**INDOOR AIR QUALITY ASSESSMENT**

**Massachusetts Rehabilitation Commission**

**Worcester Branch**

**340 Main Street**

**Worcester, Massachusetts**

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Worcester, Massachusetts


Prepared by:

Massachusetts Department of Public Health

Bureau of Environmental Health

Indoor Air Quality Program

March 2017

**Executive Summary**

This general indoor air quality (IAQ) assessment was prompted by a referral of an employee complaint. At the time of the assessment, reduction of the number of plants in this office is recommended.

# Background

|  |  |
| --- | --- |
| Building: | Massachusetts Rehabilitation Commission (MRC) |
| Address: | 340 Main Street, 5th floor, Worcester, Massachusetts |
| Assessment Requested by: | Virginia Platt, Project Manager, Division of Capital Asset Management and Maintenance (DCAMM) |
| Reason for Request: | Follow up/general IAQ concerns |
| Date of Assessment: | February 3, 2017 |
| Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment: | Michael Feeney, Director, IAQ Program |
| Building Description: | Multi-story building in downtown Worcester; the MRC is located on the 5th floor. |
| Building Population: | Approximately 130 employees and visitors from the public |
| Windows: | Not openable |

# Methods

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

Note that this building has been visited by the BEH/IAQ program several times before to address issues relating to particulate infiltration from the ground-floor food service and other IAQ concerns. Reports from these visits are available on the MDPH website at <http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-rpts/cities-and-towns-w.html>.

# 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 areas assessed, indicating adequate fresh air in the space.
* ***Temperature*** was within or very close to the recommended range of 70°F to 78°F in all areas assessed.
* ***Relative humidity*** was below the recommended range of 40% to 60% in all areas assessed.
* ***Carbon monoxide*** levels were non-detectable in all 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 (μg/m3) in all areas assessed.

## Ventilation

Mechanical ventilation is provided by a series of heating, ventilation and air conditioning (HVAC) air handling units (AHUs) located in closets throughout the floor. Fresh air is drawn through vents located above select window frames. Ductwork connects the AHUs to ceiling-mounted air supply diffusers. By design, air diffusers are equipped with fixed louvers that direct air along the ceiling to flow down the walls and create airflow. Air returns to the AHUs through the fixed louvers in the doors of the AHU closets. A few areas, such as the lounge/kitchen, training rooms and restroom, also have direct-vented exhaust to remove pollutants generated in these areas.

Lack of air exchange/circulation can lead to the build-up of naturally occurring pollutants in the space, which can result in IAQ/comfort complaints. It is recommended that all systems be operated in the “fan on” mode during occupied periods to provide for air circulation. It is also recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994); it was not known the last time these systems were balanced.

## Microbial/Moisture Concerns

Plants were observed in a few areas (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 and should be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold.

Two water-damaged ceiling tiles were observed in an office (Table 1). Water-damaged tiles indicate a leak from plumbing or the building envelope and should be replaced once the source has been repaired.

Water bubblers were directly on carpet. Leaks from these appliances can damage carpeting. Plastic or rubber mats with raised edges should be placed under these items to catch water from spills or leaks.

# Conclusions/Recommendations

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

1. Keep plants in good condition, avoid overwatering, and remove from the airstream of heating and ventilation equipment.
2. Replace water-damaged ceiling tiles after repairing leaks.
3. Operate supply and exhaust ventilation continuously in all areas during occupied periods. Ensure all HVAC equipment is maintained and supply and return vents are cleaned periodically to prevent dust re-aerosolization.
4. Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
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 irritations).
6. 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

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.

| **Location** | **Carbon**  **Dioxide**  **(ppm)** | **Carbon Monoxide**  **(ppm)** | **Temp**  **(°F)** | **Relative**  **Humidity**  **(%)** | **PM2.5**  **(µg/m3)** | **Occupants**  **in Room** | **Windows**  **Openable** | **Ventilation** | | **Remarks** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Supply** | **Exhaust** |
| Background (outdoors) | 421 | ND |  |  |  |  |  |  |  |  |
| Waiting room | 572 | ND | 79 | 9 | 1 | 1 | Y | Y | Y |  |
| Hall | 576 | ND | 78 | 14 | 1 | 0 | Y | Y | Y |  |
| Breakroom | 647 | ND | 73 | 13 | 3 | 4 | N | Y | Y |  |
| 002 | 673 | ND | 77 | 14 | 1 | 3 | Y | Y | Y |  |
| 007 | 510 | ND | 71 | 10 | 14 | 1 | Y | Y | Y |  |
| 014 | 530 | ND | 73 | 10 | 10 | 2 | Y | Y | Y |  |
| 017 | 640 | ND | 73 | 13 | 9 | 1 | Y | Y | Y |  |
| 023 | 616 | ND | 73 | 14 | 6 | 1 | Y | Y | Y |  |
| 026 | 639 | ND | 74 | 16 | 5 | 2 | Y | Y | Y |  |
| 034 | 617 | ND | 72 | 15 | 5 | 1 | Y | Y | Y |  |
| 037 | 573 | ND | 71 | 14 | 4 | 3 | Y | Y | Y | 2 water-damaged ceiling tiles |
| 038 | 560 | ND | 72 | 13 | 4 | 5 | Y | Y | Y |  |
| 046 | 536 | ND | 72 | 13 | 6 | 2 | Y | Y | Y |  |
| 047 | 554 | ND | 73 | 13 | 5 | 3 | Y | Y | Y |  |
| 060 | 492 | ND | 73 | 12 | 5 | 2 | Y | Y | Y |  |
| 070 | 613 | ND | 73 | 15 | 5 | 0 | Y | Y | Y |  |
| 071 | 636 | ND | 73 | 13 | 5 | 6 | Y | Y | Y |  |
| 075 | 588 | ND | 73 | 13 | 5 | 1 | Y | Y | Y |  |
| 081 | 653 | ND | 73 | 14 | 7 | 4 | Y | Y | Y |  |
| 082 | 720 | ND | 73 | 14 | 4 | 2 | Y | Y | Y | Plants |
| 085 | 688 | ND | 73 | 15 | 5 | 5 | Y | Y | Y |  |
| 091 | 668 | ND | 73 | 14 | 3 | 3 | Y | Y | Y | Plants |
| 093 | 614 | ND | 73 | 14 | 3 | 3 | Y | Y | Y | Plants |
| 101 | 630 | ND | 73 | 13 | 3 | 1 | N | Y | Y |  |
| 104 | 630 | ND | 72 | 14 | 4 | 2 | N | Y | Y |  |
| 112 | 619 | ND | 73 | 14 | 3 | 0 | N | Y | Y |  |
| 114 | 671 | ND | 73 | 15 | 3 | 1 | N | Y | Y |  |
| 122 | 623 | ND | 73 | 14 | 2 | 1 | Y | Y | Y |  |
| 127 | 662 | ND | 75 | 13 | 3 | 1 | Y | Y | Y |  |
| 130 | 628 | ND | 74 | 14 | 2 | 1 | Y | Y | Y |  |
| 131 | 627 | ND | 74 | 13 | 3 | 3 | Y | Y | Y |  |
| 137 | 621 | ND | 75 | 13 | 2 | 2 | Y | Y | Y | Plants |
| 138 | 622 | ND | 75 | 13 | 3 | 3 | Y | Y | Y |  |
| 142 | 677 | ND | 74 | 13 | 3 | 0 | N | Y | Y |  |
| 144 | 654 | ND | 75 | 13 | 3 | 1 | Y | Y | Y |  |
| 149 | 572 | ND | 74 | 13 | 3 | 2 | Y | Y | Y | Plants |