



# Wheatley Hall IAQ Assessment

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## Acknowledgments

MULTIPLE LAYERS OF  
PROTECTION TO PREVENT  
COVID-19 INFECTION

\* TESTING AND TRACING

\*\* VENTILATION (HVAC)

\* MASKS

\* PHYSICAL DISTANCE

\* VACCINES

\*\* VENTILATION (HVAC)

IMPROVEMENTS WILL REMOVE  
AEROSOLS CARRYING VIRUSES (COVID  
AND OTHERS) BY REPLACING ROOM  
AIR WITH OUTSIDE AND FILTERED AIR

STALE ROOM AIR CAN CARRY SMALL  
CARRYING VIRUS PARTICLES FOR 2 TO  
6 HOURS

Why does  
HVAC  
matter?

HVAC (a long-term Engineering Control) introduces fresh and filtered air into occupied spaces

The Harvard School of Public Health recommends a target of 5 ACH and characterizes ACH targets as follows:

**Ideal (5 ACH)**

Excellent (5-6 ACH)

Good (4-5 ACH)

Bare Minimum (3-4 ACH)

Low (3 ACH).

# Why does HVAC matter?





# Ventilation Assessment Results

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WHEATLEY HALL

UNIVERSITY OF MASSACHUSETTS BOSTON

MTA SURVEY NOVEMBER- DECEMBER 2021



Twenty-one Rooms  
17 Classroom/Labs  
4 Offices  
Inadequate Air Supply  
( $<4$  ACH)

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IMMEDIATE INCREASE OF SUPPLY AIR IS NEEDED  
TO ACHIEVE  $>4$  ACH

Floor	Rooms Evaluated	Below <4.0 ACH OA	Above >4 ACH OA
1 <sup>st</sup>	9 (6 Classrooms-3 Offices)	9	0
2 <sup>nd</sup>	6 (6 Classrooms)	4	2
3 <sup>rd</sup>	6 (2 Classrooms & 1 Lab, 3Office)	5	1
4 <sup>th</sup>	6 (2 Class/Lab, 4 Offices)	2	4
5 <sup>th</sup>	2 (2 Offices)	1	1
6 <sup>th</sup>	2 (Offices)	0	2
3 Floors	4 (4 Bathrooms)	2 – “0” and minimal ventilation 2 – adequate ventilation	
TOTALS	35	21	14

## Results 1A- Ventilation Assessment Wheatley Hall -UMASS Boston

Guidance TC-HSPH/AIHA—4 - 5 ACH (supply outside air (OA))

# 21 Spaces Recommended for Improvement of Supply Air

Guidance TC-HSPH/AIHA—4-5 ACH (supply outside air (OA))

Floor	Rooms Evaluated	Rooms below <4.0 ACH OA (range)
1 <sup>st</sup>	6 Classrooms (10, 19,20, 36,58, 61)	6 (1.8 –2.7)
	3 Offices (77-P, R, V)	3 (2.0 - 3.4)
2 <sup>nd</sup>	4 Classrooms (46,98, 124, 206)	4 (1.7– 3.1)
3 <sup>rd</sup>	2 Class & 1 Lab (122, 124*, 97)	3 (0.0 – 1.6)
	3 Offices (6, 54/25,)	2 (1.6 – 2.5)
4 <sup>th</sup>	1 Laboratory/classroom (151)	1 (1.8)
	1 Office ( 144*--no supply air)	0
5 <sup>th</sup>	1 Office (56)	1 (2.8)
Totals	35	21 (60%)





# CO<sub>2</sub> Assessment Results

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Seven  
Classroom/Labs  
CO<sub>2</sub> concentrations above  
MDPH Guideline 800 ppm  
**No students in Classrooms**

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INDICATOR OF LOW AIR QUALITY

DEFICIENT VENTILATION

Results 3- CO2 ppm Concentration Assessment

Guidelines MDPH: 800 ppm fully Occupied Room Outside

Conditions: CO2 ppm (414-485) (11-12/2021)

Floor	Rooms Evaluated (All Unoccupied)	Above 800 ppm CO2
1 <sup>st</sup>	(2 Classrooms 1-1- and 1-20)	809-818
2 <sup>nd</sup>	(2 Classrooms 2-60 and 2-124)	1082-920
5 <sup>th</sup>	(1 Office 5-58)	814
6 <sup>th</sup>	( 1 Office 6-113)	820
6 <sup>th</sup>	Women’s Bathroom 6-99	821
TOTALS	35 measurements (28 below -- 7 above 800 ppm CO2 Guideline) Potential for CO2 >> 1000ppm when Classrooms Occupied	7





# Particulate - PM<sub>2.5</sub> Assessment Results

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# Sixteen Spaces

$\text{PM}_{2.5} > 5.0 \text{ ug}/\text{m}^3$

Outside Reading =  $2.0 \text{ ug}/\text{m}^3$

**No students in Classrooms**

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- INDICATOR OF LOW AIR QUALITY--DEFICIENT VENTILATION
  - AIRBORNE RESPIRABLE PARTICLES CONCENTRATIONS ABOVE OUTSIDE LEVELS



**Results 4- Particulates PM2.5**  
**Outside Conditions: PM2.5 (2.0 ug/m<sup>3</sup>)**  
**35 Rooms Evaluated November 30 and December 2, 2021, all unoccupied**

Floor	Rooms Evaluated	Range	PM2.5 (5-10)	PM2.5 >10
1 <sup>st</sup>	9 (6 Classrooms-3 Offices)	2-11	1	1
2 <sup>nd</sup>	6 (6 Classrooms)	2-25	-	2
3 <sup>rd</sup>	6 (2 Class&1 Lab, 3 Offices)	2-11	2	2
4 <sup>th</sup>	6 (2 Class/Lab, 4 Offices)	2-15	1	1 (BR)
5 <sup>th</sup>	2 (2 Offices)	6-6	2	-
6 <sup>th</sup>	2 (Offices)	5-23	2	2 (BR)
Totals	35 (16 (46%) above 5 ug/m <sup>3</sup> )	2-25	8	8



# Recommendations

## MTA IAQ ASSESSMENT

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MTA SURVEY NOVEMBER- DECEMBER 2021

# Recommendations HVAC System

## Five General Recommendations

### 1. UPDATE HVAC SYSTEM

Sixty percent (60%) of the academic spaces ( including 17 classrooms) assessed are below the basic guideline of 4 Air Changes per hour ( $> 4ACH$ ). Ventilation improvement in these classrooms and offices should be a priority

### 2. INCREASE SUPPLY AIR

Investigate if additional fresh air can be supplied immediately to highly occupied classrooms by increasing the power of the ventilation fans of the twelve H & C units.

### 3. CONDUCT OVERALL EVALUATION OF HVAC SYSTEM

In preparation to an overhaul of supply air capacity, UMASS Boston should consider engaging an engineering consulting firm for advice and to conduct a building-wide HVAC assessment.

# Recommendations HVAC System

## Five General Recommendations

### 3. BALANCING HVAC SYSTEM

Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994). Balancing requires adjusting in supply and exhaust air flows to school spaces to achieve  $> 4$  ACH, and the removal of obstructions and cleaning of fans and air ducts.

### 4. IMMEDIATE PROVISIONAL ACTION- SUPPLEMENT HVAC WITH PORTABLE AIR PURIFIERS

Although the priority is for the HVAC system to achieve 4 ACH, portable air purifiers with HEPA filters may be used to supplement HVAC system. The size of the portable air cleaner should be appropriate to meet 4 ACH. Use the tool <https://tinyurl.com/portableaircleanertool> to purchase the correct portable air purifiers

# Recommendations HVAC System

## Five General Recommendations

### 5. COVERING COSTS OF IMPROVEMENTS

UMASS Boston should apply for federal and state funds earmarked for ventilation improvements related to the COVID Pandemic. The U.S. Department of Education has released new guidance encouraging the use of American Rescue Plan (ARP) funds to improve ventilation systems and make other indoor air quality improvements in schools. More information can be found at these link <https://www.ed.gov/coronavirus/improving-ventilation> .



# Recommendations HVAC System

## Five Specific Recommendations

### 1. SUPPLY AIR IMPROVEMENTS ON UNDERVENTILATED ROOMS

- Twenty one priority places (<4 ACHs) require supply air increases: Six classrooms and three offices in the 1<sup>st</sup> Floor; Four classroom on the 2<sup>nd</sup> floor, Three classrooms and one office on the 3<sup>rd</sup> Floor; One classroom/lab on the fourth floor
- In the interim, HEPA Portable Air Cleaning devices must be considered. Of special concern is that seventeen of these spaces are active Classrooms/Labs. Those classrooms require immediate intervention.

# Recommendations HVAC System

## Five Specific Recommendations

### 2. HIGH CO<sub>2</sub> CONCENTRATION ON ACADEMIC SPACES

UMASS Boston should consider conducting a full CO<sub>2</sub> concentration survey in all academic spaces with rooms occupied in classes and laboratories. Seven out of 35 spaces are above the MDPH recommendation of 800 ppm. This in spite of the fact that all rooms evaluated were unoccupied

### 3. PARTICULATES PM<sub>2.5</sub> IN ACADEMIC SPACES

Air supply must increase in the 16 academic spaces (out of 35- 46%) where concentrations ranged from 2,5 to 23 ugm/m<sup>3</sup> PM<sub>2.5</sub>. This elevated level of particles raises concerns -that because of their size – they could be carriers of SAR-Cov-19 viral particles, increasing the risk of infection

# Recommendations HVAC System

## Five Specific Recommendations

### 4. BATHROOM VENTILATION IMPROVEMENTS

The lack of ventilation in the women's bathroom on the 6<sup>th</sup> Floor ( Room 6-99) should be remedy as soon as possible. Also, Men's bathroom on the first floor (1-18)

Recommendations for safe bathrooms are listed below.

- Bathrooms should be kept under negative pressure
- Keep toilet room doors closed, even when not in use.
- Put the toilet seat lid down, if there is one, before flushing.
- Vent separately where possible ( vent directly outdoors and run fan continuously
- Keep bathroom windows closed (open windows could lead to re-entrainment) of air into other parts of the building.
- Consider limiting the number of occupants at any one time

# Recommendations HVAC System

## Five Specific Recommendations

### 5. GENERAL RECCOMENDATIONS FOR EVALUATING HVAC SYSTEMS

- \* Work with an HVAC contractor to determine if additional fresh air can be supplied to the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> floor.

- \*Visibly inspect the air ducts. Ducts can also get filled with dust, which can impact the proper flow of air. If needed, clean the ductwork. Duct work may develop cracks and holes where air might be escaping. Change filters on a regular basis.

- \* Examine the fan speed and set multiple speed connections properly. Check the performance of all mechanical systems in the air handlers. Clear any debris from outdoor units. Heat pumps and air conditioning units located outside can collect debris which compromises efficient air flow throughout the system. Change filters if necessary. Inspect the systems coils and clean them if necessary. If the current primary fan does not have the power to push air through long or complicate ductwork, fans can be replaced, or air booster fans installed.

- \* Check performance of electrical systems. Check the systems thermostats for proper function.

# Recommendations HVAC System

## Five Specific Recommendations

\* Check for possible ventilation blockages. Employees sometime block vents and registers in an attempt to control their immediate environment. It is important that all vents and registers remain open and are not blocked by machinery or other equipment.

\* New office space created at Wheatley Hall that may not have take HVAC requirements into consideration. Walls were erected and new offices created that fell outside the original design of the HVAC system. The current ductwork may not be capable of accommodating the new office space to efficiently move air where it is now needed. Ductwork adjustments can be made to maximize air flow.

*Improving Fan System Performance: A Sourcebook for Industry* was developed by the U.S. Department of Energy's (DOE) Industrial Technologies Program and the Air Movement and Control Association International, Inc. (AMCA). This 92-page document provides potential performance improvements, some practical guidelines, and details where the user can find more help. You can find it at: <https://www.nrel.gov/docs/fy03osti/29166.pdf>





# The End

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# Questions

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# Extra Slides

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Floor	Rooms Evaluated	Below <4.0 ACH OA	Above >4 ACH OA
1 <sup>st</sup>	6 Classrooms	6 (1.8 – 2.7)	0
	3 Offices	3 (2.0 - 3.4)	0
2 <sup>nd</sup>	6 Classrooms	4 (1.7– 3.1)	2 (5.1–5.8)
3 <sup>rd</sup>	2 Classrooms & 1 Lab	3 (0.0 – 1.6)	0
	3 Offices	2 (1.6 – 2.5)	1 (6.1)

Floor	Rooms Evaluated	Below <4.0 ACH OA	Above >4 ACH OA
4th	2 Laboratory/classroom	1 (1.8)	1 (4.7 )
	4 Offices	0	4 (4.7 – 16)
5th	2 Offices	1 (2.8)	1 (6.6)
6th	2 (Offices)	0	2 (5.9 – 7.9)
3 Floors	4 (4 Bathrooms)	2 – “0” and minimal ventilation 2 – adequate ventilation	

## 1B. Ventilation Assessment (By Floor) Wheatley Hall -UMASS Boston

Guidance TC-HSPH/AIHA—4-5 ACH (supply outside air (OA))