

# **INDOOR AIR QUALITY ASSESSMENT**

**Newbury Town Hall  
25 High Road  
Newbury, Massachusetts**



Prepared by:  
Massachusetts Department of Public Health  
Center for Environmental Health  
Emergency Response/Indoor Air Quality Program  
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## **Background/Introduction**

At the request of the Newbury Board of Health (NBOH) and Newbury Police Department (NPD), the Massachusetts Department of Public Health (MDPH), Center for Environmental Health (CEH) provided assistance and consultation regarding indoor air quality concerns at the NPD located at 25 High Road, Newbury, Massachusetts. The request was prompted by concerns about water damage and mold in the NPD that resulted from flooding due to heavy rains during May 2006. Since the NPD is located in the bottom floor of the Newbury Town Hall (NTH), CEH staff conducted an assessment of the NTH as well. This report details general indoor air quality conditions observed in the NTH. Conditions observed in the NPD were detailed in a separate report (MDPH, 2006).

On June 2, 2006, a visit to conduct an assessment of the NTH was made by Cory Holmes, an Environmental Analyst in the CEH's Emergency Response/Indoor Air Quality (ER/IAQ) Program. The NTH is a two-story clapboard sided building with a concrete/cobblestone foundation. The NTH is built into a hill, with portions of the police department located below grade. The NTH occupies the top floor, which consists of office space, meeting rooms and storage areas. Windows are openable throughout the building.

In May of 2006, the New England area experienced some of the heaviest rainfalls on record, which resulted in widespread flooding in buildings across the region. No flooding or substantial water-damaged occurred in the NTH portion of the building.

## **Methods**

Air tests for carbon dioxide, temperature and relative humidity were conducted with the TSI, Q-TRAK™ IAQ Monitor, Model 8551. CEH staff also performed a visual inspection of building materials for water damage and/or microbial growth.

## **Results**

This NTH has a staff off approximately 15 and is visited frequently by members of the public. Tests were taken during normal operations. Results appear in Table 1.

## **Discussion**

### **Ventilation**

It can be seen from Table 1 that carbon dioxide levels were below 800 parts per million (ppm) in all areas surveyed indicating adequate air exchange. However, it is important to note that the NTH does not have any means of mechanical ventilation, but uses windows to introduce fresh air and portable air-conditioning (AC) units for cooling. At the time of the CEH assessment, Detective Lucey of the NPD reported that the town was considering installing a heating, ventilation and air conditioning (HVAC) system to provide mechanical ventilation and temperature control in the building.

Most of the air conditioners examined were equipped with a “fan only” or “exhaust open” setting. In this mode of operation, air conditioning units can provide air circulation by delivering outside air into space without cooling (i.e., air provided by unit equals that of outside temperature).

The Massachusetts Building Code requires that each room of an office have a minimum ventilation rate of 20 cubic feet per minute (cfm) per occupant of fresh outside air or openable windows (SBBRS, 1997; BOCA, 1993). The ventilation must be on at all times that the room is occupied. Providing adequate fresh air ventilation with open windows and maintaining the temperature in the comfort range during the cold weather season is impractical. Mechanical ventilation is usually required to provide adequate fresh air ventilation.

Carbon dioxide is not a problem in and of itself. It is used as an indicator of the adequacy of the fresh air ventilation. As carbon dioxide levels rise, it indicates that the ventilating system is malfunctioning or the design occupancy of the room is being exceeded. When this happens, a buildup of common indoor air pollutants can occur, leading to discomfort or health complaints. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week, based on a time-weighted average (OSHA, 1997).

The MDPH uses a guideline of 800 ppm for publicly occupied buildings. A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches. For more information concerning carbon dioxide, please see [Appendix A](#).

Temperature measurements ranged from 76° F to 81° F, which were above the MDPH recommended comfort range in a few areas; however ACs in these rooms were not activated at the time of the assessment. 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 indoor air quality, fluctuations of temperature in occupied spaces are typically experienced, even in a building with an adequate fresh air supply. Often times, temperature control is difficult, especially in an old building without a mechanical ventilation system.

The relative humidity measurements in the building ranged from 51 to 71 percent, which were above the MDPH recommended comfort range in one area (the central meeting area). The MDPH recommends that indoor air relative humidity be maintained in the comfort range of 40 to 60 percent. Windows were observed to be open during the assessment, which occurred on a day of high outdoor relative humidity (98%). While temperature is mainly a comfort issue, relative humidity in excess of 70 percent for extended periods of time can provide an environment for mold and fungal growth (ASHRAE, 1989). During periods of high relative humidity (late spring/summer months), windows and exterior doors should be closed to keep moisture out. 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**

A few areas had water-damaged ceiling tiles (Picture 1). Water-damaged ceiling tiles can provide a source of mold and should be replaced after a moisture source or leak is discovered and repaired. The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2001; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Water-damaged porous materials cannot be adequately cleaned to remove mold growth. The application of a mildewcide to moldy porous materials is not recommended.

Occupants reported musty odors in the pantry/kitchen area. Upon examination, CEH staff observed mold growth along the gasket of the refrigerator (Picture 2). At the time of the assessment, CEH staff recommended that the gasket be cleaned and disinfected with an appropriate antimicrobial.

Plants were observed in some areas. Plants, soil and drip pans can serve as sources of mold growth. Plants should be properly maintained, over-watering of plants should be avoided and drip pans should be inspected periodically for mold growth.

## **Other Concerns**

Several other conditions that can affect indoor air quality were noted during the assessment. Reports of pest infestation, mainly rodents, were reported by NTH personnel. 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 readily in sensitive individuals. CEH staff observed trash being stored directly against the building near the rear entrance of the town hall (Picture 3), which can attract rodents. The reduction/elimination of attractants (i.e., trash) as well as any pathways of egress into the building (Picture 4) should be the first steps taken to eliminate infestation.

Window-mounted ACs are normally equipped with filters, which should be cleaned or changed as per manufacturer's instructions to avoid the build-up and re-aerosolization of dirt, dust and particulate matter. CEH staff examined filters within AC units and found them occluded with dust and debris (Picture 5). In addition, exposed fiberglass insulation was observed around window mounted ACs (Picture 6). Fiberglass insulation can provide a source of skin, eye and respiratory irritation.

Also of note was the amount of materials stored inside offices (Picture 7). In areas throughout the building, items were observed on windowsills, tabletops, counters, bookcases 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. Several had accumulated dust (Pictures 8 and 9). Dust can be irritating to eyes, nose and respiratory tract. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up.

Finally, carpeting in several areas was extremely worn and damaged (Picture 10). Disintegrating textiles can be a source of particulates, which can be irritating to the eyes, nose and throat.

## **Conclusions/Recommendations**

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

1. Consider installing a general HVAC system in the building. Consult with an HVAC engineering firm to examine the feasibility of providing mechanical supply and exhaust ventilation.
2. 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. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).
3. Ensure roof leaks are repaired, and replace any remaining water-damaged ceiling tiles. Examine the space above and around these areas for mold growth. Disinfect areas of water leaks with an appropriate antimicrobial.
4. Clean and disinfect refrigerator gasket with an appropriate antimicrobial. Clean afterwards with soap and water.
5. Ensure windows are closed during hot, humid weather to maintain indoor temperatures and avoid condensation problems.



6. Utilize ACs or dehumidifiers to reduce relative humidity. Ensure dehumidifiers are cleaned and maintained as per the manufactures instruction to prevent microbial growth.
7. Use the principles of integrated pest management (IPM) to rid the building of pests. A copy of the IPM recommendations is available at:  
[http://www.state.ma.us/dfa/pesticides/publications/IPM\\_kit\\_for\\_bldg\\_mgrs.pdf](http://www.state.ma.us/dfa/pesticides/publications/IPM_kit_for_bldg_mgrs.pdf).
8. Seal spaces around portable ACs, breaches in the building exterior (e.g., utility holes, foundation cracks) to prevent pest entry.
9. Clean/change filters for ACs as per the manufacture's instructions or more frequently if needed.
10. Encapsulate insulation around portable air conditioners.
11. Store trash away from building. Consider obtaining a dumpster to collect trash.
12. Relocate or consider reducing the amount of materials stored to allow for more thorough cleaning. Clean items regularly with a wet cloth or sponge to prevent excessive dust build-up.
13. Consider replacing old/stained/worn carpeting. If not feasible, clean existing carpeting annually (or semi-annually in soiled high traffic areas) as per the recommendations of the Institute of Inspection, Cleaning and Restoration Certification (IICRC). Copies of the IICRC fact sheet can be downloaded at:  
[http://www.cleancareseminars.com/carpet\\_cleaning\\_faq4.htm](http://www.cleancareseminars.com/carpet_cleaning_faq4.htm) (IICRC, 2005)
14. Refer to resource manuals and other related indoor air quality documents for additional building-wide evaluations and advice on maintaining public buildings, available at: [http://mass.gov/dph/indoor\\_air](http://mass.gov/dph/indoor_air).

## References

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BOCA. 1993. The BOCA National Mechanical Code/1993. 8<sup>th</sup> ed. Building Officials and Code Administrators International, Inc., Country Club Hill, IL

IICRC. 2005. Carpet Cleaning FAQ 4 Institute of Inspection, Cleaning and Restoration Certification. Institute of Inspection Cleaning and Restoration, Vancouver, WA.

MDPH. 2006. Indoor Air Quality Assessment, Newbury Police Department, Newbury, Massachusetts. Massachusetts Department of Public Health, Center for Environmental Health, Boston, MA. June 2006.

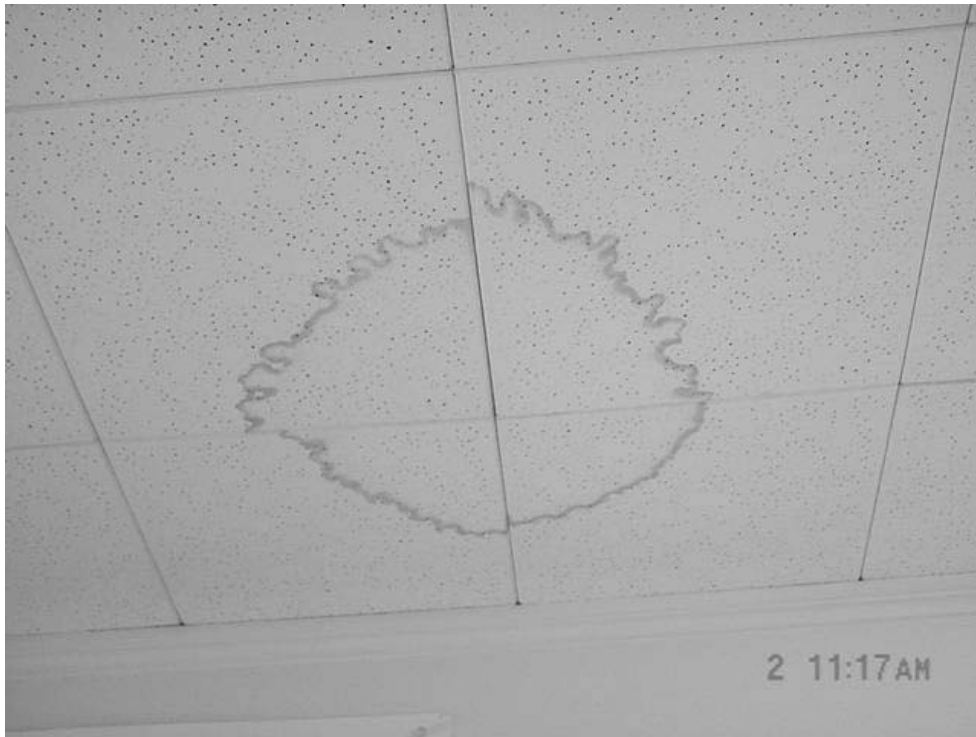
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SBBRS. 1997. Mechanical Ventilation. State Board of Building Regulations and Standards. Code of Massachusetts Regulations. 780 CMR 1209.0.

US EPA. 1992. Indoor Biological Pollutants. US Environmental Protection Agency, Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Research Triangle Park, NC. ECAO-R-0315. January 1992.

US EPA. 2001. "Mold Remediation in Schools and Commercial Buildings". Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. March 2001. Available at: [http://www.epa.gov/iaq/molds/mold\\_remediation.html](http://www.epa.gov/iaq/molds/mold_remediation.html)

**Picture 1**



**Water Damaged Ceiling Tiles**

**Picture 2**



**Mold Growth (as Indicated by Black Areas) along Refrigerator Gasket**

**Picture 3**



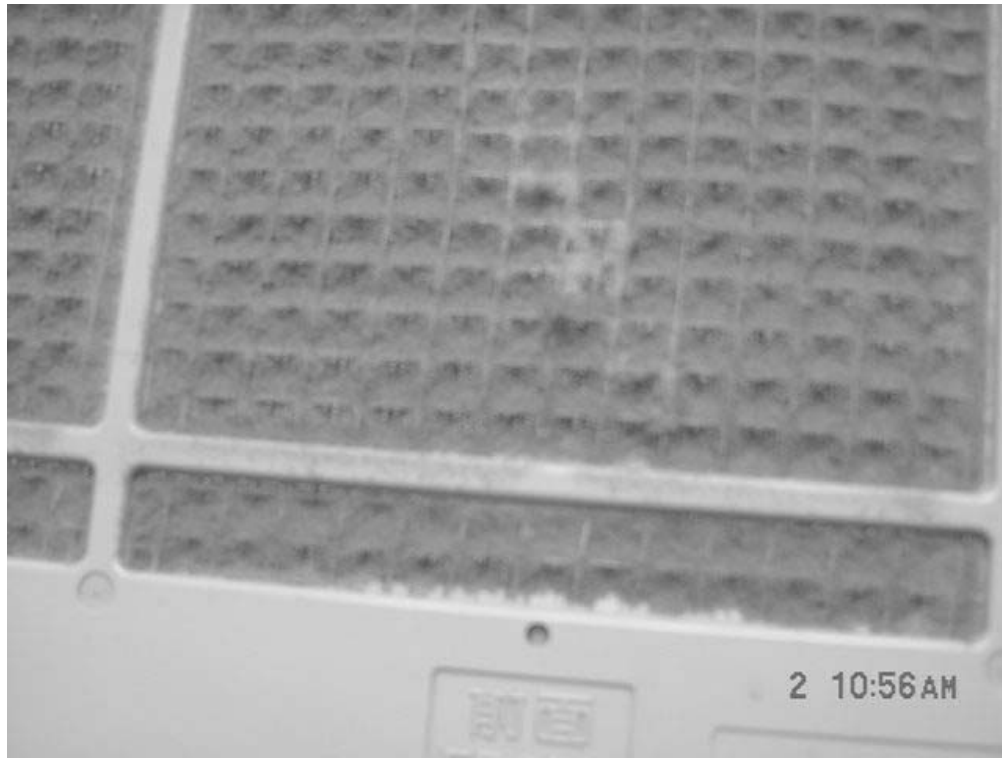
**Refuse Stored Outside Town Hall Rear Entrance**

**Picture 4**



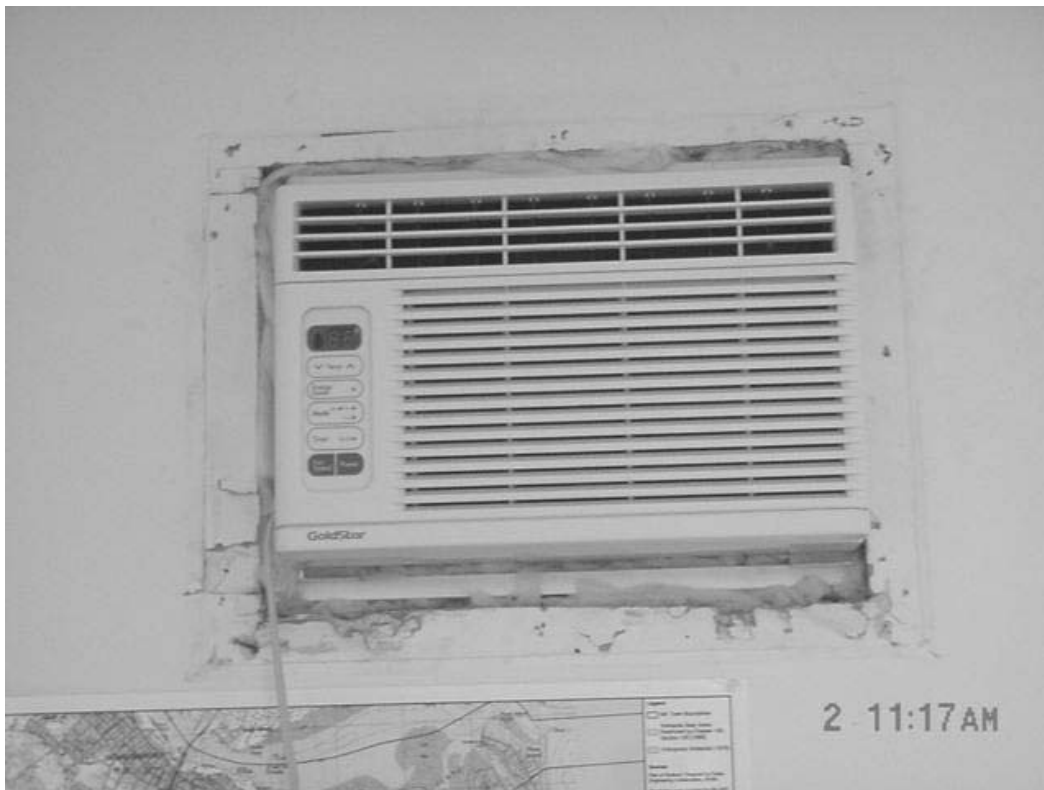
**Open Utility Hole/Egress for Pests/Rodents into Building**

**Picture 5**



**Accumulated Dust on AC Filter**

**Picture 6**



**Exposed Fiberglass around AC Unit**

**Picture 7**



**Accumulated Items Stored in Office**

**Picture 8**



**Dust Accumulation on Baseboard Heater**

**Picture 9**



**Dust Accumulation on Flat Surfaces in Office**

**Picture 10**



**Worn/Stained Carpeting**

**TABLE 1**

**Indoor Air Test Results – Newbury Town Hall, 25 High Road Newbury, MA**

**June 2, 2006**

| Location                     | Carbon Dioxide (*ppm) | Temp (°F) | Relative Humidity (%) | Occupants in Room | Windows Openable | Ventilation |         | Remarks   |
|------------------------------|-----------------------|-----------|-----------------------|-------------------|------------------|-------------|---------|---|
|                              |                       |           |                       |                   |                  | Supply      | Exhaust |   |
| Background                   | 417                   | 65        | 98                    |                   |                  |             |         | Heavy clouds, intermittent rainfall                         |
| Central Meeting Area         | 556                   | 76        | 71                    | 3                 | N                | N           | N       | 4 CT-new from leaks (heavy rain)                            |
| Planning Board               | 681                   | 78        | 59                    | 1                 | N                | N           | N       | Wall AC-filters clogged/dusty                               |
| Town Clerk                   | 516                   | 78        | 56                    | 1                 | Y                | N           | N       | Carpet plant, windows open                                  |
| Pantry/Kitchen               |                       |           |                       |                   | Y                | N           | N       | Mold-gasket of refrigerator                                 |
| Restrooms                    |                       |           |                       |                   | Y                | N           | N       | Windows open  |
| Building and Conservation    | 580                   | 78        | 54                    | 0                 | Y                | N           | N       | 6 CT, carpet old/worn/stained, exposed fiberglass around AC |
| Assessors Office             | 490                   | 76        | 53                    | 1                 | Y                | N           | N       | AC  |
| Treasure/Collectors          | 626                   | 78        | 55                    | 3                 | Y                | N           | N       | Windows open  |
| Accounting Dept              | 606                   | 78        | 54                    | 0                 | Y                | N           | N       |   |
| Selectmen’s Secretary Office | 665                   | 80        | 55                    | 1                 | Y                | N           | N       | AC  |

**\* ppm = parts per million parts of air, CT = water damaged ceiling tiles**

**Comfort Guidelines**

|  |
|--|
| Carbon Dioxide - < 600 ppm = preferred         |
| 600 - 800 ppm = acceptable                     |
| > 800 ppm = indicative of ventilation problems |
| Temperature - 70 - 78 °F                       |
| Relative Humidity - 40 - 60%                   |



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| Location           | Carbon Dioxide (*ppm) | Temp (°F) | Relative Humidity (%) | Occupants in Room | Windows Openable | Ventilation |         | Remarks         |
|--------------------|-----------------------|-----------|-----------------------|-------------------|------------------|-------------|---------|-----------------|
|                    |                       |           |                       |                   |                  | Supply      | Exhaust |                 |
| Selectmen’s Office | 618                   | 81        | 54                    | 0                 | Y                | N           | N       | AC              |
| Harbormaster       | 577                   | 79        | 51                    | 0                 | Y                | N           | N       | AC-cobwebs/dust |

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