

# **INDOOR AIR QUALITY ASSESSMENT**

**Massachusetts Department of Developmental Services  
436 Dwight Street  
Springfield, Massachusetts**



Prepared by:  
Massachusetts Department of Public Health  
Bureau of Environmental Health  
Indoor Air Quality Program  
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## Executive Summary

This general indoor air quality (IAQ) assessment was prompted by a referral of an employee complaint from another state office sharing the floor with Massachusetts Department of Developmental Services (DDS) Springfield office regarding lack of ventilation. At the time of this assessment, repairs to the ventilation system were complete and all IAQ measurements were within preferable ranges. Recommendations are made to reduce plants and clutter as well as eliminate the use of candles to improve air quality in the space.

## Background

<b>Building:</b>	Massachusetts Department of Developmental Services (DDS)
<b>Address:</b>	Springfield State Office Building (SSOB) 436 Dwight St., Springfield, MA
<b>Assessment Requested by:</b>	Referral from MA Department of Labor Standards
<b>Date of Assessment:</b>	November 19, 2015
<b>Bureau of Environmental Health/Indoor Air Quality (BEH/IAQ) Program Staff Conducting Assessment:</b>	Michael Feeney, Director
<b>Date of Building Construction:</b>	1937
<b>Reason for Request:</b>	General IAQ concerns regarding lack of ventilation due to heating, ventilating and air-conditioning (HVAC) system repairs

## Building Description

The SSOB is a four-story, stone and cement building constructed in 1937 as a post office. The building was renovated in the 1970s and converted into a multi-agency state office building. DDS is located on the 2<sup>nd</sup> floor. Windows are not openable throughout the building. This space is occupied by approximately 30 employees and can be visited by 20 to 50 individuals daily.

## **Results and Discussion**

Test results are presented in Table 1. Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

### **Ventilation**

It can be seen from Table 1 that carbon dioxide levels were below 800 parts per million (ppm) in all areas tested, indicating adequate air exchange at the time of assessment. Fresh air is provided by a number of rooftop-mounted air-handling units (AHU) and distributed through ducted ceiling vents. Mechanical exhaust ventilation is provided by ceiling-mounted return grates.

### **Temperature and Relative Humidity**

Temperature readings in occupied areas during the assessment were within the MDPH recommended comfort guidelines (Table 1). The MDPH recommends that indoor air temperatures be maintained in a range of 70°F to 78°F in order to provide for the comfort of building occupants. In many cases concerning IAQ, fluctuations of temperature in occupied spaces are typically experienced, even in a building with an adequate fresh air supply.

The relative humidity measured during the assessment was within the MDPH recommended comfort range (Table 1). The MDPH recommends a comfort range of 40 to 60 percent for indoor air relative humidity. Relative humidity levels in the building would be expected to drop during the winter months due to heating. The sensation of dryness and irritation is common in a low relative humidity environment. Low relative humidity is a very common problem during the heating season in the northeast part of the United States.

### **Microbial/Moisture Concerns**

Indoor plants were noted in some areas. Plants can be a source of pollen and mold, which can be respiratory irritants to some individuals. Plants should be equipped with non-porous drip pans. Plants should also be located away from ventilation sources to prevent the entrainment and/or aerosolization of dirt, pollen, or mold.

Water coolers were observed on carpeted areas. Spills or leaks from these appliances can moisten carpeting. They should be located in a non-carpeted area or on waterproof mats.

### **Other IAQ Evaluations**

Indoor air quality can be negatively influenced by the presence of respiratory irritants, such as products of combustion. The process of combustion produces a number of pollutants. Common combustion emissions include carbon monoxide, carbon dioxide, water vapor, and smoke (fine airborne particle material). Of these materials, exposure to carbon monoxide and particulate matter with a diameter of 2.5 micrometers ( $\mu\text{m}$ ) or less (PM2.5) can produce immediate, acute health effects upon exposure. To determine whether combustion products were present in the indoor environment, BEH/IAQ staff obtained measurements for carbon monoxide and PM2.5.

#### *Carbon Monoxide*

*Carbon monoxide should not be present in a typical, indoor environment.* If it is present, indoor carbon monoxide levels should be less than or equal to outdoor levels. On the day of assessment, outdoor carbon monoxide concentrations were non-detectable (ND) (Table 1). All carbon monoxide levels indoors were ND (Table 1).

#### *Particulate Matter*

Outdoor PM2.5 concentrations were measured at  $7 \mu\text{g}/\text{m}^3$  (Table 1). Indoor PM2.5 levels ranged from 2 to  $5 \mu\text{g}/\text{m}^3$  (Table 1), which were below the NAAQS PM2.5 level of  $35 \mu\text{g}/\text{m}^3$ . Frequently, indoor air levels of particulates (including PM2.5) can be at higher levels than those measured outdoors. A number of activities that occur indoors and/or mechanical devices can generate particulate during normal operations. Sources of indoor airborne particulates may include but are not limited to particles generated during the operation of fan belts in the HVAC system, use of stoves and/or microwave ovens in kitchen areas; use of photocopiers, fax machines and computer printing devices; operation of an ordinary vacuum cleaner and heavy foot traffic indoors.

## **Other Conditions**

Other conditions that can affect IAQ were observed during the assessment. Scented candles and wax heating devices were observed in a number of offices. If candles are heated or burned, both VOCs and heated wax oils are vaporized. Paraffin wax fume can be a source of eye and respiratory irritation (CDC, 2011). The fuming of paraffin wax by heating or burning is not recommended in the indoor environment.

In several areas, items were observed on the floors, windowsills and desks. The large number of items stored provides a source for dusts to accumulate. These items (e.g., papers, folders, boxes) make it difficult for custodial staff to clean. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up. In addition, these materials can accumulate on flat surfaces (e.g., desktops, shelving and carpets) in occupied areas and subsequently be re-aerosolized causing further irritation. Similarly, dust/debris from items placed on top of radiators can become airborne through movement of the heated air. Plastic sealable totes may be used to store items that are not needed daily; these prevent dust from accumulating on the items and are cleanable.

## **Conclusions/Recommendations**

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

1. Properly maintain indoor plants, avoid overwatering and do not place them on porous materials. Consider reducing the number of plants.
2. Place water cooler on plastic mats or in non-carpeted areas.
3. Avoid the use of candles and heated wax in the office.
4. Reduce the amount of clutter to aid in cleaning.
5. 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 irritation).

6. Refer to resource manuals and other related indoor air quality 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

CDC. 2011. Paraffin wax fume. NIOSH Pocket Guide. April 4, 2011.

<http://www.cdc.gov/niosh/npg/npgd0477.html>

Massachusetts Department of Public Health. (MDPH). 2015. “Indoor Air Quality Manual: Chapters I-III”. Available from:

<http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/>

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m <sup>3</sup> )	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background (outdoors)	438	ND	60	49	7					
NE corner cubicles	562	ND	72	45	4	1	N	Y	Y	Plants
Private office	548	ND	72	44	4	0	N	Y	Y	
North Cubicles	547	ND	72	44	4	0	N	Y	Y	
Private office	587	ND	72	44	4	1	N	Y	Y	
Meeting room	562	ND	72	43	4	0	N	Y	Y	Door open
Northwest corner cubicles	585	ND	72	44	4	2	N	Y	Y	Plants
Cubicles near photocopier	580	ND	72	44	4	1	N	Y	Y	Plants, photocopier
Private office	558	ND	72	43	4	0	N	Y	Y	Cardboard
Northwest West cubicles	641	ND	72	43	5	1	N	Y	Y	Plants
West cubicles	549	ND	73	42	4	2	N	Y	Y	Plants
Lunch room	613	ND	74	41	4	8	N	Y	Y	

ppm = parts per million

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

ND = non-detect

**Comfort Guidelines**

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

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