

# **INDOOR AIR QUALITY ASSESSMENT**

**Department of Environmental Protection  
436 Dwight Street  
Springfield, Massachusetts**



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

## BACKGROUND

<b>Building:</b>	Department of Environmental Protection (DEP)-4 <sup>th</sup> & 5 <sup>th</sup> floors
<b>Address:</b>	Springfield State Office Building (SSOB) 436 Dwight St., Springfield, MA
<b>Assessment Requested by:</b>	Kelly Flaherty Division of Capital Asset Management and Maintenance (DCAMM)
<b>Reason for Request:</b>	Employee concerns re: odors
<b>Date of Assessment:</b>	March 25, 2016
<b>Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:</b>	Michael Feeney, Director, Indoor Air Quality (IAQ) Program Jason Dustin, Environmental Analyst/Inspector IAQ Program
<b>Date of Building Construction:</b>	1937
<b>Building/Site Description:</b>	The building is a five-story stone and cement building formerly used as a post office
<b>Windows:</b>	Non-openable

### Executive Summary:

No significant public health concerns were identified during this visit. Some occupants expressed concern over a “sheet rock” or “burnt paper” odor on the fifth floor. This issue is discussed in detail under the “Other IAQ Evaluations” section of the report. The general IAQ assessment for the building revealed no major concerns. Any active leaks should be repaired and water-damaged porous materials such as stained ceiling tiles should be replaced. It is recommended that more storage solutions are implemented to improve cleaning access and products containing fragrances be reduced/eliminated within the office area.

## METHODS

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

## RESULTS and DISCUSSION

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

- **Carbon dioxide** levels were below 800 parts per million (ppm) in all areas surveyed. It should be noted that the building was scarcely occupied at the time of assessment which can reduce carbon dioxide levels.
- **Temperature** was within the MDPH recommended range of 70°F to 78°F in all areas.
- **Relative humidity** was below the MDPH recommended range of 40 to 60% in all areas as is typical during the heating season in the Northeast.
- **Carbon monoxide** levels were non-detect (ND) throughout all areas surveyed.
- **Particulate matter (PM<sub>2.5</sub>)** concentrations ranged from 3 to 19 µg/m<sup>3</sup>. All of the readings were below the National Ambient Air Quality (NAAQS) guideline of 35.
- **Total Volatile Organic Compounds (TVOCs)** levels were ND throughout the building.

### Ventilation

It can be seen from Table 1 that carbon dioxide levels were below 800 ppm in all areas surveyed. Fresh air is provided by air-handling units (AHUs) located on the roof. Fresh air is ducted to supply air diffusers located throughout the space (Picture 1). Air is returned to the AHUs via ceiling plenum exhaust vents (Picture 2).

Some DEP staff on the 4<sup>th</sup> floor reported that when coming into the office at approximately 6:45am, the air quality is “stale”. AHUs are regulated by a centrally controlled system which is programmed to begin preheating at this time before most of the staff arrives later in the morning. The AHU system controls could be reprogrammed to allow for preheating or cooling at least one hour prior to staff occupying the office space. If not feasible, the hours of early staff arrival could be delayed until the system has adequately conditioned and exchanged the air within the office.

The BEH/IAQ program recommends that thermostats/central controls be set to the fan “on” setting during occupied periods to provide continuous air circulation and filtration. This setting typically reduces the incidence of IAQ complaints due to the dilution and removal of common indoor air pollutants.

### **Microbial/Moisture Concerns**

In order for building materials to support mold growth, a source of water exposure is necessary.

- Water-damaged ceiling tiles were observed in several areas throughout the DEP office space (Pictures 3 and 4, Table 1). DEP staff reported that most water damage was historic except for the leak in the entry hall of the DEP space on the fifth floor just after the Reception area (Picture 5). The source of this leak should be investigated and repaired.
- Any porous materials (e.g., ceiling tiles) not dried within 48 hours should be discarded and replaced.
- Plants were noted in several areas (Pictures 6 to 8). Plants can be a source of pollen and mold, which can be respiratory irritants to some individuals. Plants should be properly maintained and equipped with drip pans and should be located away from air diffusers to prevent the aerosolization of dirt, pollen and mold.

### **Other IAQ Evaluations**

As mentioned previously, DEP staff expressed concerns regarding an odor that was described as a “sheetrock” or “burnt paper” smell. BEH/IAQ staff examined samples of the gypsum wallboard (GW) that was recently replaced in a small area on the 5<sup>th</sup> floor. Extra sheets of this GW located in the basement did not have any odor. BEH/IAQ staff also used a moisture meter to determine if the GW installed in the “File Room” was wet from water in and around the area where odor complaints were reported. No elevated moisture readings were detected in any of the GW in this area.

BEH staff examined the suspended ceiling, which contain a radiant heating loop near the perimeter walls of the entire 5<sup>th</sup> floor space (Picture 9). BEH staff noted the heating loop was installed in the beams of the suspended ceiling without any separation or insulation between the heating loop housing and the suspended ceiling beams. BEH staff found that the heating loop had a temperature range of 135°F to 147°F in several areas (Table 2). The metal beams adjacent to the heating loop housing had a temperature range of 115°F to 128°F, which then heated the adjacent ceiling tiles to a temperature within a range of 92°F to 103°F. Ceiling tiles have an operational temperature range set by the manufacturer. If the operational temperature range is

exceeded, it is likely to accelerate off-gassing of odor and breakdown of the ceiling tiles. DEP staff reported that these ceiling tiles had a strong odor when they arrived for installation. According to the manufacturer, the temperature range recommendation for use is 60 °F to 85 °F (Armstrong, 2016). It is likely that the odors reported are starches and other compounds in the ceiling tiles which are being off-gassed due to the high heat in close proximity to the new ceiling tiles. In addition, the exhaust vent was not operating in this area, which would result in off-gassing odors to accumulate in this location. Other locations in the DEP offices had similar ceiling temperature measurements; however each area had a functioning exhaust vent.

DCAMM staff reported that electrostatic filters are used in the roof top AHUs and that they are investigating ways to further improve filtering. The building is in close proximity to a working railway which presents a challenge in terms of excess particulate matter clogging typical AHU filters. Consideration should be given to utilizing pre-filters and performing more frequent filter changes.

The 4<sup>th</sup> floor men's bathroom was noted to have several missing ceiling tiles (Picture 10). These tiles should be replaced as soon as possible to avoid the entrainment of bathroom odors and moisture into the ceiling return plenum.

BEH/IAQ staff noted air fresheners, scented hand sanitizers, cleaners, and dry erase materials in use. All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals and their use should be minimized.

Supply and exhaust vents were noted to be dusty in several areas throughout the DEP space (Pictures 11 and 12). Some of this debris may be the result of filter bypass. These vents should be cleaned regularly to avoid aerosolizing accumulated particulate matter.

In several areas, items were observed on the floor, windowsills, tabletops, counters, bookcases, and desks (Pictures 13 and 14). The large number of stored items provides a source for dusts to accumulate. These items (e.g., papers, folders, boxes) make it difficult for custodial staff to clean. Once aerosolized, they can act as irritants to eyes and respiratory system. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up. In addition, further storage solutions should be implemented.

DEP has a number of field personnel who often work in contaminated environments. Upon returning to the office from these field sites, it is likely that field personnel track mud, dust and debris into the office. This debris has the potential to contain chemicals/irritants. Consideration

should be given to providing a locker room or decontamination area for field personnel to change clothing/boots to avoid tracking contaminated debris into the office space.

DEP staff reported that they were not aware of a regular cleaning program utilizing wet-wiping and high efficiency particulate arrestence (HEPA) vacuuming of the office space. Wet-wiping flat surfaces and using a HEPA vacuum on carpeting greatly reduces common indoor irritants and small particulate matter.

Some supply diffusers were noted to be covered with duct tape (Picture 15). Any obstructions to the supply or return vents will interfere with the HVAC system balance and should be removed. Dedicated local exhaust vents should be installed in kitchen/breakrooms to remove food odors/smoke. Also, consider sealing pathways (Picture 16) in these areas to avoid entraining food odors/smoke into the return plenum system.

## **CONCLUSION AND RECOMMENDATIONS**

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

1. Repair and activate the exhaust vent in the area where the odors was denoted.
2. Investigate strategies to mitigate the probable ceiling tile odor in areas of elevated temperature surrounding the ceiling heating pipe loop. Some strategies may include improving insulation techniques near the ceiling tiles or replacing the ceiling tiles in those areas with a more heat resistant material.
3. Investigate the source of the active leak on the fifth floor (through door past the Reception area) and repair as necessary.
4. Remove any water-damaged porous materials (e.g., ceiling tiles) that were not dried within 24 to 48 hours and replace new.
5. Ensure a regular program for wet-wiping of surfaces and HEPA vacuuming of carpet to minimize particulate matter which can have irritant effects.
6. Consider providing a locker room or decontamination area for field staff to avoid tracking possible contaminated debris into the office space.
7. Ensure thermostats/central controls are set to the fan “on” setting during occupied periods to provide *continuous* air circulation and filtration. This setting typically reduces the incidence of IAQ complaints due to the dilution and removal of common indoor air pollutants.

8. Any obstructions (e.g., duct tape) to the supply or return vents will interfere with the HVAC system balancing and should be removed.
9. Consider programming AHU controls to condition and exchange air an hour before early staff arrival times. Alternatively, staff arrival schedules could be delayed until the AHU system adequately conditions and exchanges the air in the space.
10. Continue with plans to improve the AHU filter systems. Consider utilizing a bank of pre-filters in front of the typical higher efficiency AHU filters. More frequent changing will most likely be required due to the proximity to the railway.
11. The missing ceiling tiles in the 4<sup>th</sup> floor men's bathroom should be replaced as soon as possible to avoid the entrainment of bathroom odors and moisture into the ceiling return plenum.
12. Supply and exhaust vents should be cleaned regularly to avoid aerosolizing accumulated particulate matter.
13. The large number of stored items (e.g., papers, folders, boxes) makes it difficult for custodial staff to clean. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up. Consider implementing further storage solutions.
14. Minimize the use of air fresheners, scented hand sanitizers, cleaners, and dry erase materials within the building. These products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals.
15. Plants should be properly maintained and equipped with drip pans and should be located away from air diffusers to prevent the aerosolization of dirt, pollen and mold.
16. Carpets should be regularly vacuumed with HEPA-filtered vacuum cleaners as well as cleaned annually to prevent them from becoming a source of suspended particulate matter.
17. Regular 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 irritation).
18. Dedicated local exhaust vents should be installed in kitchens/breakrooms to remove food odors/smoke and eject the exhaust to the outdoors. Also, consider sealing pathways in these areas to avoid entraining food odors/smoke into the return plenum system.

19. Refer to resource manual and other related indoor air quality 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

Armstrong. 2016. “How to Install Your Armstrong Ceiling Tiles”. Armstrong World Industries, Inc. Lancaster, PA. [www.armstrong.com](http://www.armstrong.com)

Massachusetts Department of Public Health (MDPH). 2015. 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**



**Ceiling-mounted, slotted supply diffuser**

**Picture 2**



**Ceiling plenum return vent**

**Picture 3**



**Water-damaged ceiling tiles**

**Picture 4**



**Water-damaged ceiling tiles**

**Picture 5**



**Area of reported active leak on 5<sup>th</sup> floor**

**Picture 6**



**Plant and debris in office area**

**Picture 7**



**Plant with debris and water staining**

**Picture 8**



**Plant with debris and water staining**

**Picture 9**



**Section of perimeter heating loop pipe inspected (arrow)**

**Picture 10**



**Missing ceiling tiles in 4<sup>th</sup> floor men's bathroom**

**Picture 11**



**Dust/debris accumulated on supply vent**

**Picture 12**



**Dusty return vent**

**Picture 13**



**Accumulated items in office space**

**Picture 14**



**Accumulated items in office space**

**Picture 15**



**Supply diffuser blocked with duct tape**

**Picture 16**



**Pathways around utilities in kitchen area**

Location: Department of Environmental Protection

Address: 436 Dwight Street, Springfield, MA

Indoor Air Results

Date: 3/25/2016

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	TVOCs (ppm)	PM2.5 (µg/m <sup>3</sup> )	Occupants in Room	Windows Openable	Ventilation		Remarks
									Intake	Exhaust	
Background (outside)	407	ND	45	39	ND	12					
5 <sup>th</sup> Floor											
5206 File Room	634	ND	70	36	ND	3	0	N	Y	Y	WD CTs, GW tested negative for moisture, slight odor
Reception	563	ND	34	ND	ND	3	2	N	Y	Y	WD CT, Lysol wipes, HS, mini fridge on carpet
519	509	ND	71	32	ND	5	0	N	Y	Y	Plants
5203	504	ND	71	31	ND	3	1	N	Y	Y	Plants
Reception/copy room	517	ND	72	31	ND	3	0	N	Y	Y	PC, WD CT
523 Break room	531	ND	73	29	ND	4	0	N	Y	Y	Gaps around utilities at ceiling
524 Conference	523	ND	72	29	ND	3	0	N	Y	Y	Paper odor
525 Conference	573	ND	72	29	ND	3	0	N	Y	Y	Slight paper odor, DEM

ppm = parts per million

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

WD = water-damaged

ND = non detect

CP = cleaning products

CT = ceiling tile

AI = accumulated items

HS = hand sanitizer

PF = personal fan

DEM = dry erase materials

AI = accumulated items

**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 (%)	TVOCs (ppm)	PM2.5 (µg/m <sup>3</sup> )	Occupants in Room	Windows Openable	Ventilation		Remarks
									Intake	Exhaust	
Foyer outside 526	533	ND	71	31	ND	3	0	N	Y	Y	Large plant with standing water, HS
527	541	ND	71	30	ND	4	0	N	Y	Y	Plants, WD CTs
528	507	ND	72	29	ND	3	1	N	Y	Y	Bowed CT
5307	503	ND	72	30	ND	4	0	N	Y	Y	HS, AI
5308	516	ND	72	30	ND	3	1	N	Y	Y	Plants, AI
5311	511	ND	72	29	ND	3	1	N	Y	Y	Plants
5312	501	ND	73	28	ND	4	1	N	Y	Y	Plants, HS, AI
5401	502	ND	73	29	ND	3	1	N	Y	Y	Plant, CP
5465	504	ND	73	28	ND	3	0	N	Y	Y	
5464	519	ND	73	28	ND	4	1	N	Y	Y	
5405	508	ND	73	28	ND	3	1	N	Y	Y	

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									Intake	Exhaust	
5456	505	ND	73	27	ND	4	0	N	Y	Y	Plants in adjacent cube & AI
5455	510	ND	73	27	ND	3	0	N	Y	Y	AI
531	486	ND	73	28	ND	4	0	N	Y	Y	WD CTs, plants
532	558	ND	71	30	ND	3	1	N	Y	Y	
5451	491	ND	71	29	ND	4	0	N	Y	Y	Bowed CT
5415	583	ND	71	29	ND	5	0	N	Y	Y	WD CT
5412	500	ND	71	29	ND	5	0	N	Y	Y	AI
5409	514	ND	72	30	ND	4	0	N	Y	Y	
5407	524	ND	72	30	ND	4	0	N	Y	Y	
4 <sup>th</sup> Floor											
4201 Break room	501	ND	72	31	ND	19	1	N	Y	Y	Burning odor (toaster)

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									Intake	Exhaust	
4220	479	ND	72	31	ND	5	1	N	Y	Y	
4212	484	ND	72	32	ND	5	0	N	Y	Y	AI
4211	482	ND	72	30	ND	5	0	N	Y	Y	Duct tape over supply vent
4214	472	ND	71	31	ND	7	1	N	Y	Y	AI
4208	481	ND	71	31	ND	5	0	N	Y	Y	
4217	480	ND	71	31	ND	6	0	N	Y	Y	AI
4303	464	ND	71	31	ND	6	0	N	Y	Y	
4311	459	ND	70	31	ND	6	0	N	Y	Y	AI, Plants, WD CT
4312	487	ND	71	30	ND	5	1	N	Y	Y	
4316	484	ND	71	31	ND	5	0	N	Y	Y	Plants, AI
4401	486	ND	71	30	ND	5	1	N	Y	Y	

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									Intake	Exhaust	
4463	473	ND	71	32	ND	5	1	N	Y	Y	
4460	463	ND	71	31	ND	6	1	N	Y	Y	
4457	474	ND	71	32	ND	6	1	N	Y	Y	
4455	481	ND	71	32	ND	5	1	N	Y	Y	
4417	459	ND	70	31	ND	6	0	N	Y	Y	Plants, AI
4414	495	ND	70	32	ND	6	1	N	Y	Y	PF
4411	485	ND	70	32	ND	7	0	N	Y	Y	AI
4409	511	ND	70	33	ND	6	1	N	Y	Y	WD CT
4407	522	ND	70	33	ND	6	0	N	Y	Y	
4403	483	ND	70	33	ND	7	0	N	Y	Y	
4320	486	ND	70	33	ND	6	0	N	Y	Y	AI, plant

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									Intake	Exhaust	
4315	481	ND	70	32	ND	6	0	N	Y	Y	AI
4313	541	ND	71	31	ND	7	0	N	Y	Y	

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Location: DEP WERO

Address: 436 Dwight St., Springfield, MA

Suspended Ceiling  
Temperature

Date: 3/25/2016

Table 2

Location	Temperature Heat Loop Surface (°F)	Temperature Suspended Ceiling Metal Beam (°F)	Temperature Ceiling Tile Resting on Beam Adjacent to Heat Loop (°F)
5206	147	110	93
5200	137	128	94
5101	135	127	102
520	135	119	92
5209	71	70	72
5210	70	70	69
5212	69	69	68
5307	68	66	67
5309	69	68	68
5317	138	131	110
5405	142	129	111
5407	72	77	76
5453	66	65	69
5415	65	64	64
5454	136	106	93
5459	135	92	84

**Location: DEP WERO**

**Address: 436 Dwight St., Springfield, MA**

**Suspended Ceiling  
Temperature**

**Date: 3/25/2016**

**Table 2 (continued)**

<b>Location</b>	<b>Temperature Heat Loop Surface (°F)</b>	<b>Temperature Suspended Ceiling Metal Beam (°F)</b>	<b>Temperature Ceiling Tile Resting on Beam Adjacent to Heat Loop (°F)</b>
528	69	69	68
5208	69	69	69
502	142	134	94