y obst	Carpet, paper on walls, TB, WAC

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