**INDOOR AIR QUALITY REASSESSMENT**

**Burncoat High School**

**179 Burncoat Street**

**Worcester, MA**



Prepared by:

Massachusetts Department of Public Health

Bureau of Environmental Health

Indoor Air Quality Program

May 2017

# Background/Introduction

|  |  |
| --- | --- |
| **Building:** | Burncoat High School (BHS) |
| **Address:** | 179 Burncoat Street, Worcester, MA |
| **Assessment Requested by:** | Brian Allen, Chief Financial and Operations Officer, Worcester Public Schools (WPS) |
| **Reason for Request:** | Reassess the ventilation |
| **Date of Assessment:** | April 7, 2017 |
| **Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:** | Mike Feeney, Director, Indoor Air Quality (IAQ) Program,  Jason Dustin Environmental Analyst/Inspector IAQ Program |
| **Date of Building Construction:** | 1964 |
| **Building Description:** | Two-level brick building consisting of classrooms, auditorium, gymnasium, art rooms, kitchen, cafeteria, library and office space. |
| **Building Population:** | The school has approximately 1,064 students and 75 staff |
| **Windows:** | Openable |

The reason for this visit was to reassess the adequacy of the ventilation system. The first assessment (MDPH, 2017) showed that due to some inactive exhaust systems and a closed fresh air intake vent, there were some areas with elevated carbon dioxide. WPS reportedly implemented many of the recommendations from the first visit and requested the IAQ program to perform further testing to ensure that these ventilation changes were effective.

# Methods

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

# General Ventilation

The following is a summary of indoor air testing results (Table 1).

* ***Carbon dioxide*** measurements were below the MDPH recommended level of 800 parts per million (ppm) in the majority of areas surveyed the day of assessment, indicating adequate fresh air exchange.
* ***Temperature*** was within the MDPH recommended range of 70°F to 78°F in most of the areas visited.
* ***Relative humidity*** was below the MDPH recommended range of 40% to 60% in most areas as is typical during the heating season in the Northeast.
* ***Carbon monoxide*** levels were non-detectable in all areas tested.
* ***Particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality (NAAQS) level of 35 μg/m3 in all areas surveyed.

## Ventilation

Fresh air in most classrooms is supplied by air handling units (AHUs) located in a mechanical room in the lower level. The AHUs draw air from outdoors through an intake vent on the exterior wall of the building. In most classrooms, return air is drawn through floor vents. Fresh and return air streams are mixed together in a large mixing room in the lower level. Supply air is then filtered, heated, and provided to classrooms via floor-mounted air diffusers.

BHS Facilities staff reported that the louvers for the fresh air intake vent in the mixing room were opened to the proper setting. BHS staff also reported that the exhaust units that were inactive during the previous assessment have been repaired. According to the measurements shown in Table 1, the recommendations that were implemented have made a significant improvement in air exchange. It was reported by BHS Facilities staff that the B Cafeteria ventilation was being worked on at the time of this assessment and may account for the elevated carbon dioxide readings.

There are some isolated areas that lack supply or exhaust ventilation. These areas should utilize open windows and doors until a long term solution can be implemented.

BHS facilities staff reported that floor-mounted supply and return vents were cleaned of accumulated debris and that staff have been educated to avoid blocking the vents with stored furniture/materials. As mentioned in the prior report, in order to function properly, both supply and return vents must remain free of obstructions.

## Microbial/Moisture Concerns

Some areas were noted to have remaining water-damaged ceiling tiles and plaster ceilings/walls. BHS facilities staff reported that plans are underway to renovate the women’s locker area and that they will continue to replace historic water-damaged ceiling tiles.

Measures should be taken to ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency’s guidelines (US EPA, 2008). The US EPA and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials (e.g., ceiling tiles, gypsum wallboard) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If not dried within this time frame they should be removed/discarded.

## Other Concerns

Some occupants reported that abandoned drain traps were a continuing problem in regards to sewer odors. These odors should be reported promptly and the drains should be either properly capped or have water poured into them on a regular basis to avoid future issues.

BHS staff reported that they are researching alternatives to the tennis balls used as chair glides. They plan to implement the alternative glides as soon as they make an appropriate choice.

# Conclusions/Recommendations

1. Continue to ensure all water leaks are fixed promptly and remove any water-damaged porous materials (e.g., ceiling tiles) that were not dried properly within 24-48 hours.
2. Ensure that any water-damaged plaster ceilings/walls are repaired and clean any associated debris to avoid irritant effects.
3. Determine whether abandoned plumbing fixtures are to be used or not. Fixtures that are to be used should have water poured into drains on a regular basis to avoid dry drain traps. Fixtures no longer needed should be removed and properly capped.
4. Continue to ensure that all ventilation components throughout the building are properly functioning and operating continuously during occupied hours.
5. Encourage occupants to utilize open windows and doors in areas lacking mechanical ventilation until a long-term solution can be implemented.
6. Continue to implement remaining recommendations from the previous assessment (MDPH, 2017).
7. Consider adopting the US EPA (2000) document, “Tools for Schools”, as an instrument for maintaining a good IAQ environment in the building. This document is available at: <http://www.epa.gov/iaq/schools/index.html>.
8. 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>.

**Long-term Recommendation**

1. Consider contracting with an HVAC engineer to design/install mechanical ventilation in those areas which are not equipped with it.

# References

American Conference of Governmental Industrial Hygienists (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/>.

MDPH. 2017. Massachusetts Department of Public Health. Indoor Air Quality Assessment: Worcester Burncoat High School. March 2017. Available at: <http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-rpts/cities-and-towns-w.html>

US EPA. 2000. Tools for Schools. Office of Air and Radiation, Office of Radiation and Indoor Air, Indoor Environments Division (6609J). EPA 402-K-95-001, Second Edition. <https://www.epa.gov/iaq-schools>.

US EPA. 2008. “Mold Remediation in Schools and Commercial Buildings”. Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. September 2008. Available at: <http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide>.

| Location | Carbon  Dioxide  (ppm) | Carbon Monoxide  (ppm) | Temp  (°F) | Relative  Humidity  (%) | PM2.5  (µg/m3) | Occupants  in Room | Remarks |
| --- | --- | --- | --- | --- | --- | --- | --- |
|
| Background | 396 | 1.0 | 49 | 46 | 13 | - | Partly cloudy, moderate wind |
| A12 | 640 | ND | 71 | 38 | 0 | 2 |  |
| A14 | 639 | ND | 70 | 37 | 0 | 2 |  |
| A16 | 637 | ND | 70 | 39 | 0 | 0 |  |
| A18 | 647 | ND | 70 | 37 | 0 | 2 |  |
| A5 | 607 | ND | 72 | 31 | 3 | 2 |  |
| A5 Conference | 512 | ND | 73 | 30 | 8 | 3 |  |
| A6 | 611 | ND | 72 | 33 | 0 | 5 |  |
| A7 | 661 | ND | 73 | 33 | 5 | 5 |  |
| A7 main | 587 | ND | 72 | 34 | 7 | 4 |  |
| A8 | 691 | ND | 73 | 38 | 0 | 4 |  |
| A9 | 614 | ND | 72 | 33 | 8 | 5 |  |
| A9 | 677 | ND | 74 | 32 | 1 | 5 |  |
| A9-Center | 535 | ND | 73 | 30 | 7 | 1 |  |
| A9-Greeen | 491 | ND | 73 | 30 | 7 | 0 |  |
| A9-Michaud | 515 | ND | 72 | 31 | 8 | 0 |  |
| B1 | 584 | ND | 73 | 34 | 9 | 2 |  |
| B10 | 673 | ND | 73 | 31 | 9 | 0 |  |
| B11 | 812 | ND | 75 | 34 | 9 | 24 |  |
| B14 | 719 | ND | 72 | 32 | 7 | 16 |  |
| B16 Cafe | 1434 | ND | 72 | 44 | 22 | 50 |  |
| B19 Suite | 717 | ND | 72 | 32 | 8 | 5 |  |
| B2 | 667 | ND | 74 | 35 | 10 | 9 |  |
| B3 | 867 | ND | 73 | 36 | 8 | 19 |  |
| B4 | 754 | ND | 72 | 34 | 9 | 15 |  |
| B5 | 577 | ND | 75 | 30 | 8 | 1 |  |
| B5A | 710 | ND | 74 | 36 | 9 | 1 |  |
| B6 | 676 | ND | 73 | 32 | 12 | 11 |  |
| B9 | 711 | ND | 74 | 32 | 9 | 15 |  |
| C1 | 448 | ND | 72 | 29 | 8 | 11 | Reported mice problem |
| C1 supply room | 466 | ND | 72 | 28 | 8 | 2 | Drain odors, MT, cleaning complaints |
| C11 Library | 683 | ND | 74 | 28 | 6 | 25 |  |
| C19 | 553 | ND | 75 | 28 | 6 | 23 |  |
| C19 Storage | 516 | ND | 75 | 29 | 6 | 0 |  |
| C1A | 390 | ND | 73 | 25 | 7 | 16 | Windows open |
| C2 | 511 | ND | 74 | 27 | 2 | 8 |  |
| C4 | 677 | ND | 75 | 30 | 2 | 22 |  |
| C6 | 838 | ND | 76 | 29 | 4 | 21 |  |
| C8 | 750 | ND | 76 | 30 | 7 | 19 |  |
| C9 | 448 | ND | 73 | 27 | 7 | 6 |  |
| Cafeteria B | 1286 | ND | 70 | 46 | 9 | 100+ |  |
| Cafeteria D | 562 | ND | 71 | 32 | 3 | 100+ |  |
| Clinician | 694 | ND | 77 | 34 | 10 | 1 |  |
| -Corles | 893 | ND | 72 | 34 | 11 | 0 |  |
| D1 | 468 | ND | 72 | 27 | 4 | 4 |  |
| D10 | 511 | ND | 71 | 30 | 1 | 6 |  |
| D14 | 776 | ND | 72 | 31 | 6 | 26 |  |
| D16 | 382 | ND | 71 | 28 | 6 | 0 | Windows open |
| D18 | - | - | - | - | - | - | Room locked |
| D2 | 474 | ND | 71 | 30 | 1 | 5 |  |
| D20 | 456 | ND | 70 | 30 | 6 | 9 |  |
| D24 | 743 | ND | 71 | 31 | 7 | 22 |  |
| D3 | 505 | ND | 72 | 28 | 1 | 0 |  |
| D4 | 439 | ND | 71 | 28 | 0 | 5 |  |
| D5 | 556 | ND | 71 | 30 | 1 | 0 |  |
| D6 | 578 | ND | 72 | 32 | 0 | 8 |  |
| D8 | 631 | ND | 72 | 40 | 1 | 0 |  |
| D8A | 501 | ND | 71 | 29 | 0 | 1 |  |
| E1 | 642 | ND | 75 | 30 | 2 | 13 |  |
| E2 | 571 | ND | 73 | 31 | 2 | 22 |  |
| E3 | 519 | ND | 75 | 28 | 2 | 21 |  |
| E4 | 529 | ND | 73 | 29 | 2 | 9 |  |
| E5 | 462 | ND | 76 | 26 | 2 | 5 |  |
| E5A | 453 | ND | 71 | 24 | 3 | 0 |  |
| E6 | 495 | ND | 74 | 28 | 2 | 0 |  |
| E8 | 590 | ND | 75 | 27 | 2 | 14 |  |
| F6 | 563 | ND | 75 | 30 | 4 | 16 |  |
| F8-10 Auto | 461 | ND | 74 | 27 | 13 | 25 |  |
| Gym | 737 | ND | 73 | 35 | 8 | 2 |  |
| H10 | 541 | ND | 70 | 35 | 12 | 0 |  |
| H14 | 672 | ND | 70 | 33 | 7 | 12 |  |
| H16 | 478 | ND | 69 | 33 | 7 | 6 | Windows open |
| H17 | - | - | - | - | - | - | Door locked |
| H8 | 535 | ND | 66 | 41 | 3 | 3 |  |
| H9 | 550 | ND | 69 | 38 | 4 | 0 |  |
| Main Office | 646 | ND | 70 | 36 | 11 | 4 |  |
| Police office | 551 | ND | 72 | 35 | 10 | 0 |  |
| Principal’s Office | 567 | ND | 70 | 36 | 11 | 3 |  |
| -rear | 745 | ND | 73 | 34 | 8 | 0 |  |
| ROTC class | 1077 | ND | 72 | 39 | 13 | 2 |  |
| ROTC office | 1001 | ND | 71 | 37 | 6 | 2 |  |
| Women Teachers | 764 | ND | 72 | 34 | 9 | 0 |  |