**INDOOR AIR QUALITY ASSESSMENT**

**EOHHS Service Center**

**38 Industrial Park Road**

**Plymouth, Massachusetts**



Prepared by:

Massachusetts Department of Public Health

Bureau of Environmental Health

Indoor Air Quality Program

September 2022

# BACKGROUND

|  |  |
| --- | --- |
| Building: | Executive Office of Health and Human Services (EOHHS) Service Center |
| Address: | 38 Industrial Park Road, Plymouth, MA |
| **Assessment Requested by:** | Pedro Batista, Project Coordinator, Executive Office of Health and Human Services (EOHHS) |
| Reason for Request: | General indoor air quality (IAQ) assessment |
| Date of Assessment: | September 12, 2022 |
| Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment: | Cory Holmes, Assistant Director, Indoor Air Quality (IAQ) Program |
| Building Description: | Single-story building that serves as office space for the Department of Developmental Services, Department of Mental Health, and the Massachusetts Rehabilitation Commission. |
| Building Population: | Approximately 100 employees |
| Windows: | Not openable |

# 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 the MDPH guidelines of 800 parts per million (ppm) in all areas assessed, indicating adequate fresh air in the space. Note that some areas were lightly occupied or unoccupied at the time of assessment due to a hybrid work schedule, carbon dioxide levels would be expected to be higher with increased occupancy.
* ***Temperature*** was within the recommended range of 70°F to 78°F in all areas assessed.
* ***Relative humidity*** was above the recommended range of 40% to 60% in all areas assessed and reflective of outdoor conditions.
* ***Carbon monoxide*** levels were non-detectable (ND) 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.
* ***Total volatile organic compounds (TVOCs)*** were ND in all areas tested.

## Ventilation

Heating, ventilation, and air conditioning (HVAC) is provided by rooftop air-handling units (AHUs). Conditioned air is delivered to occupied areas via louvered supply vents, and stale air is removed via return vents. The HVAC system is controlled by digital thermostats. The BEH IAQ program recommends that the fan be set to the “on” setting to provide continuous circulation/filtration during occupied hours.

To have proper ventilation with a mechanical ventilation system, the systems must be balanced after installation to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). These systems were most recently balanced in August 2022.

## Microbial/Moisture Concerns

Note that relative humidity in the occupied space was above the MDPH comfort range. Furthermore, according to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) humidity in excess of 70% for long periods of time can lead to water damage of porous materials even in the absence of liquid water/condensation (ASHRAE, 2019). In addition, the dew point inside the building, which can be calculated from temperature and relative humidity, was lower than outside, which indicates that water has been removed from the air. Moving the thermostat set point up a few degrees would reduce the relative humidity given the same dew point. For example, at a temperature of 68°F and a relative humidity of 70%, the dew point would be 58°F. That same dew point at an air temperature of 74°F would lead to a relative humidity of 57%, which would be within the MDPH comfort range. For additional control of humidity, if the percent of outside air brought into the building is easily adjustable, the settings can be temporarily changed to bring less outside air in during periods of high outside temperature and humidity, and then returned to normal once the weather becomes more temperate.

A few areas had water-damaged ceiling tiles (Table 1). Water-damaged ceiling tiles indicate leaks from either the roof or plumbing system and can provide a source for mold growth. These tiles should be replaced after a water leak is discovered and repaired.

Plants were observed in several 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.

## Other IAQ Evaluations

The workspace is 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). Regular cleaning with a high efficiency particulate air (HEPA) filtered vacuum in combination with an annual cleaning will help to reduce accumulation and potential aerosolization of materials from carpeting.

Personal fans were observed in a few areas. Fan blades in some cases, had accumulated dust/debris, which can be reaerosolized when fans are activated. Some supply, return, and exhaust vents also had light dust/debris accumulation (Table 1).

Exposure to low levels of total volatile organic compounds (TVOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. Although no measurable levels of TVOCs were detected, BEH/IAQ staff examined rooms for products containing VOCs. BEH/IAQ staff noted hand sanitizers, cleaning products, and dry erase materials in use within the building. All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals. Consult the document “[Clean Air Is Odor Free](https://www.mass.gov/doc/clean-air-is-odor-free-removing-fragrances-to-improve-indoor-air-quality-in-schools-and-0/download)” for more information on use of scented products. While hand sanitizers may be necessary, these should be used in areas with good ventilation, with the containers kept closed when not in use.

Finally, a bird’s nest was brought in by occupants and displayed on an interior windowsill. Bird’s nests can contain allergens and asthmagens and provide a source of irritation. This nest was removed by Mr. Batista during the assessment.

# CONCLUSIONS AND RECOMMENDATIONS

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

## *Ventilation recommendations*

1. Operate supply and exhaust ventilation continuously during occupied periods.
2. Raise the thermostat set point a few degrees to increase comfort and reduce relative humidity during humid weather.
3. Continue to have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
4. Change HVAC filters quarterly or as per the manufacturer’s instructions using *the best quality/highest* minimum efficiency reporting value (MERV) rated filters that can be used with current equipment.
5. During filter changes, vacuum debris from AHU cabinets.

### Water Damage recommendations

1. If the amount of outside air can be changed easily, temporarily reduce outside air percentage during periods of elevated relative humidity. Return to normal set points once the weather moderates.
2. Ensure all leaks are repaired and replace water-damaged ceiling tiles.
3. Keep plants in good condition, avoid overwatering, and remove from the airstream of heating and ventilation equipment.

### Other recommendations

1. 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).
2. Clean personal fans, supply, return, and exhaust vents regularly to remove accumulated dust/debris.
3. Clean carpeting in accordance with IICRC recommendations (IICRC, 2012); annually (or semi-annually in soiled/high traffic areas).
4. Continue to reduce or eliminate the use of scented cleaners, hand sanitizers and dry erase materials to reduce irritation. Consult the document “[Clean Air Is Odor Free](https://www.mass.gov/doc/clean-air-is-odor-free-removing-fragrances-to-improve-indoor-air-quality-in-schools-and-0/download)” for more information on use of scented products.
5. Refrain from bringing in items (e.g., bird’s nest) that might provide a source of allergens/asthmagens.
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

ASHRAE. 2019. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Ventilation for Acceptable Indoor Air Quality. ANSI/ASHRAE Standard 62.1-2019. Atlanta, GA.

IICRC. 2012. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: FAQ.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: <https://www.mass.gov/lists/indoor-air-quality-manual-and-appendices>.

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)** | **TVOC**  **(ppm)** | **Occupants**  **in Room** | **Windows**  **Openable** | **Ventilation** | | **Remarks** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Supply** | **Exhaust** |
| Background | 409 | ND | 70 | 100 | 5 | ND |  |  |  |  | Light to moderate rain |
| Waiting Room | 614 | ND | 71 | 75 | 1 | ND | 0 | N | Y | Y |  |
| Reception | 534 | ND | 71 | 65 | 1 | ND | 0 | N | Y | Y | PF |
| 103 | 518 | ND | 70 | 72 | 1 | ND | 0 | N | Y | Y |  |
| 104 | 524 | ND | 71 | 73 | 1 | ND | 0 | N | Y | Y |  |
| 105 | 522 | ND | 71 | 74 | 1 | ND | 0 | N | Y | Y |  |
| 106 | 516 | ND | 70 | 74 | 1 | ND | 0 | N | Y | Y |  |
| 107 | 535 | ND | 71 | 74 | 1 | ND | 0 | N | Y | Y |  |
| 108 | 559 | ND | 71 | 74 | 1 | ND | 0 | N | Y | Y |  |
| 114 | 522 | ND | 71 | 76 | 1 | ND | 0 | N | Y | Y | 2 WD CTs, dust/debris on vents |
| 115 | 531 | ND | 71 | 76 | 1 | ND | 0 | N | Y | Y | Plants, dust/debris on vents |
| 116 | 573 | ND | 71 | 77 | 1 | ND | 0 | N | Y | Y | WD CT, AP |
| 117 | 521 | ND | 71 | 78 | 1 | ND | 0 | N | Y | Y |  |
| 120 | 592 | ND | 72 | 72 | 1 | ND | 0 | N | Y | Y |  |
| 122 | 524 | ND | 71 | 65 | 1 | ND | 0 | N | Y | Y |  |
| 124 | 528 | ND | 72 | 66 | 1 | ND | 0 | N | Y | Y | Dust/debris on vents |
| 125-127 | 602 | ND | 71 | 65 | 1 | ND | 0 | N | Y | Y |  |
| 128-130 | 579 | ND | 71 | 66 | 1 | ND | 1 | N | Y | Y |  |
| 131-135 | 549 | ND | 72 | 73 | 1 | ND | 0 | N | Y | Y |  |
| 138-140 | 524 | ND | 71 | 64 | 1 | ND | 1 | N | Y | Y |  |
| 143-148 | 547 | ND | 72 | 64 | 1 | ND | 0 | N | Y | Y |  |
| 149 | 504 | ND | 72 | 64 | 1 | ND | 0 | N | Y | Y |  |
| 151 | 533 | ND | 72 | 62 | 1 | ND | 0 | N | Y | Y |  |
| 152 | 545 | ND | 71 | 64 | 1 | ND | 0 | N | Y | Y |  |
| 154 | 500 | ND | 72 | 68 | 1 | ND | 0 | N | Y | Y |  |
| 155 | 501 | ND | 72 | 68 | 1 | ND | 0 | N | Y | Y |  |
| 156 | 633 | ND | 72 | 60 | 1 | ND | 0 | N | Y | Y |  |
| 157 | 524 | ND | 71 | 74 | 1 | ND | 0 | N | Y | Y |  |
| 161 | 613 | ND | 72 | 63 | 1 | ND | 0 | N | Y | Y |  |
| 165-168 | 573 | ND | 71 | 71 | 1 | ND | 1 | N | Y | Y | Plants |
| 171-173 | 556 | ND | 71 | 70 | 1 | ND | 0 | N | Y | Y | Plants |
| 174-177 | 583 | ND | 71 | 69 | 1 | ND | 0 | N | Y | Y |  |
| 178-181 | 555 | ND | 71 | 69 | 1 | ND | 1 | N | Y | Y |  |
| 182 | 537 | ND | 71 | 69 | 1 | ND | 0 | N | Y | Y |  |
| 184-187 | 548 | ND | 71 | 67 | 1 | ND | 0 | N | Y | Y |  |
| 188-191 | 588 | ND | 72 | 69 | 1 | ND | 0 | N | Y | Y |  |
| 193-194 | 605 | ND | 72 | 69 | 1 | ND | 1 | N | Y | Y |  |
| 195 | 585 | ND | 72 | 69 | 1 | ND | 1 | N | Y | Y |  |
| 200 | 577 | ND | 71 | 66 | 1 | ND | 0 | N | Y | Y | Dust/debris on vents |
| 202 | 580 | ND | 71 | 67 | 1 | ND | 0 | N | Y | Y |  |
| 203A | 515 | ND | 71 | 65 | 1 | ND | 0 | N | Y | Y |  |
| 207-216 | 542 | ND | 71 | 64 | 1 | ND | 0 | N | Y | Y |  |
| 218-223 | 546 | ND | 72 | 64 | 1 | ND | 0 | N | Y | Y |  |
| 224 | 538 | ND | 72 | 66 | 1 | ND | 0 | N | Y | Y |  |
| 226 | 539 | ND | 72 | 64 | 1 | ND | 0 | N | Y | Y |  |
| 228-230 | 538 | ND | 72 | 64 | 1 | ND | 0 | N | Y | Y |  |