**WATER DAMAGE ASSESSMENT**

**Massachusetts Department of Developmental Services**

**340 Main Street**

**Worcester, Massachusetts**



Prepared by:

Massachusetts Department of Public Health

Bureau of Environmental Health

Indoor Air Quality Program

May 2019

# Background

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| --- | --- |
| Building: | Department of Developmental Services (DDS) |
| Address: | 340 Main Street, Worcester |
| Assessment Requested by: | Erin McCabe, Executive Office of Health and Human Services |
| Reason for Request: | Concerns regarding odors/water damage |
| Date of Assessment: | April 19, 2019 |
| Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment: | Michael Feeney, Director, Indoor Air Quality (IAQ) Program |
| Building Description: | Multi-story building in downtown Worcester  |
| Building Population: | Approximately 130 employees and visitors from the public |
| Windows: | Openable in some areas  |
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An area of office space in the southwest corner of the rear of the 5th floor that is around a vault and rear stairwell of the building (the flooded area) was inundated with water from a heating, ventilating and air-conditioning (HVAC) coil leak that occurred in July of 2018. DDS staff had reported an odor in this location on an intermittent basis since the flooding incident. DDS staff reported that the floor was dried to address the moistened carpet and walls. The BEH/IAQ Program was asked to examine the DDS floor in the area of the water damage.

# Methods

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

# IAQ Testing Results

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015). The following is a summary of testing results.

* ***Temperature*** was within the recommended range of 70°F to 78°F in the areas tested.
* ***Relative humidity*** was within the recommended range of 40 to 60% in areas tested at the time of the assessment.
* ***Moisture Measurements*** in all carpeting in the areas around the vault had elevated levels of moisture in comparison to non-flooded (control) areas at the time of assessment.

# Discussion

## Microbial/Moisture Concerns

The leak occurred during a timeframe of unusual weather that existed from July to September 2018. The Boston area experienced an unprecedented period of extended hot, humid weather. According to the Washington Post, “[d]ata…show[s]…cities in the Northeast have witnessed such humidity levels for record-challenging duration...[i]ncluding Albany, Boston, Burlington Portland and Providence” during the summer of 2018 (WP, 2018). “Boston and nearby locations… [saw]…historic numbers of those warm nights with low temperatures at or above 70 degrees…Providence and Blue Hill Observatory have already broken their annual records” (WP, 2018). If a building does not have adequate exhaust ventilation and air chilling capacity to remove/reduce relative humidity from outside air, then hot, moist air can be introduced into a building and linger to increase occupant discomfort as well as possibly moisten materials (or prevent/inhibit drying) which may lead to mold growth.

The DDS office flooring consists of carpet tile adhered to plywood installed over the original floor. It is feasible that water from the July 2018 water damage incident resulted in water passing into the space below the plywood through seams at the wall/floor. The combination of humid weather and water-impermeable carpet tile may have prevented the drying of the space between the plywood overlay and the original floor.

On the day of the assessment IAQ staff noted a musty wood odor upon entering the hallway outside room 54. The odor was confined to the flooded area and was not present in control areas or other locations examined by IAQ staff. The odor detected can be associated with chronic moisture exposure to wood or with dry drain traps/broken vent pipes in the sewer system. As reported by EOHHS staff, a smoke test in the restroom of this area indicated no leaks or dry traps adjacent to the flooded area, which would indicate the source is the floor.

In general, floors should have roughly uniform moisture measurements that can change due to weather conditions. There are a number of measurements that indicate an unaccounted moisture source may exist in the flooded area. In the experience of the IAQ Program, relative humidity would expect to be +/- 2% throughout a space with normal occupancy. It is important to note that humidity in the flooded area was 6-10% higher than the control areas. This relative humidity increase may indicate that a moisture source exists in the flooded area.

In order to assess if flooring had a uniform moisture content, measurements were taken in locations reported to be outside where the water damage occurred (002 and 11). Moisture testing of flooring indicates that the material below the carpet tiles in the flooded area has a moisture content that is 10-25% higher than floor measurements in the control locations (Table 1). These moisture measurements indicate that a moisture source exist below the carpet tiles in the flooded area. Based on the observations and measurements made during the assessment, it appears that the flooring beneath the carpet tile is currently moistened.

In general, the US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials (e.g., GW, carpeting) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur.

# Conclusions/Recommendations

Based on the observations made during this assessment, the source of the odors is likely the flooring beneath carpet tile. In order to address this situation, carpet tile and flooring needs to be examined, and removed if it is the source of the odor:

1. The IAQ Program suggests removing flooring in a limited area to ascertain if the odor and/or excessive moisture are present beneath the floor.
2. All mold-colonized flooring materials found (plywood and padding) should be removed and replaced.
3. In order to facilitate remediation, it is advisable to relocate DDS personnel from this location while examination and possible remediation is completed.
4. It is highly recommend to use the US EPA’s “Mold Remediation in Schools and Commercial Buildings” (available at: <http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide>) as a guideline for remediation efforts.
5. Given the location of the flooded area, sealing this area during remediation should be achieved by sealing the entrance to the hallway outside room 54.
6. Refer to resource manuals and other related IAQ 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**

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

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/>.

US EPA. 2008. Mold Remediation in Schools and Commercial Buildings. US Environmental Protection Agency, Office of Air and Radiation, Indoor Environments Division, Washington, D.C. EPA 402-K-01-001. <http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide>.

WP. 2018. ‘It’s been relentless’: Smothering summer humidity in the Northeast has crushed records. Washington Post, Washington, DC. https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/08/30/its-been-relentless-smothering-summer-humidity-in-the-northeast-has-crushed-records

| **Location** | **Air Temperature****(oF)** | **Relative Humidity****(%)** | **Moisture Content in Exterior Wall around window (%)** | **Moisture content in interior wall (%)** | **Moisture content of carpeting at Exterior Wall****(%)** | **Moisture content of carpeting 5′ from Exterior Wall****(%)** | **Moisture content of hallway carpeting****(%)** | **Presence of odor** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 002 | 75 | 44 | 24(plaster) | 1(gypsum wallboard) | 2 | 3 |  | No |
| 11 | 75 | 40 | 1-2(gypsum wallboard) | 0-4(gypsum wallboard) | 3 | 3 |  | No |
| 46 | 74 | 50 | 0(gypsum wallboard) | 0(gypsum wallboard) | 13 | 16 |  | Yes |
| Hallway outside 54 | 74 | 51 | - | 8-15(plaster) | - | - | 28 | Yes |
| 56 | 74 | 52 | 0 | 0-8 | 26 | 15 |  | Yes |
| Hallway outside 58 | 73 | 53 | 0-4(gypsum wallboard) | 29(plaster) | 13 | 14 |  | Yes |
| Space between AC closet and restroom | 73 | 54 | 10(gypsum wallboard) | 10-28(gypsum wallboard) | 10 | 14 |  | Yes |