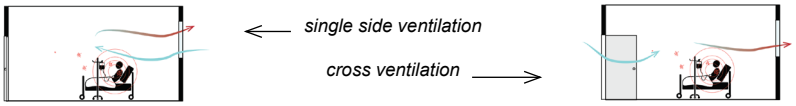
6.2 Non-residential settings

natural ventilation

Minimum requirements	Steps – key questions	Strategies
Minimum recommended ventilation rate: •10 L/s/person (EN 16798-1) *(42, 43)*	Does the ventilation rate meet the minimum requirement? To estimate the ventilation rate consult point 2.	**NO** → + Assess the opening location and opening surface considering potential new openings (add/modify window or door dimensions). + Enable cross ventilation, if not yet present, instead of single-sided ventilation. Keep the doors open to allow air movement.  *single side ventilation* *cross ventilation* + The use of a pedestal fan placed close to an open window could enable ventilation.  + Installation of air extractors or whirlybirds *(33)*; building works to improve stack effect of other natural ventilation strategies.  + If no other strategy can be adopted, consider using a stand-alone air cleaner with MERV 14 / ISO ePM1 70-80% filter *(44)*. The air cleaner should be positioned in the areas used by people and close to people. Air cleaner capacity should at least cover the gap between the minimum requirement and the measured ventilation rate – compare the device clean air delivery rate (CADR) (m^3/hr) with the room ventilation rate. Note: Consider that filtered recirculated air does not replace ventilation in any circumstance. 
	YES ↓	
As a contaminant dilution strategy the indoor air should be changed as uniformly as possible	Is the air within the space well mixed?	**NO** → The use of fans and/or fan coil or split units for cooling and heating as well as ceiling fans increase the air mixing within the room or the space *(44)*. This strategy should be implemented only if the minimum ventilation rate has been met.  *1) pedestal fan* *2) ceiling fan* *3) split*
	YES ↓	
Occupancy and ventilation	Does the facility have periods of non-occupancy?	**YES** → Open the windows to allow proper ventilation before and after occupied times. Windows should be opened for approximately 15 minutes when entering the room (especially when the room was occupied by others beforehand) *(37)*.
	NO ↓	
Heating and air conditioning with recirculating units should be assessed, maintained and cleaned	Are air conditioning and heating performed by non-ducted (with indoor air recirculation) convectors such as split system or fan coil units?	**YES** → + In collaboration with a HVAC professional, if the device is equipped with filters, consider replacing existing air filters with MERV 14 / ISO ePM1 70-80% or the highest compatible with the filter rack. Make sure the units can overcome the additional pressure drop of the new filters. Note: Consider that non-ducted recirculating units do not replace ventilation in any circumstance. + Air-conditioning and heating units performed by split system and fan coil units should be periodically cleaned and maintained. Filters should also be periodically cleaned or changed. Note: Consider that non-ducted recirculating units do not replace ventilation in any circumstance.
	NO ↓	
	END	

mechanical ventilation

Minimum requirements	Steps – key questions		Strategies
Minimum recommended ventilation rate: • 10 L/s/person (EN 16798-1) *(42, 43)*	Does the ventilation rate meet the minimum requirement? To assess the ventilation rate consult point 1.	**NO** →	In consultation with a HVAC professional, assess the opportunity to increase the ventilation rate according to system capabilities. Disable demand-control ventilation controls that reduce air supply based on temperature or occupancy. If the ventilation rate cannot be increased mechanically, consider maximizing ventilation by using natural ventilation through opening windows *(37)* (see natural ventilation section for more strategies). If the system does not allow increasing the ventilation up to the recommended minimum per person requirement, consider reducing the maximum room occupancy to meet the L/s/person standard. If no other strategy can be adopted, consider using a stand-alone air cleaner with MERV 14 / ISO ePM1 70-80% filter. The air cleaner should be positioned in the areas used by people and close to people. Stand-alone air cleaners should be operated continuously. Air cleaner capacity should at least cover the gap between the minimum requirement and the measured ventilation rate *(44)* – compare the device clean air delivery rate (CADR) (m³/hr) with the room ventilation rate. Note: Consider that filtered recirculated air does not replace ventilation in any circumstance. 
	YES ↓		
As a contaminant dilution strategy, the indoor air should be changed as uniformly as possible.	Is the air within the space well mixed?	**NO** →	The use of fans and/or fan coil units or split system units for cooling and heating increase the air mixing within the room or the space *(44)*. This strategy should be implemented only if the minimum ventilation rate has been met.    *1) pedestal fan* *2) ceiling fan* *3) split*
	YES ↓		
Occupancy and ventilation	Does the facility have periods of non-occupancy?	**YES** →	Operate the HVAC system with maximum outside airflow for 2 hours *(37)* at normal speed before and after occupied times.
	NO ↓		
Verify air recirculation	Does the HVAC system work with recirculation mode?	**YES** →	Increase the percentage of outdoor air as air supply, using economizer modes of HVAC operations, potentially up to 100%. Before increasing outdoor air percentage, verify compatibility with HVAC system capabilities *(38)*. In consultation with a HVAC professional, assess the opportunity to install MERV 14 / ISO ePM1 70-80% filter on air return duct according to system capability. Increased filter efficiency generally results in increased pressure drop through the filter *(45)*. Ensure HVAC systems can handle filter upgrades without negative impacts to pressure differentials and/or airflow rates prior to changing filters *(39)*. If no other strategies can be adopted, consider using stand-alone air cleaners (often called air purifiers) with particle filters. These should be operated continuously. Air cleaner capacity should at least cover the gap between the minimum requirement and the measured ventilation rate. Use high-efficiency media filters (such as MERV 14 / ISO ePM1 70-80% or higher) *(44)*. Note: Consider that filtered recirculated air does not replace ventilation in any circumstance. 
	NO ↓		

Verify heat recovery unit

Is the HVAC system designed with heat recovery?

YES

Virus particle transmission via heat recovery devices is not an issue when a HVAC system is equipped with a twin-coil "run around loop" heat exchanger that guarantees air separation between the return and supply side *(40)*.

Virus particle transmission via heat recovery devices is not an issue when a HVAC system is equipped with cross-flow air-to-air heat exchangers, if the heat exchanger is not compromised.

For rotary heat exchangers, fitted with purging sectors and properly maintained seals, leakage rates are very low, and cross contamination is a minimal risk.

If critical leaks (>3%) are detected in the heat recovery device, in consultation with a HVAC professional, assess the opportunity to install MERV 14 / ISO ePM1 70-80% filter according to system capability. Increased filter efficiency generally results in increased pressure drop through the filter. Ensure HVAC systems can handle filter upgrades without negative impacts to pressure differentials and/or airflow rates prior to changing filters *(39)*.

If critical leaks (>3%) are detected in the heat recovery sections and the system does not allow MERV 14 / ISO ePM1 70-80% filter installation or the highest compatible with the filter rack, pressure adjustment *(37)* (higher pressure on supply air side than exhaust air side), deactivation or by-pass of the heat exchanger could be adopted *(41)*.

NO

HVAC system should be operated continuously when people are in the building and should be regularly inspected, maintained and cleaned

Is the HVAC system regularly inspected, maintained, cleaned and operated, including filter cleaning and replacement?

NO

HVAC systems should be regularly inspected, maintained and cleaned according to the manufacturer's recommendations. Contact a HVAC professional, manufacturer or a specialized company to verify that the system complies with the manufacturer's maintenance requirements.

Clean or replace the air filter according to the manufacturer's recommendations.

YES

Heating and air conditioning with recirculating units should be assessed, maintained and cleaned

Conditioning and heating is performed by non-ducted (with indoor air recirculation) convectors such as split or fan coil units.

YES

In collaboration with a HVAC professional, if the device is equipped with filters, consider replacing existing air filters with MERV 14 / ISO ePM1 70-80% filter or the highest compatible with the filter rack. Make sure the units can overcome the additional pressure drop of the new filters.
Note: Consider that non-ducted recirculating units do not replace ventilation in any circumstance.

Air-conditioning and heating units performed by split system and fan coil units should be periodically cleaned and maintained. Filters should also be periodically cleaned or changed.
Note: Consider that non-ducted recirculating units do not replace ventilation in any circumstance.

NO

Air should be exhausted directly to the outside away from air-intake vents, people and animals *(34)*

Is the exhausted air correctly managed?

NO

If the system does not allow air filter installation, consider fencing the area nearby the exhausted outlet, keeping people or animals at a distance at least of 4 m. The air intake should be at least at 2 m if air outlet is above and 4 m if air outlet is below (EN 16798) from the exhaust.

In consultation with a HVAC professional, assess the opportunity to install MERV 14 / ISO ePM1 70-80% filter according to system capability.

YES

END

Footnotes

(Notes 1-4 are used in the earlier reports)

(5) HEPA Air filtration Unit Selection Guide

The COVID-19 pandemic has made air filtration units very popular, with some models hard to get. And it has led to a confusing cacophony of products and claims. Here is a simple guide to sensible selection of filtration units. While the guide is simple, the selection of the units is not simple, due to many misleading claims and unnecessary bells and whistles.

We suggest four criteria:

(1) Be big enough – 100 cfm minimum.

(2) Have true HEPA filtration.

(3) Be quiet enough for a classroom.

(4) Be a mechanical filter only – no snake oil.

1. Be Big Enough – 100 cfm Minimum

Manufacturers misleadingly claim large airflow rates that are possible only with noise levels comparable to those of a window air conditioner. And the actual airflow rates at lower fan speeds are usually not listed and not available. A rule of thumb is to assume that the actual usable airflow rate is a third to a half of the advertised rate.

Unless you are getting a unit for a small office, a flow rate of 100 cfm is a good minimum. If first cost is paramount, then you may find that multiple 100-cfm units will have the lowest cost.

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2. **Have True HEPA Filtration**

HEPA (High Efficiency Particulate Air) filtration removes at least 99.9% of airborne particles of a wide range of sizes (0.01 – 10 microns, a range that includes the size of COVID-19 viruses). Lesser filtration efficiency also would be acceptable, but HEPA filtration is such a popular standard that more filtration units are available with it than without it.

3. **Be Quiet Enough for a Classroom**

We suggest a maximum noise level of 45 dBA. For most brands, compliance with this criterion is difficult to pin down prior to purchasing a filtration unit, due to the lack of published data. (However, see our Recommended Selections, below.) An ideal classroom will have even lower noise levels of 40 dBA or less, but this level is not achievable with HEPA filtration units except at very high cost per cfm, and background noise levels may be this high anyway.

4. **Be A Mechanical Filter Only – No Snake Oil**

With a 99.9% efficient filter, why would you need anything more? Answer: you don't. You don't need an air ionizer – or if your selected unit comes with one, just turn it off. Be aware that some units do not let you turn it off, so avoid these units. You don't need Microban, silver nano-particles, or any other anti-bacterial treatment of the filters or any part of the unit. (The federal government rightly is discouraging the use of this class of products.) They have no effect on viruses in any case. You don't need ultraviolet light, or photo electrochemical oxidation, or plasmawave technology, etc. You don't need an "air quality sensor" measuring particles or Volatile Organic Compounds.

A carbon prefilter is fine – this removes gaseous organic chemicals, including odors.

Recommended Selections

Here are recommended selections that meet all four criteria. All of them have been widely available lately, and current shipping estimates are shown below.

- Honeywell HPA300, 100 cfm (our measurement) at 45 dBA (our measurement at 3 feet) on “Germ” (lowest speed), about $300, Energy Star Rated. (Ships in 7 days at Amazon)
- Blueair Classic 205, 140 cfm at 44 dBA on medium speed, about $400, Energy Star Rated. (Ships in 7 days at Amazon)
- Blueair Classic 605, 275 cfm at 44 dBA on medium speed, about $850, Energy Star Rated. (Ships in 5 days at Amazon)

Choice of Fan Speed

Use the selected quiet speed during normal operation. During mealtimes, when most masks are off, and the room is already noisy, run the unit at maximum speed = maximum airflow. (Notes on masks: KN95 masks offer much better protection than cloth or fabric face coverings, and we have heard from teachers who keep their masks on while the students are eating.)

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Subject: Appendix 3 – Abbott BinaxNOW Rapid Antigen Test
From: Roy Swain <roy.swain@outlook.com>
Date: 9/8/2021, 6:11 AM
To: Roy Swain <roy.s@kohlerandlewis.com>

Evaluation of Abbott BinaxNOW Rapid Antigen Test for SARS-CoV-2 Infection at Two Community-Based Testing Sites — Pima County, Arizona, November 3-17, 2020 | MMWR

Attached is a table of results from

https://www.cdc.gov/mmwr/volumes/70/wr/mm7003e3.htm#T1_down
<https://www.cdc.gov/mmwr/volumes/70/wr/mm7003e3.htm#T1_down>

where I show the false positive and negative percentages.

It looks like this test is excellent for

(1) checking to see if someone with symptoms has covid-19:
- if the result is positive, this is conclusive (0% false positives)
- but if it's negative, you need a PCR test (9% false negatives)

(2) doing a screening test on someone with no symptoms, to see if they should be allowed in the building
- if the result is negative, this is good enough (3% false negatives)
- if the result is positive, some people will be turned away in error (8% false positive), all should follow up with PCR test

TABLE 2. BinaxNOW antigen test — Pima County, Arizona, November 2020

Results and Performance	Real-time RT-PCR, no. of tests		
	Positive	Negative	Total
BinaxNOW antigen test result			
All participants (N = 3,419)			
Positive	157	4	161
Negative	142	3,116	3,258
Total	299	3,120	3,419
Symptomatic (≥1 symptom) (n = 827)			
Positive	113	0 = ∅ FALSE POS.	113
Negative	63 = 9% FALSE NEG.	651	714
Total	176	651	827
Asymptomatic (n = 2,592)			
Positive	44	4 = 8% FALSE POS.	48
Negative	79 = 3% FALSE NEG.	2,465	2,544
Total	123	2,469	2,592

FACT SHEET FOR PATIENTS

Abbott Diagnostics Scarborough, Inc.
BinaxNOW™ COVID-19 Ag Card

Updated: April 6, 2021

Coronavirus Disease 2019 (COVID-19)

You are being given this Fact Sheet because your sample(s) was tested for the Coronavirus Disease 2019 (COVID-19) using the BinaxNOW COVID-19 Ag Card.

This Fact Sheet contains information to help you understand the risks and benefits of using this test for the diagnosis of COVID-19. After reading this Fact Sheet, if you have questions or would like to discuss the information provided, please talk to your healthcare provider.

For the most up to date information on COVID-19 please visit the CDC Coronavirus Disease 2019 (COVID-19) webpage:
https://www.cdc.gov/COVID19

What is COVID-19?
COVID-19 is caused by the SARS-CoV-2 virus which is a new virus in humans causing a contagious respiratory illness. COVID-19 can present with a mild to severe illness, although some people infected with COVID-19 may have no symptoms at all. Older adults and people of any age who have underlying medical conditions have a higher risk of severe illness from COVID-19. Serious outcomes of COVID-19 include hospitalization and death. The SARS-CoV-2 virus can be spread to others not just while one is sick, but even before a person shows signs or symptoms of being sick (e.g., fever, coughing, difficulty breathing, etc.). A full list of symptoms of COVID-19 can be found at the following link: https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html.

What is the BinaxNOW COVID-19 Ag Card?
The BinaxNOW COVID-19 Ag Card is a type of test called an antigen test. Antigen tests are designed to detect proteins from the virus that causes COVID-19 in respiratory specimens, for example nasal swabs.

Why was my sample tested?
You were tested because your healthcare provider believes you may have been exposed to the virus that causes COVID-19 based on your signs and symptoms (e.g., fever, cough, difficulty breathing), and/or other risk factors and you are within the first seven days of the onset of symptoms.

What are the known and potential risks and benefits of the test?
Potential risks include:

- Possible discomfort or other complications that can happen during sample collection.
- Possible incorrect test result (see below for more information).

Potential benefits include:

- The results, along with other information, can help your healthcare provider make informed recommendations about your care.
- The results of this test may help limit the spread of COVID-19 to your family and others in your community.

What does it mean if I have a positive test result?
If you have a positive test result, it is very likely that you have COVID-19. Therefore, it is also likely that you may be placed in isolation to avoid spreading the virus to others. There is a very small chance that this test can give a positive result that is wrong (a false positive result). Your healthcare provider will work with you to determine how best to care for you based on your test result(s) along with your medical history, and your symptoms.

What does it mean if I have a negative test result?
A negative test result means that proteins from the virus that causes COVID-19 were not found in your sample. It is possible for this test to give a negative result that is incorrect (false negative) in some people with COVID-19. This means that you could possibly still have COVID-19 even though the test is negative. If your test result is

- **Where can I go for updates and more information?** The most up-to-date information on COVID-19 is available at the CDC General webpage: **https://www.cdc.gov/COVID19.** In addition, please also contact your healthcare provider with any questions/concerns.

negative, your healthcare provider will consider the test result together with all other aspects of your medical history (such as symptoms, possible exposures, and geographical location of places you have recently traveled) in deciding how to care for you. The amount of antigen in a sample may decrease the longer you have symptoms of infection. Specimens collected after you have had symptoms for more than seven days may be more likely to be negative compared to a molecular assay. It is important that you work with your healthcare provider to help you understand the next steps you should take.

What are the differences between antigen tests and other COVID-19 tests?
There are different kinds of tests for COVID-19. Molecular tests (also known as PCR tests) detect genetic material from the virus. Antigen tests detect proteins from the virus. Antigen tests are very specific for the virus, but are not as sensitive as molecular tests. This means that a positive result is highly accurate, but a negative result does not rule out infection.

If your test result is negative, you should discuss with your healthcare provider whether an additional molecular test would help with your care, and when you should discontinue home isolation. If you will not have an additional test to determine if you are contagious, the CDC currently recommends that you should stay home until three things have happened:

- You have had no fever for at least 24 hours (that is one full day of no fever without the use of medicine that reduces fevers)

AND

- Other symptoms of COVID-19 are improving **Loss of taste and smell may persist for weeks or months after recovery and need not delay the end of isolation

AND

- At least 10 days have passed since your symptoms first appeared.

For more information, the CDC has provided guidelines on how to prevent the spread of COVID-19 if you are sick: https://www.cdc.gov/coronavirus/2019-ncov/downloads/sick-with-2019-nCoV-fact-sheet.pdf.

Is this test FDA-approved or cleared?
No. This test is not yet approved or cleared by the United States FDA. FDA may issue an Emergency Use Authorization (EUA) when certain criteria are met, which includes that there are no adequate, approved, available alternatives. The EUA for this test is supported by the Secretary of Health and Human Service's (HHS's) declaration that circumstances exist to justify the emergency use of *in vitro* diagnostics for the detection and/or diagnosis of the virus that causes COVID-19. This EUA will remain in effect (meaning this test can be used) for the duration of the COVID-19 declaration justifying emergency of IVDs, unless it is terminated or revoked by FDA (after which the test may no longer be used).

What are the approved alternatives?
There are no approved available antigen alternative tests. Any tests that have received full marketing status (e.g., cleared, approved), as opposed to an EUA, by FDA can be found by searching the medical device databases here: https://www.fda.gov/medicaldevices/device-advice-comprehensive-regulatoryassistance/medical-device-databases .

A cleared or approved test should be used instead of a test made available under an EUA, when appropriate and available. FDA has issued EUAs for other tests that can be found at: https://www.fda.gov/emergency-preparedness-andresponse/mcm-legal-regulatory-and-policyframework/emergency-use-authorization.

- **Where can I go for updates and more information?** The most up-to-date information on COVID-19 is available at the CDC General webpage: **https://www.cdc.gov/COVID19.** In addition, please also contact your healthcare provider with any questions/concerns.