

CORONAVIRUS DISEASE (COVID-19)

COVID-19 Inpatient Surge Guidance: Unit Ventilation Recommendations



Audience: Facilities Directors

Revision Date: 4/13/2022

Version: Version #2

COVID-19 Response Team Owner: Logistics, Facilities

Date of Last Review: 2/21/2024

UNIVERSAL: This guide should be used for all COVID patients regardless of Ministry COVID Levels

What's Changed: Added new recommendations from CDC on role of HVAC in preventing transmission of COVID-19

Purpose

The following System Office guidance and recommendations are for heating, ventilation, and air conditioning (HVAC) systems servicing inpatient care units designated for patients with acute COVID-19 or persons under investigation (PUI).

HVAC Controls & Equipment

According to CDC, the risk of spreading SARS-CoV-2 through ventilation systems is not clear at this time. Viral RNA has reportedly been found on return air grilles, in return air ducts, and on heating, ventilation, and air conditioning (HVAC) filters, but detecting viral RNA alone does not imply that the virus was capable of transmitting disease. One investigation did detect virus in the room of a small number of patients up to 3-4 meters away from the patients' heads. However, the concentration of viable virus detected was believed to be too low to cause disease transmission. While airflows within a particular space may help spread disease among people in that space, there is no definitive evidence to date that viable virus has been transmitted through an HVAC system (meaning virus moved in return air back to the air handler, bypassed filters and was still in supply air) to result in disease transmission to people in other spaces served by the same system.

Even if contamination occurs, return air is mixed with outside air and would therefore be diluted even further and filtered in the air handling unit (AHU) before it is then supplied to occupied patient care or other areas.

CDC Recommendations for Engineering Controls to Prevent Transmission of SARS-CoV-2:

Engineering Controls

- Design and install engineering controls to reduce or eliminate exposures by shielding healthcare providers (HCP) and other patients from infected individuals. Examples of engineering controls include:

- physical distancing and use of barriers or partitions to guide patients through triage areas
 - curtains between patients in shared areas
 - air-handling systems (with appropriate directionality, filtration, exchange rate, etc.) that are properly installed and maintained
- System Office Recommendations:
 - Confirm the MERV rating of the filters in the AHU that service the designated unit. ASHRAE 170-2017 design standard calls for minimum filter efficiencies of MERV 7 for filter bank number 1 and MERV 14 for bank number 2. MERV 14 will capture $\geq 90\%$ of particles in size of 1.0 microns. (1) While the size of SARS-CoV-2 is sub-micron, approximately 0.16 microns, it is contained within respiratory secretions which are larger than 1 micron and therefore MERV 14 filters are effective in capturing any virus if it reaches the air handler through return air.

6.0 Systems & Equipment – 6.4 Filtration

		U.S. Standards			Particle Size Range, µm	Applications	
ASHRAE 52.2				ASHRAE 52.1			
MERV	Particle Size Range			Test			
		1 to 3 µm	0.3 to 1 µm	Arrestance	Dust Spot		
1	<20%	-	-	<65%	<20%	>10	Residential, light, pollen, dust mites
2	<20%	-	-	65 - 70%	<20%		
3	<20%	-	-	70 - 75%	<20%		
4	<20%	-	-	>75%	<20%		
5	20 - 35%	-	-	80 - 85%	<20%		
6	35 - 50%	-	-	>90%	<20%	3.0 - 10	Industrial, dust, molds, spores
7	50 - 70%	-	-	>90%	20 - 25%		
8	>70%	-	-	>95%	25 - 30%		
9	>85%	<50%	-	>95%	40 - 45%		
10	>85%	50 - 65%	-	>95%	50 - 55%		
11	>85%	65 - 80%	-	>98%	60 - 65%	1.0 - 3.0	Industrial, Legionella, dust
12	>90%	>80%	-	>98%	70 - 75%		
13	>90%	>90%	<75%	>98%	80 - 90%		
14	>90%	>90%	75 - 85%	>98%	90 - 95%		
15	>90%	>90%	85 - 95%	>98%	>95%		
16	>95%	>95%	>95%	>98%	>95%	0.3 - 1.0	Hospitals, Smoke removal, bacteria
17	-	-	≥99.97%	-	-		
18	-	-	≥99.99%	-	-		
19	-	-	≥99.999%	-	-		
20	-	-	≥99.9999%	-	-		

- Maintain filters in the air handlers using routine facility maintenance procedures and processes.

6.0 Systems & Equipment – 6.4 Filtration

Table 6-2	Space Designation	Filter Bank 1-MERV	Filter Bank 2-MERV
	Operating Rooms; Inpatient and Ambulatory Diagnostic and Therapeutic Radiology; Inpatient Delivery and Recovery Spaces	7	14
	Inpatient Care, Treatment, Diagnosis, and those Spaces Providing Direct Service or Clean Supplies and Clean Processing	7	14
	Airborne Infectious Isolation (All) Rooms	7	14
	Protective Environment (PE) Rooms	7	HEPA
	Laboratories, Procedure Rooms	13	N/R
	Administrative, Bulk Storage, Soiled Holding Spaces, Food Preparation Spaces, and Laundries	7	N/R
	All Other Outpatient Spaces	7	N/R
	Skilled Nursing Facilities	7	N/R

- Frequency of replacement of filters should be based on health ministry's preventive maintenance schedule and reflect instructions from the filter manufacturer.
 - Filter racks, gaskets and spacers should be properly aligned to minimize or eliminate air leaking past filters.
- Facility maintenance colleagues should follow standard operating procedures for removal of filters needing replacement. CDC has stated that biological aerosols are not likely to become an airborne infectious problem once removed by filter media. They recommend the air handler be shut down during filter change-out and used filters be placed plastic bag(s) and sealed upon removal. A study using a type of Mycobacteria to examine survival once captured in a HEPA filter found over 99% was no longer viable within 48 hours and little if any of these bacteria was released from the filter media even vortexing / sonication. (2) Continue to operate in 'economizer' mode; meaning the supply air is decreased (but more outdoor air) and increased return air. This will remove more air than is supplied to the cohort unit, maximizing outside air flow and diluting the air supplied to the designated unit.
- HVAC engineers will need to monitor and assure that these changes to the HVAC system:
 - Do not alter the negative pressure in the Airborne Infection Isolation Rooms (AIIR)
 - Unintentionally imbalance the HVAC system
 - Negatively impact occupant comfort
 - Has adequate environmental controls as warm/humid weather increases

Not Recommended:

- Installation of additional HEPA filtration in the return air at point of use from the designated unit. Additional filtration equipment will not provide any substantial improvement in safety of patients or personnel based on the aerobiology of SARS-CoV-2.

References:

1. ASHRAE. ANSI/ASHRAE/ASHE Standard 170-2017. Ventilation of Health Care Facilities. Atlanta, GA: ASHRAE. 2017.
2. Centers for Disease Control and Prevention (CDC). Guidance for Filtration and Air-Cleaning Systems to Protect Building Environments from Airborne Chemical, Biological, or Radiological Attacks. DHHS (NIOSH) Publication No. 2003-136.
3. Gwangpyo K, Burge HA, Muilenberg M, Rudnick S, First M. Survival of Mycobacteria on HEPA filter material. J Amer Biol Safety Assoc 1998;3(2):65–78.
4. [Ventilation in Buildings | CDC](#)