

# **INDOOR AIR QUALITY ASSESSMENT**

**Department of Mental Health  
Case Management Wing, Hadley Building  
167 Lyman Street  
Westborough, MA**



Prepared by:  
Massachusetts Department of Public Health  
Bureau of Environmental Health  
Indoor Air Quality Program  
July 2016

## Background

<b>Building:</b>	Hadley Building, Case Management Wing
<b>Address:</b>	167 Lyman Street, Westborough, MA
<b>Assessment Requested by:</b>	Todd Gundlach, Director, Engineering & Facilities Management, Department of Mental Health (DMH)
<b>Reason for Request:</b>	General indoor air quality (IAQ)
<b>Date of Assessment:</b>	June 17, 2016
<b>Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:</b>	Cory Holmes, Environmental Analyst/Inspector, IAQ Program
<b>Building Description:</b>	A multi-story, brick-faced building with basement. Formerly served as the Westborough State Hospital, converted to DMH office space in 2009. The case management wing is made up of individual offices, several multi-occupant offices, conference rooms and common areas.
<b>Year Built:</b>	1945-1947
<b>Building Population:</b>	The case management wing houses approximately 20 staff members
<b>Windows:</b>	Openable

## METHODS

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

## IAQ Testing Results

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

- **Carbon dioxide levels** were below 800 parts per million (ppm) in all but one of the 20 areas tested, indicating adequate fresh air exchange.
- **Temperature** was within the recommended range of 70°F to 78°F in all areas tested.

- **Relative humidity** was within or close to the recommended range of 40 to 60% in most areas tested.
- **Carbon monoxide** levels were non-detectable (ND) in all areas tested.
- **Total volatile organic compound (TVOC)** levels were ND in all areas tested.
- **Fine particulate matter (PM<sub>2.5</sub>)** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 µg/m<sup>3</sup> in all areas tested.

### **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 irritants may exist and cause symptoms in sensitive individuals.

The Case Management wing is not fully equipped with a central HVAC system. Fresh air for the case management wing is mostly provided by openable windows. Most offices have two openable windows and a window-mounted air conditioner (AC). However, there was a vent at the end of the hallway (Picture 1), which was said to provide a mechanical means of outside air to the hallway. This system was reported to be under repair at the time of the assessment.

Restrooms are equipped with local exhaust vents to remove odors and moisture; however several of these were not operating during the assessment. Several of the restrooms had passive door vents which were found to be sealed (Picture 2). These vents should be restored to provide make-up air while exhaust vents are operating.

### **Microbial/Moisture Concerns**

A few areas (Library and 119) exhibited signs of historic water damage in the form of peeling paint and water-stained plaster (Pictures 3 and 4). At the time of assessment, repointing/waterproofing activities were being conducted on the exterior of the building outside the Library (Picture 5).

While temperature is mainly a comfort issue, relative humidity in excess of 70 percent for extended periods of time can provide an environment for mold and fungal growth (ASHRAE,

1989). During periods of high relative humidity (late spring/summer months), windows and exterior doors should be closed to keep moisture out while ACs are operating to prevent condensation on cool surfaces.

Room 133 was equipped with a two ductless AC units. These units have condensation drains that are typically pumped to the outside of the building. These units should be regularly inspected to insure that the condensation drains and pumps are working properly and are not clogged or leaking. Room 134 had cloth stationed beneath the window AC (Picture 7), to presumably seal drafts or perhaps absorb leaks. This material is porous and can grow mold if wet repeatedly.

A severely water-damaged box was observed in the storeroom (Room 128, Picture 8). This box and its contents should be evaluated and if found to be mold-colonized or odorous, should be discarded.

Water coolers and water fountains were observed on carpeting. Spills and leaks from these appliances can moisten carpeting and lead to microbial growth and odors.

Plants were observed in several areas (Table 1). Plants, soil, and drip pans can serve as sources of mold/bacterial growth (Picture 6). Plants should be properly maintained, over-watering of plants should be avoided, and drip pans should be inspected periodically for mold growth.

### **Other IAQ Evaluations**

Accumulated items were found stored on floors and other flat surfaces which can make it more difficult for custodial staff to clean. Some flat surfaces, exhaust vents, and personal fans were found to be dusty. Dust can be reaerosolized and cause irritation; these items should be cleaned regularly.

Most areas of the office space were carpeted. 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). Regular cleaning with a high efficiency particulate arrestance (HEPA) filtered vacuum in combination with an annual cleaning will help to reduce accumulation and potential aerosolization of materials from the carpeting.

Air conditioning units are typically equipped with filters. Filters for AC units should be cleaned prior to and periodically during the cooling season.

## Conclusions/Recommendations

The following recommendations are made to assist in maintaining IAQ:

1. Continue with plans to repair hallway air handling unit. Consider long-term plans to work with an HVAC engineer to determine if units can be retrofitted with chiller/AC capabilities.
2. Ensure fans/motors for restroom exhaust vents are operational. Restore passive door vents to provide make-up air.
3. Use open windows (weather permitting), to temper rooms and provide fresh air.
  - Care should be taken to ensure windows are properly closed at night and on weekends.
  - Keep windows closed *during hot, humid weather* to maintain indoor temperatures and to avoid condensation problems when air conditioning is activated.
  - Shut windows after hours during winter months to avoid the freezing of pipes and potential flooding.
4. 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).
5. Continue with plans to repaint/waterproof the exterior. Once repairs complete, clean and repaint areas of water damage/peeling paint (e.g., 119, Library).
6. Consider putting water dispensers on waterproof mats or in areas without carpeting. Consider installing floor tile below/around stationary water fountains.
7. Regularly inspect the ductless AC units for proper condensation drainage.
8. Ensure window ACs are sealed properly to eliminate drafts and or/water penetration. Refrain from using cloth/porous materials around AC units.
9. Indoor plants should be properly maintained and equipped with drip pans to prevent water damage to porous building materials and be located away from ventilation sources to prevent the aerosolization of dirt, pollen or mold.

10. Examine water-damaged box/contents in storeroom 128, discard if moldy.
11. Clean AC filters prior to and periodically/as needed during the cooling season.
12. Clean supply and exhaust vents and personal fans regularly to prevent aerosolization of debris.
13. Clean carpeting annually or semi-annually in soiled high traffic areas as per the recommendations of the Institute of Inspection, Cleaning and Restoration Certification (IICRC, 2012).
14. Consider reducing the amount of items stored in offices to make cleaning easier. Periodically move items to clean flat surfaces.
15. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: <http://mass.gov/dph/iaq>.

## References

ASHRAE. 1989. Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigeration and Air Conditioning Engineers. ANSI/ASHRAE 62-1989.

IICRC. 2012. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: FAQ. Retrieved from <http://www.iicrc.org/consumers/care/carpet-cleaning/#faq>.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: <http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/>.

**Picture 1**



**Vent at end of hallway**

**Picture 2**



**Restroom passive door vent sealed**

**Picture 3**



**Water-damaged plaster and peeling paint in the Library**

**Picture 4**



**Water-damaged ceiling/wall plaster and peeling paint in Room 119**

**Picture 5**



**Repointing/waterproofing activities outside of Library**

**Picture 6**



**Standing water/debris in drip pan**

**Picture 7**



**Cloth below AC in room 134**

**Picture 8**



**Water-damaged box in storeroom**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m <sup>3</sup> )	TVOCs (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Intake	Exhaust	
Background	376	ND	83	25	10	ND					Warm, sunny
Hoffman Office	645	ND	75	36	8	ND	1	Y	N	N	Carpet, plants, AC
107	624	ND	74	35	9	ND	3	Y	N	N	Plants
Library	530	ND	76	40	10	ND	0	Y	N	N	Peeling paint, WD plaster, plants, repointing project ongoing
111 Kitchen	611	ND	76	44	7	ND	0	Y	N	N	
112	697	ND	77	45	8	ND	4	Y	N	N	Plants
114 Men's Restroom								Y	N	Y	Passive door vent-sealed
116 Storage Room	469	ND	76	40	7	ND	0	Y	N	N	
118	731	ND	76	41	6	ND	0	Y	N	N	
119	475	ND	76	41	7	ND	0	Y	N	N	WD plaster, peeling paint
120	640	ND	77	43	5	ND	0	Y	N	N	

ppm = parts per million

AC = air conditioner

ND = non-detect

PF = personal fan

µg/m<sup>3</sup> = micrograms per cubic meter

DEM = dry erase materials

PC = photo copier

WD = water-damaged

**Comfort Guidelines**

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

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

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m <sup>3</sup> )	TVOCs (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Intake	Exhaust	
121	491	ND	76	44	6	ND	0	Y	N	N	
122	688	ND	74	44	9	ND	1	Y	N	N	Abandoned vent
123	637	ND	73	46	10	ND	0	Y	N	N	Plants
124	579	ND	75	41	10	ND	1	Y	N	N	Plants
126	564	ND	74	39	9	ND	0	Y	N	N	PFs, plants
127	566	ND	74	45	8	ND	1	Y Open	N	N	Plants
128	584	ND	76	41	9	ND	0	Y	N	N	Holes in wall, dust/debris on flat surfaces
129 Restroom								Y	Y	Y	Passive door vent, exhaust not operating
130	1288	ND	77	49	7	ND	7	Y	N	N	Plants
132	452	ND	77	41	6	ND	2	Y Open	N	N	PC, DEM, PF, AC

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Temperature: 70 - 78 °F  
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Location: DMH, Case Management Wing, Hadley Building

Indoor Air Results

Address: 167 Lyman Street, Westborough, MA

Table 1 (continued)

Date: 6/17/2016

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m <sup>3</sup> )	TVOCs (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Intake	Exhaust	
133	509	ND	76	43	10	ND	0	Y	N	N	Wall-mounted AC units
134	447	ND	77	44	7	ND	0	Y	N	N	AC-cloth underneath

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