

INDOOR AIR QUALITY ASSESSMENT

**Department of Revenue Office
540 Myles Standish Boulevard
Taunton, MA**



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

Background

Building:	Department of Revenue Office (DOR)
Address:	540 Myles Standish Boulevard, Taunton
Assessment Requested by:	Joshua Martin, Deputy Director, Office of Facilities Management, Massachusetts Department of Revenue
Reason for Request:	General indoor air quality (IAQ) for lease renewal.
Date of Assessment:	June 13, 2016
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Ruth Alfasso, Environmental Engineer/Inspector, IAQ Program
Building Description:	Square brick building with a flat roof. DOR is the sole tenant.
Building Population:	Approximately 100 employees.
Year of Construction:	1980s; DOR has been the sole tenant since 2012.
Windows:	Not 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 47 areas assessed, indicating adequate fresh air in the space.
- **Temperature** was within the recommended range of 70°F to 78°F in all areas assessed.
- **Relative humidity** was within or close to the lower end of the recommended range of 40% to 60% in all areas assessed.
- **Carbon monoxide** levels were non-detectable in all indoor areas assessed.

- *Fine particulate matter (PM2.5)* concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 $\mu\text{g}/\text{m}^3$ in all but one area assessed.

The assessment results indicate that the ventilation system is providing adequate fresh air for the occupancy in the building. Note that many areas had low occupancy which can reduce the creation of carbon dioxide. To maximize air exchange, the BEH recommends that mechanical ventilation systems operate continuously during periods of occupancy. Without the system operating as designed, normally occurring pollutants cannot be diluted or removed, allowing them to build up and lead to IAQ/comfort complaints.

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. The following analysis examines and identifies components of the HVAC system and likely sources of respiratory irritant/allergen exposure due to water damage, aerosolized dust, and/or chemicals found in the indoor environment.

Fresh air is provided by air handling units (AHUs) located on the roof. Air from the AHUs is filtered, heated/cooled, and delivered to rooms via ducted supply vents (Picture 1). Air is returned/exhausted through vents located around lights (Picture 2). Direct exhaust ventilation was present in restrooms and some conference rooms.

Additional exhaust ventilation may be useful in the kitchen/lounge and copy areas where particulates and odors may be generated. Note that there was an odor of burned food in the kitchen/lounge area, which has no direct exhaust and particulate levels exceeded the NAAQS limits of 35 $\mu\text{g}/\text{m}^3$ at the time of assessment.

It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). It was unknown when the last time these systems had been balanced.

Microbial/Moisture Concerns

Stained ceiling tiles were observed in a few places on the second floor (Picture 2; Table 1). It was reported that the roof leaks sometimes during heavy rain events. Water-damaged ceiling tiles can provide a source for mold and should be replaced after a water leak is discovered and repaired.

Plants were observed in offices (Pictures 3 and 4; Table 1). 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 to prevent water damage to porous materials. Plants should also be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold. Water coolers, fountains, and small refrigerators were found located in carpeted areas where they can moisten the carpet and lead to microbial growth (Picture 5; Table 1).

Ductless air conditioning units were observed along the south side of the building (Picture 6), to help with temperature control in areas subject to solar heating. Ductless air conditioning units have condensate drains, hoses, and sometimes pumps that need to be kept in good working order to prevent stagnant water and leaks.

Other IAQ Evaluations

Exposure to low levels of total volatile organic compounds (TVOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. To determine if VOCs were present, BEH/IAQ staff examined rooms for products containing VOCs. BEH/IAQ staff noted air fresheners, hand sanitizers, cleaners, and dry erase materials in use within the building (Picture 7; Table 1). All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals.

The offices were mostly carpeted. Carpets should be cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning and Restoration Certification (IICRC) recommendations, (IICRC, 2012).

In some offices, items such as paper, boxes and decorative items make it harder for custodial staff to clean. Fan blades on personal fans had settled dust and debris, which can be reaerosolized and cause irritation.

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Operate supply and exhaust ventilation in all areas during occupied periods.
2. Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
3. Consider having direct exhaust installed in kitchen and copy areas to remove odors and particulates generated in these areas.
4. Repair roof/plumbing leaks and replace stained ceiling tiles.
5. Keep plants in good condition, avoid overwatering, and avoid placing them on porous items such as carpets or paper.
6. Place refrigerators and water dispensing equipment in areas without carpeting or use a waterproof mat underneath them.
7. Ensure ductless air conditioning condensation collecting systems are monitored and maintained to prevent stagnant water and leaks.
8. Reduce use of cleaning products, sanitizers, and scented products.
9. Clean carpeting in accordance with IICRC recommendations (IICRC, 2012).
10. Reduce stored materials and store in an organized manner to allow for thorough cleaning.
11. Clean supply and exhaust vents and personal fans regularly to prevent aerosolization of debris.
12. 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

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/>.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

Picture 1



Supply vent

Picture 2



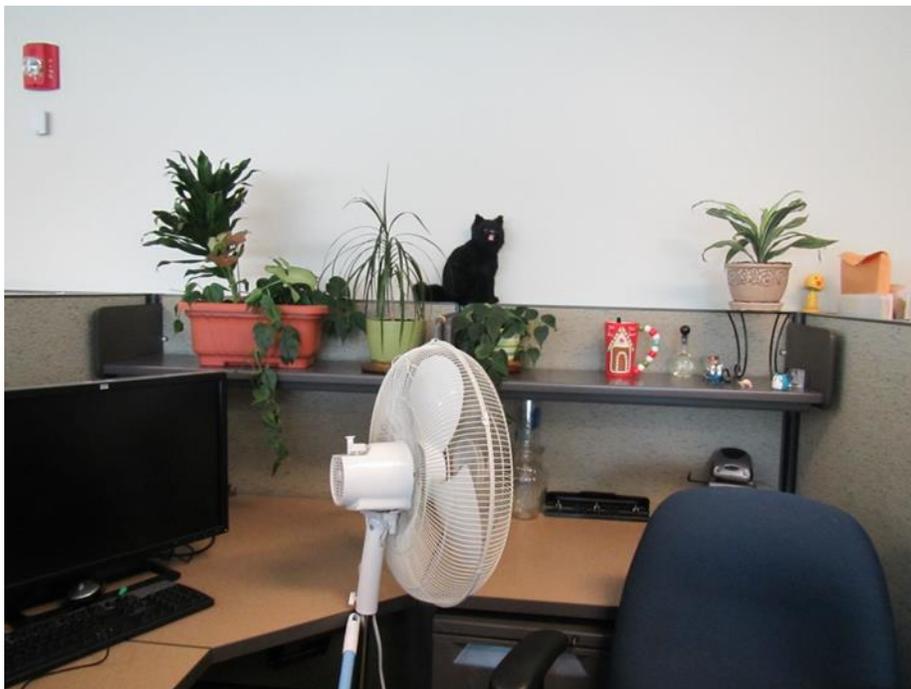
Vent around light fixture (arrow) and water-damaged ceiling tile

Picture 3



Plant in an office and a personal fan

Picture 4



Plants and a stand fan

Picture 5



Water cooler and small refrigerator on carpet

Picture 6



Ductless air conditioning unit

Picture 7



Cleaning products/sanitizers

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m ³)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background	359	ND	73	44	3					Sunny and breezy, parking lot
First Floor										
Imaging	662	ND	73	40	5	0	N	Y	N	Copy and mail machines, no direct exhaust
Files							N	Y	Y	NC, most boxes on shelves
McGarry (cubicle)	658	ND	73	45	13	2	N	Y	Y	
Levangie (cubicle)	646	ND	73	42	10	1	N	Y	Y	Food, CP
Connolly (cubicle)	656	ND	74	42	3	1	N	Y	Y	Plant
Goodmen (cubicle)	658	ND	74	42	6	2	N	Y	Y	PF, CP, plant
Pina (cubicle)	647	ND	74	40	3	2	N	Y	Y	Fridge on carpet, plant
Deputy Regional Director	612	ND	74	40	9	1	N	Y	Y	DO

ppm = parts per million

µg/m³ = micrograms per cubic meter

CP = cleaning products

CT = ceiling tile

DEM = dry erase materials

DO = door open

HS = hand sanitizer

NC = not carpeted

ND = non detect

PF = personal fan

WC = water cooler

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 ³)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Crehan (cubicle)	612	ND	74	40	3	0	N	Y	Y	
Couto (cubicle)	610	ND	74	40	2	3	N	Y	Y	
McKendrick (cubicle)	581	ND	73	38	3	3-6	N	Y	Y	Plants
Dolison (cubicle)	568	ND	72	38	2	4	N	Y	Y	PF – dusty, pest trap, food, WC on carpet
Maloof (cubicle)	564	ND	72	38	4	3	N	Y	Y	WC on carpet
Oberg (cubicle)	603	ND	73	41	2	1	N	Y	Y	CP, food
Women’s restroom						0	N	Y	Y	
Amonal (cubicle)	551	ND	71	40	4	1	N	Y	Y	WC on carpet
Falk (cubicle)	546	ND	71	40	3	2	N	Y	Y	PF
Regional director	552	ND	71	40	3	0	N	Y	Y	DO, coffee

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								Supply	Exhaust	
Second floor										
Alves-Cox (cubicle)	605	ND	72	43	4	1	N	Y	Y	Plants
Computer training	597	ND	73	43	3	0	N	Y	Y	18 computers, DEM
Lounge	602	ND	73	43	34-38	1	N	Y	Y	Exhaust not direct, burned popcorn odor, NC, fridge, microwave, vending
EICT room	601	ND	73	41	3	0	N	Y	Y	3 WD-CT
Wolk	603	ND	73	41	3	0	N	Y	Y	
Hassol (cubicle)	620	ND	73	41	7	1	N	Y	Y	
Shenken (cubicle)	613	ND	73	41	3	0	N	Y	Y	HS, PF, items on windowsill
Files						0	N	Y	Y	NC, WD-CT
Shine	802	ND	74	41	8	1	N	Y	Y	

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Table 1 (continued)

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m ³)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Burgos	675	ND	74	41	2	1	N	Y	Y	Plant
Craveiro	630	ND	74	41	2	0	N	Y	Y	Plants, PF
Calvori-Moniz	594	ND	74	41	3	1	N	Y	Y	PF, DO
Sawyer	638	ND	74	40	2	0	N	Y	Y	
Empty room							N	Y	Y	Items, baskets
Mazurck	625	ND	74	40	3	1	N	Y	Y	DO
Belizaire	595	ND	75	40	3	1	N	Y	Y	Space heater on
Power-Santisi	606	ND	74	40	2	2	N	Y	Y	HS
Regional Counsel (empty)	611	ND	74	40	3	0	N	Y	Y	DO
Panorese (cubicle)	647	ND	74	40	3	0	N	Y	Y	

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								Supply	Exhaust	
Boss (cubicle)	566	ND	73	39	3	0	N	Y	Y	HS
Vieira (cubicle)	576	ND	74	39	3	1	N	Y	Y	
Tufo	572	ND	73	39	3	0	N	Y	Y	Accumulated items on wall
McCormick (cubicle)	549	ND	73	40	3	1	N	Y	Y	Plants
Dacey	561	ND	73	40	3	0	N	Y	Y	PF
Semedo	566	ND	73	45	10	2	N	Y	Y	Plants
HD room	626	ND	73	40	2	0	N	Y	Y	
O'Donnell	665	ND	72	40	4	0	N	Y	Y	CP
Conference room 2	756	ND	71	40	6	1	N	Y	Y	DEM
Vacant Office	622	ND	72	42	2	0	N	Y	Y	PF-dusty

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								Supply	Exhaust	
Murray (cubicle)	596	ND	73	42	5	3	N	Y	Y	PF, plants, HS
Heyes	612	ND	74	42	11	1	N	Y	Y	Plant
Sumner (Director)	633	ND	74	44	4	1	N	Y	Y	
Dean (cubicle)	631	ND	74	43	3	3	N	Y	Y	Plants, WC on carpet
Waiting	633	ND	73	43		8	N	Y	Y	Open to mezzanine area

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