**INDOOR AIR QUALITY ASSESSMENT**

**Boston Public Library**

**Upham’s Corner Branch**

**500 Columbia Road**

**Dorchester, Massachusetts**



Prepared by:

Massachusetts Department of Public Health

Bureau of Environmental Health

Indoor Air Quality Program

January 2018

# Background

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| Building: | Boston Public Library (BPL). Upham’s Corner Branch (UC) |
| Address: | Upham’s Corner Municipal Building 500 Columbia Road, Dorchester, MA |
| Assessment Requested by: | Boston Public Health Commission |
| Reason for Request: | General indoor air quality (IAQ) and bedbugs |
| Date of Assessment: | November 2, 2017 |
| Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment: | Michael Feeney, Director, IAQ Program |
| Building Description: | The building was originally constructed as a gymnasium, library, and indoor pool with locker rooms. The current library branch occupies two floors. The upper floor is the original location for the library; the lower floor is the children’s library section that exists inside the former indoor pool area. |
| Building Population: | Approximately 5 employees |
| Year of Construction: | 1903 with renovations done in 1989 |
| Windows: | Openable |

# Introduction

The IAQ Program was contacted regarding reports of UC employee health concerns. A consultant (OccuHealth) was hired to assess employee complaints of itching and feelings of pin pricks on the skin. Subsequent to that assessment, it was reported that a bed bug was found in the UC upper story resulting in closure for bedbug inspection and treatment. The IAQ Program met with BPL officials to assess the library prior to its reopening on the day of the visit and to identify other conditions that may have contributed to the reported symptoms. The assessment was limited to UC employee-accessible locations only. Conditions on the third and second floors as well as the health clinic in the basement were not assessed.

# 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 areas, indicating adequate fresh air in the space at the time of this assessment.
* ***Temperature*** was within or just below the recommended range of 70°F to 78°F in all areas assessed.
* ***Relative humidity*** was within 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 μg/m3 in all areas assessed.

## Ventilation

The UC does not have a functioning ventilation system that provides fresh air. No mechanical ventilation equipment is installed to either introduce fresh air or to remove stale air from both floors of the library. At this time the library also has no openable windows on both floors as well. Therefore normally occurring indoor air pollutants can build up to cause irritation of the eyes nose and respiratory system.

The upper floor of the library had a natural gravity ventilation system when it was constructed in 1903. It appears that this system was abandoned and sealed. The UC does have two free standing air handling units (AHUs), but these units only provide air chilling of air inside the library (Picture 1).

There are several conditions that appear to influence airflow in the library. Airflow was noted entering the library from the stairwell door. This air from the stairwell was drawn from the lower level of the library which was originally an indoor pool and now is the children’s library. This airflow phenomenon is called the stack effect, which is where heated air will rise upwards inside a stairwell/chimney. As the heated air rises, a vacuum is created at the base of the chimney/stairwell to pull air from adjoining areas. In this instance air from the former pool area on the lower level is being drawn into the upper level of the library via the stairwell. If any source of dander, dust, odors or other pollutants exist in the lower level, these materials can then be drawn up the stairwell and then can impact the front desk.

As noted previously and the lower level of the library was originally built and operated as in indoor swimming pool. IAQ staff examined the floor and walls of the pool and noted a number of openings between marble slabs (Pictures 1 and 2). Each of these openings can be a source of water vapor, mold spores, other various pollutants and well as pathways for rodents to enter the library from beneath the pool. These airborne pollutants can then be drawn into the stairwell which then can travel into the upper floor of the library via the stairwell.

Also of note are reports of a rodent infestation within the building. A rodent infestation can result in indoor air quality related symptoms due to materials in their wastes. Mouse urine contains a protein that is a known sensitizer (US EPA, 1992). A sensitizer is a material that can produce symptoms (e.g., running nose or skin rashes) in sensitive individuals after repeated exposure. To eliminate exposure to allergens, rodents must be removed from the building. Please note that removal, even after cleaning, may not provide immediate relief since allergens can exist in the interior for several months after rodents are eliminated (Burge, 1995). Once the infestation is eliminated, a combination of cleaning, carpet removal and increased ventilation and filtration should serve to reduce allergens associated with rodents.

# Conclusions/Recommendations

The conditions of the UC present a number of issues. Without a functioning mechanical ventilation system, pollutants that exist inside the library are neither diluted nor vented to the outdoors. If a source of environmental pollutants is added to the indoor environment (e.g., rodent-associated allergens, mold or other pollutants from beneath the pool), these materials can build up in the indoor environment to cause symptoms such as irritation to the eyes, nose, throat and respiratory system. In addition individuals who are hypersensitive may have skin rashes if they come in to contact with surfaces that are coated with allergens. In this type of situation with lack of ventilation in combination with point sources of pollutants, the strategy would be to reduce exposure to building occupants by a combination of extensive cleaning, elimination slash removal of point sources of pollutants, elimination of the pathway for pollutants to travel from one part of the building to another as well as elimination of the rodent infestation.

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

1. Implement the recommendation made in the previous IAQ report.
2. Continue with plans to smoke test the building to identify possible means of egress for rodents to have access to the building.
3. Locate all air cleaning device near the stairwell door in both levels of the library to inception and filter air from the stairwell. Do not locate air cleaners near the front desk on the upper level.
4. In order to locate and identify rodent pathways and contamination in the library, it is recommended that the floor and material be examined using a black light which would identify locations of rodent urine. If the carpeting is heavily contaminated with rodent urine, it is recommended to remove carpeting.
5. Seal all spaces and holes in the marble floor and walls of the former swimming pool to make this structure air time. To do this properly all shelving inside the origanl pool should be removed from along the walls to completely examine and seal the marble slab junctions (Picture 3).
6. Consider installing exhaust vent in the restrooms on the lower level. The operation other mechanical exhaust vent in the restroom would then depressurized the lower level.
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8. Use the principles of Integrated Pest Management (IPM) and the services of a licensed pest control operator to remove rodents and reduce the potential for pest infestation. Ensure that any area where rodents may have been is thoroughly cleaned to remove allergens.
9. 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

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