



MassCOSH

# How Safe Are Our School Buildings?

*MassCOSH Recommendations and Analysis of BTU and BPS Walkthroughs September 16, 2020 and Review of School Building Walkthrough Checklists September 14, 2020 through September 18, 2020*

The need to prepare Boston Public Schools (BPS) for in-building instruction is a monumental task that has become even more critical as [Mayor Walsh announced just yesterday](#) that the City of Boston is “very close” to the “red zone” in the MA Department of Public Health’s color-coded map which categorizes communities based on the average rate of COVID-19 cases. The red category represents the highest risk and rate of cases (at least 8 per 100,000 people). In addition to ensuring social distancing, masks, hygiene, and cleaning and disinfecting, schools must ensure that students and staff are protected from all forms of exposure to SARS-CoV-2 (the virus that causes COVID-19), in particular airborne transmission of viral aerosols. Airborne aerosol transmission involves viral particles that can float in the air for long periods of time over distances well beyond six feet. It occurs when live virus is exhaled by infected individuals and then inhaled by another (uninfected) person.

Occupational health experts from the Massachusetts Coalition for Occupational Safety and Health’s (MassCOSH) Health-Technical committee were invited by the Boston Teachers Union (BTU) to participate in school building walkthroughs with BPS at six schools on 9/16/20. The goal of these walkthroughs was to affirm that changes necessary in school buildings to create a safe and healthy learning and teaching environment during the COVID-19 pandemic were in place. **This document details key concerns and recommendations of MassCOSH’s expert health-technical committee after those six walkthroughs, as well as a technical review of data collected by BTU building representatives’ during their walk-through inspections conducted with school leaders, nurses, custodians, parents, and high school students throughout 105 schools in the District between 9/14/20 and 9/18/2020.**

Many items on the BTU and BPS’ jointly agreed upon checklist were lacking in schools or not in place at the time of the walk-throughs such as: window fans, N95 respirators and other medical-grade PPE for nurses, some signage and room configurations for the various student cohorts, soap in every bathroom, sanitizer in every classroom, and many other items. Since that time,





BPS has delivered PPE and fans and additional extension cords to many schools. However, there have also been reports of fans being delivered that do not fit the windows or cannot be plugged in because the extension cords are too short. There should be time for another walk-through for all facilities to assure that all required items are in place, prior to when staff and students are to be in the facilities.

MassCOSH has a 30-year history of working with school communities - parents, students, school staff, unions, and environmental health allies to assess and improve building conditions. Through state and national coalitions, MassCOSH and its partners have advocated for resources, policies, and standards to support green and healthy conditions for all schools. MassCOSH played a key role in establishing the Healthy Schools Task Force in Boston in 2002 to address environmental conditions in BPS that can affect health and learning. For the last 18 years, the Healthy Schools Task Force developed environmental policies and procedures to improve indoor air quality and school building conditions and reported progress annually to the City Council. It is with this expertise and experience that we participated in building walkthroughs and now present these recommendations.

- Tolle Graham\*, MassCOSH Director of Healthy Schools Initiative, (retired), USW 9358
- Nancy Lessin\*, M.S., Occupational Health Specialist (retired)
- Elise Pechter\*, MPH, Certified Industrial Hygienist
- Lewis Pepper, MD, MPH, Retired research professor, Queens College, City University of New York
- Craig Slatin, Professor Emeritus, College of Health Sciences, University of Massachusetts - Lowell
- Jodi Sugerman-Brozan, Executive Director, MassCOSH
- Al Vega, Director of Policy and Programs, MassCOSH
- David H. Wegman MD, MSc, Professor Emeritus Department of Work Environment, UMass Lowell and Adjunct Professor Harvard School of Public Health
- Ben Weilerstein, Labor-Community Training Coordinator & Organizer, MassCOSH

\*Participated in a walkthrough of a BPS building along with BTU and BPS representatives.

**All photos provided by BTU members participating in walkthroughs of BPS buildings.**



# Ventilation and Filtration to Reduce Risk of Airborne Aerosol Transmission of SARS-CoV-2 (Coronavirus)

## MassCOSH Recommendations

Ventilation is needed to dilute or reduce any hazardous materials in the environment. Schools, including the Boston Public Schools, have a long history of poor or deficient ventilation. Filtration is important to remove virus aerosols from indoor air. If students or staff are infected (sick with COVID-19, asymptomatic, or presymptomatic), they are exhaling viruses into the school environment. Virus particles can become airborne, allowing them to travel further than 6 feet and linger in the air for hours. The goal is to provide enough outdoor air and capture viral particles in filters to keep anyone from becoming infected as a result of breathing in the same room or part of a building as an infected person.

Essential principles regarding ventilation in the context of preventing exposures to SARS-CoV-2, the virus that causes COVID-19, include:

- Indoor air is potentially hazardous.
- The provision of outside air must be maximized.
- Air exchange (air changes per hour, ACH) must be maximized.
- Recirculation of indoor air within a space or among spaces must be eliminated or minimized.
- Filtration of recirculated or potentially contaminated air must be maximized.
- Air flow must be directed to prevent or minimize “downstream” exposure to potentially contaminated air.



Attention to the above principles of ventilation and filtration is critical to ensure that air potentially contaminated with this deadly virus is made as safe as possible for school building occupants to breathe. In 130 BPS school buildings, only 28% (37 schools) have an HVAC system. For the 93 schools with limited or no mechanical ventilation, it requires assessment of every classroom to see if windows can remain open, if fans and extension cords can be placed to safely and strategically bring in outside air for ventilation, and the addition of portable air cleaners with HEPA filters. For those 37 schools with HVAC systems, it requires inspections of operation and capacity to provide adequate outside air and upgrades to the [CDC-recommended MERV 13 filters](#). For nurses' suites and isolation rooms, it is essential that the highest standard of ventilation and filtration is present to ensure that school nurses and all who enter these spaces are adequately protected, and that sick students remain isolated in a protected environment until they can be picked up.

The following recommendations regarding windows and fans are based on walkthroughs of six buildings conducted on 9/16/2020 and a review of BPS, DESE, CDC, and other scientific guidance regarding windows and fans. **We have several concerns and recommendations regarding windows and fans:**

1. At the time of the 9/16 walkthroughs, there were no fans in the buildings. While fans have been delivered since that time, there are reports that some fans could not fit into windows (e.g. windows tilt in or out or could in some other way not house the fan) or could not be plugged in (e.g. extension cord provided did not reach outlet).
2. BPS issued guidance regarding classroom and school fan use on or about 9/22/2020. Our concerns regarding this recently-issued guidance include:

- i. The guidance states, “Ensure the fans are stable and won’t tumble easily.” BPS school windows are not all designed to fit window fans neatly – they may not fit in windows that tilt in or out, they may have to be perched on window sills, windows may be low enough for children to reach fans, the outlet may be far from the window and require an extension cord that can be tugged on by children. Classroom teachers must not be left to sort out these problems; BPS must ensure that features are in place to address the above problems prior to students or staff entering classrooms where these problems exist.



- ii. The guidance also states, “Fans can face toward the window (blowing air out of the window) or away from the window (blowing air into the room).” A number of experts (CDC guidance; [Shelly Miller](#), Professor of Mechanical Engineering at the University of Colorado Boulder) state that with one fan, the exhaust mode (taking air from the room and blowing out the window) is preferred.

- General airflow direction should be from cleaner air to less clean air.
- Place students and teachers on cleaner side of airflow pattern to reduce exposures.
- Avoid having personal or pedestal fans
- Operate restroom fans continuously. Exhaust directly outdoors.

- iii. Placement of fans must make sure that currents of air do not place students or staff in a strong current downwind of others, to prevent potential transmission of virus aerosols. Window repairs must include placing screens in windows as needed to prevent a fall risk for small children.

In addition to ventilation or diluting the air to help protect against exposure to the virus, filtration removes aerosol viral particles in the air. **We have several recommendations regarding filtration:**

1. For buildings with HVAC systems that recirculate air, MERV 13 (or higher) filters are effective in filtering out SARS-CoV-2 (coronavirus). BPS has stated that not all HVAC systems can accommodate MERV 13 filters.
2. In buildings with HVAC systems that recirculate air and cannot accommodate at least MERV-13 filters, and for all other buildings without HVAC, portable air cleaners with HEPA filters are important. The lack of proper ventilation and filtration is particularly problematic for the nurse's offices, isolation rooms, special education classrooms, and classrooms with young children who are not required to wear masks. [CDC's 9/1/2020 guidance](#) for schools calls for portable air cleaners with HEPA filters:
  - Use portable high-efficiency particulate air (HEPA) fan/filtration systems to help enhance air cleaning (especially in higher risk areas such as the nurses office and special education classrooms).

See also "[Lowell Public Schools say backordered air purifiers will delay in-person classes for some students](#)".

3. A document provided by BPS for the 9/16 walkthroughs carrying the title "[ASHRAE published this August 20, 2020: Summary Guidance](#)" includes the following section regarding the BPS position on portable air cleaners with HEPA filters:

- If MERV-13 filters cannot be used, including when there is no mechanical ventilation of a space, portable HEPA air cleaners in occupied spaces may be considered.
- This is not possible as equipment of this size will be noisy and make a difficult learning environment. Electrical power will also need to be installed at each location.



Many portable air cleaners with HEPA filters have sound levels compatible with a good classroom learning environment (for example, 50 decibels) and are made for use with 120v outlets. Normal conversation and air conditioners have a volume of [60 decibels](#).

4. Some school bathrooms have air hand dryers. [DESE's Fall Reopening Facilities and Operations Guidance](#) (July 22, 2020) states on page 14:
  - Hand dryers: Consider replacing hand dryers with disposable towels, as hand dryers increase the flow of air particles in the bathroom.

In order to assess ventilation in buildings, CO<sub>2</sub> is being used by BPS as a proxy for outside

air ventilation. **Our concerns and recommendations regarding this method of measuring ventilation include:**

1. The more detailed documents that can provide information about CO<sub>2</sub> levels in each classroom when the building was occupied (Boston Public Schools Inspection Report 2018/2019 and previous years) were not available prior to the walk-throughs on 9/16, thus rooms with historical ventilation problems were not able to be identified and targeted for remedial action. BPS indoor air quality (IAQ) inspections have not measured CO<sub>2</sub> in buildings without HVAC. According to page 7 of BPS Operations document from September 2020 titled “BPS Indoor Air Quality Testing”:
  - Steam Heat with Limited Ventilation buildings including buildings with some mechanical ventilation do not receive the same exact testing as Central HVAC buildings (no CO<sub>2</sub> testing). The reason is that Central HVAC buildings are reliant solely on the mechanical HVAC systems for proper ventilation and conditioning and the Steam buildings with some mechanical ventilation rely mostly on operable windows as the primary source of ventilations.

Testing CO<sub>2</sub> levels in unoccupied rooms does not meaningfully evaluate ventilation. As a result, the 93 BPS buildings without HVAC have not undergone a meaningful ventilation assessment.

2. BPS has maintained that buildings/classrooms with limited or no mechanical ventilation will be safe solely with one operable window and one fan.
  - a. To assess CO<sub>2</sub> as a proxy for ventilation in buildings with limited mechanical ventilation when they are not occupied, measurements should be taken with dry ice, using the [“5-Step Guide to Checking Ventilation Rates in Classrooms”](#) from Harvard T.H. Chan School of Public Health. This will allow BPS to determine whether or not a room has sufficient ventilation solely with a window and fan. In the absence of this type of assessment to ensure proper ventilation, portable air cleaners with HEPA filters are needed. In buildings with no mechanical ventilation, one operable window and fan are [not enough to guarantee](#) a safe environment. Portable air cleaners with HEPA filters are needed.

Ventilation in BPS Schools	
Schools with HVAC system (note that not all HVAC systems are the same - some recirculate air):	37
Schools with limited mechanical ventilation:	46
Schools with no mechanical ventilation (windows & doors only):	47

## Findings from the Walkthroughs

Because fans were delivered after the walkthrough and windows continue to be fixed, it remains unclear how many classrooms and how many buildings are lacking operable windows and fans. The number and list of rooms in each school building that lack a fan and/or lack an operable window should be compiled and provided by BPS, with a second round of walkthroughs conducted if necessary.

## Walkthrough Comments from BTU Building Representatives

Sample observations made by BTU building representatives during walkthroughs at 106 buildings corroborate the concerns and recommendations made by MassCOSH.

- “No rooms had [window fans to facilitate air exchange]. The fans that did arrive are fans that will not fit; our windows hinge in and they sent us 150 window [box] fans.” [Boston Latin Academy]
- “None of the rooms have easily operating windows...[some] are off-track and cannot be closed by the same force as it took to open them; some might fall and crush fingers; tops do come down, but closing them is another story - and these windows are expected to be open all winter. 32 of the 49 rooms we visited had one or more window(s) that open. Seven rooms had zero operable windows. There are 3-4 rooms with vent prototype present. There are 3-5 rooms with no ventilator/blower, just a radiator. Fans are expected, but not currently here.” [Irving Middle]
- “1st floor kindergarten bathrooms do not have windows. Unsure whether there is an exhaust system in these bathrooms. All entry level windows will NOT be able to fit a fan; they open four inches.” [Shaw Elementary]
- “NONE of our rooms have windows that open sufficiently to circulate air with a fan. They only open partially which RECIRCULATES COVID-19 (source). Some of our rooms have fire windows that fully open, but any person could easily fall out of the window as there are no guards over them.” [Another Course to College]
- “They had fans but many of them, when put in the windows, couldn’t reach an outlet.” [Boston International Newcomers Academy]
- “UPDATE: All fans were delivered Saturday and they are dual window fans that are designed for double hung windows. They will not fit in our lean in windows, rendering them useless.” [TechBoston Academy]
- “[Rooms that do not have at least one operable window and/or fan to facilitate air exchange include] the nurse’s office, medical waiting room (isolation room), staff bathrooms (both), student bathrooms (both, office level).” [Guild Elementary]
- “Our chief concern regarding ventilation is the nurse’s office, particularly our designated medical isolation room. We must have air purifiers with HEPA filters for that office suite.” [Snowden International School at Copley]



# Nurses Offices and Isolation Rooms

## MassCOSH Recommendations

Identifying and, when necessary, isolating potential cases of COVID-19 based on presence of symptoms is crucial.

In order to safely isolate staff or students who may have COVID-19 while protecting school nurses and reducing the risk of further COVID-19 spread throughout the school:

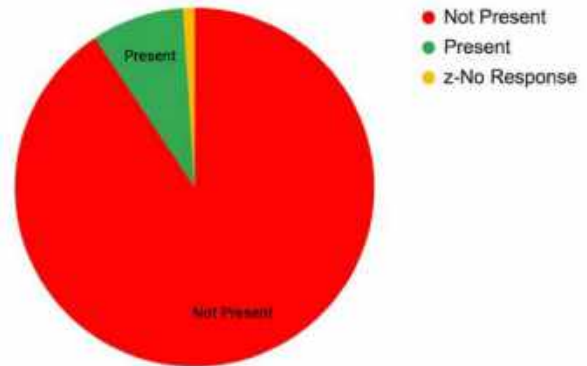
1. Every school building must have an isolation room.
2. Ventilation in the nurse’s suite and isolation room must meet 6 air changes per hour (ACH), with air being completely ventilated out of the building, not recirculating to other parts of the building (negative air pressure).
3. Portable air cleaners with HEPA filters are important for both the nurse’s office and the isolation area to achieve proper filtration..
4. Nurses and any staff working in the nurse’s office or isolation room must be provided with sufficient PPE: N95 respirators, face shields or eye protection, gloves, gowns, and other PPE as needed.

## Findings from the Walkthroughs

1. Nurses have been provided with sufficient PPE and any other supplies and offices have adequate ventilation/filtration systems. [Note that BPS reports delivery of PPE by Sep 30.

### School buildings:

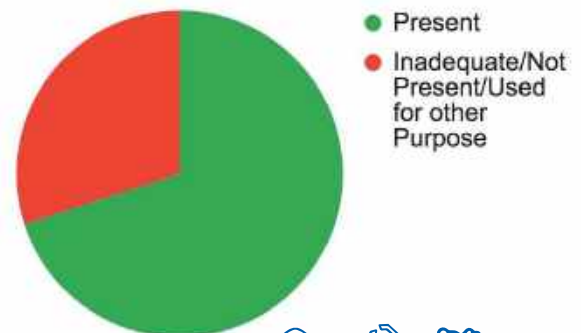
	n=	%
<b>Present</b>	<b>9</b>	<b>9%</b>
<b>Not Present/ Not Enough/ Not Arrived</b>	<b>95</b>	<b>90%</b>
<b>Blank</b>	<b>1</b>	<b>1%</b>
	<b>105</b>	<b>100%</b>



2. Medical waiting area/isolation room is identified, will not be used for any other purpose, and is confirmed appropriate (has a window and/or HVAC capacity)

### School buildings:

	n=	%
<b>Present</b>	<b>73</b>	<b>70%</b>
<b>Inadequate/Not Present/Used for other Purpose</b>	<b>32</b>	<b>30%</b>
	<b>105</b>	<b>100%</b>



# Cleaning, Disinfecting, Sanitation and Hygiene to Reduce Risk of Fomite (Surface) Transmission of SARS-CoV-2

## MassCOSH Concerns and Recommendations

1. Disinfecting products were observed in school walkthroughs that are hazardous, and are not to be used without gloves and eye protection. This warning information is listed on labels and safety data sheets. Plans for use on desks *by* high school students or staff did not take into consideration the need for this necessary personal protective equipment and training regarding hazards and precautions.
2. Two of the disinfectants observed (GeneFect, Re-Juv-Nal) must be rinsed with water prior to contact with food.
3. Review of the EPA N list for disinfectants effective against SARS-CoV-2, the virus that causes COVID, revealed that several of these products would have to remain wet for 10 minutes (called dwell time) to disinfect, prior to rinsing.
4. MassCOSH, BTU and Boston Public Schools worked together several years ago to implement a green cleaning policy. Great steps were taken to ensure cleaning preceded disinfecting, and to ensure that safer disinfectants were purchased and used. Oxivir Tb was adopted and used in the early education classrooms as a safer disinfectant. Oxivir Tb is also recommended as a [safer disinfectant for human coronavirus](#). **We were pleased to learn that, based on our recommendations, BPS will use Oxivir Tb going forward.** We are unclear if Oxivir will be replacing more hazardous chemicals such as GeneFect, Re-Juv-Nal, and others to be used for daily (or more often) cleaning of student and teacher desks.

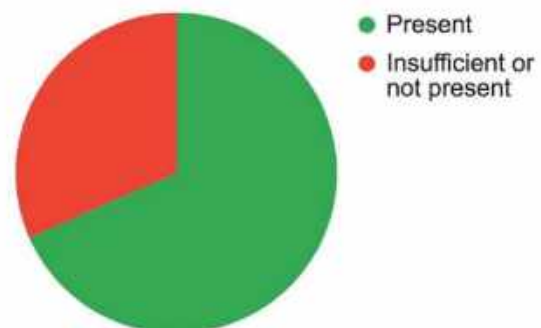
## Findings from the Walkthroughs

Below is an analysis of the data provided by building representatives at 106 walkthroughs conducted between 9/14/20 and 9/18/20 regarding the state of supplies needed for proper sanitation, disinfection and hygiene. It is worth noting that **only 28 out of 105 schools reported being fully prepared with cleaning supplies, hand washing stations, etc.**

1. Sanitizing stations in interior (not exterior) entrance(s) & classrooms

### By school building:

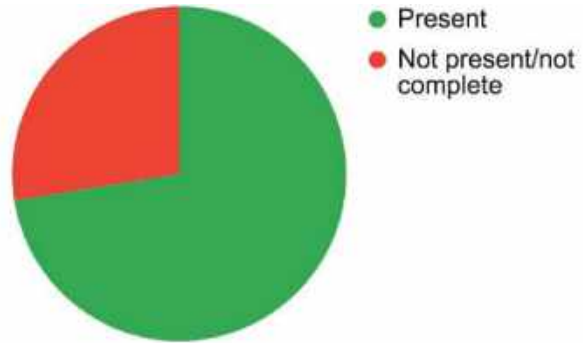
	n=	%
<b>Present</b>	<b>71</b>	<b>68%</b>
<b>Insufficient or Not present</b>	<b>34</b>	<b>32%</b>
	<b>105</b>	<b>100%</b>



2. Clean & stocked bathrooms with a posted cleaning log

By school building:

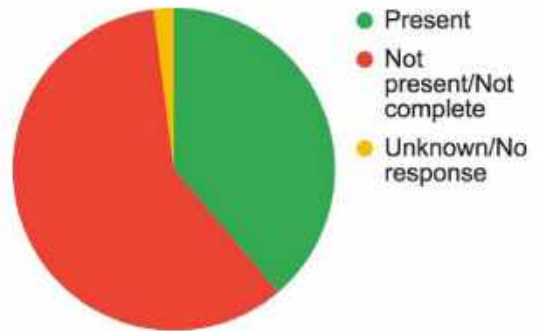
	n=	%
Present	77	73%
Not Present	28	27%
	105	100%



3. Access to hazardous waste disposal

By school building:

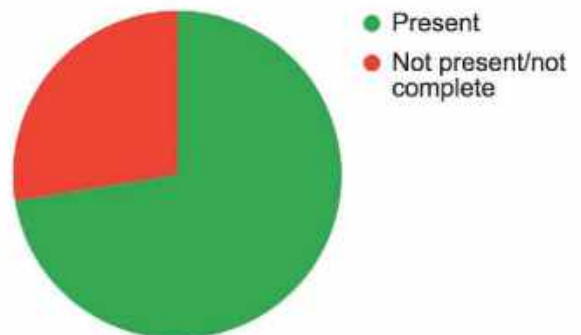
	n=	%
Present	41	39%
Not Present or Not complete	62	59%
Unknown/no response	2	2%
	105	100%



4. Cleaning materials provided for all classrooms and offices including hand sanitizer (at least 60% alcohol), soap where sinks available, wipes and/or paper towels with spray cleaner, and gloves upon request, with plans to replenish daily.

By school building:

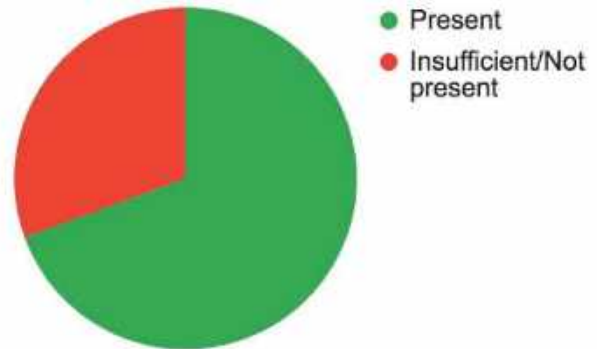
	n=	%
Present	85	81%
Not Present	20	19%
	105	100%



5. Working sinks in each restroom and/or accessible to staff and students on each floor (e.g. not only in staff bathroom): Running Water, soap dispensers, ideally automated, replenished daily as necessary. Paper towel dispensers, replenished daily as necessary. If classroom sinks in rooms that are in use are not operable, they will be repaired in a timely fashion.

**By school building:**

	n=	%
<b>Present</b>	<b>75</b>	<b>71%</b>
<b>Insufficient/Not Present</b>	<b>30</b>	<b>29%</b>
	<b>105</b>	<b>100%</b>



## Conclusion

MassCOSH’s analysis of school buildings supplemented by its walkthroughs finds that many BPS classrooms and buildings are not yet prepared to be safely used by students and staff. While there is still a week to get these measures in place, we are quickly running out of time before the anticipated October 1 start. The protections to prevent the spread of COVID-19 described in this document should be implemented as soon as possible, and follow-up walkthroughs and additional ongoing air quality testing should be scheduled to confirm appropriate measures are in place. **The BTU is advocating to open safe buildings as soon as possible and to ensure that all rooms that can be used safely. Rooms and buildings that are not adequate should not be used until those buildings/spaces can be made safer and the district should look into alternative spaces that can be safely used for our students and schools.**



We wish to thank all of the custodians, facilities, engineering and maintenance staff for their incredible work over the spring, summer and fall. More has been done to upgrade the schools' facilities in a few short months than over the last few decades for many of our schools due to the unprecedented crises our communities have faced. While we have concerns about what still needs to be done, it is the incredible commitment and effort put forth by these staff members that has helped the buildings get to where they are and will be.