RECOMMENDATIONS FOR HEATING, VENTILATION, AND AIR CONDITIONING IN HEALTHCARE FACILITIES

- Heating, Ventilation, and Air Conditioning (HVAC) systems are an important component of service in health care facilities. Providing adequate thermal conditions and ventilation systems that prevent the dispersion of pathogens, is fundamental to protect the health of patients, caregivers and staff and to the overall operation of sensitive equipment.
- HVAC systems provide thermal conditions that can be vital for patients
- Respiratory infections can be transmitted via respiratory droplets of different sizes from infected persons.
- In the context of COVID-19, airborne transmission may be possible in procedures or support treatments that generate aerosols i.e., endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation. Special consideration should be given to such procedures to prevent airborne transmission.[1]
- For detailed HVAC design considerations for healthcare facilities please consult WHO[2] and CDC[3] guidelines and the recommendations from ASHRAE Epidemic Task Force[4].

GENERAL RECOMMENDATIONS FOR HVAC AND NATURAL VENTILATION SYSTEMS TO PREVENT VIRUS TRANSMISSION WHILE MAINTAINING ADEQUATE THERMAL AND VENTILATION CONDITIONS

Item	Key Actions
General recommendations (Applicable to common areas, offices and general spaces)	Planning Activities • Establish a plan to perform maintenance on all systems, that considers the specific needs and environmental conditions within the facility. • Assess the current status of the ventilation system (HVAC or Natural) within the facility to prevent transmission of respiratory infections. HVAC system design • Implement a “clean to less clean” directional design for airflows. • Require a minimum of 2 air changes per hour (ACH). • Establish a minimum separation distance of 10m (30ft) between exhaust outlets and outdoor air intakes. • Avoid Variable Air Volume (VAV) systems, which present a risk to maintaining “clean to less clean” airflow. Operational aspects • Make sure your HVAC provider has the certifications and licenses required to provide services in your jurisdiction. • Maintain relative humidity between 40-60%.

[1] https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations
[2] https://www.who.int/water_sanitation_health/publications/natural_ventilation/en/
[3] https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/air.html#c3
[4] https://www.ashrae.org/technical-resources/resources

	• Keep the temperature between 70°F–75°F (21°C–24°C). • Do not regularly turn HVAC systems or air filtration equipment off. Doing so affects airflows and can cause contamination with agents such as molds and fungi. • Develop a workplan with the maintenance team and HVAC provider to ensure timely maintenance and service of HVAC systems. • Ensure HVAC systems are connected to emergency power supplies. Air Filtration • Prefer Minimum Efficiency Reporting Value (MERV) 13 or higher for systems serving general environments.

Special considerations for clinical management and medical procedures with HVAC systems.	Operational and design considerations
	• Utilize airborne infection isolation rooms with negative pressure to perform aerosol generating procedures.
	• Facilities should monitor and record daily the proper negative-pressure function of these rooms.
	• Consider source control options (Local Exhaust Source Control at Patient Head, ventilated headboards, intubation guards, etc.).
	• Maintain doors closed.
	• Eliminate or minimize air recirculation.
	• Maintain negative pressure in all rooms to prevent contaminated air from entering hallways and corridors.
	• Recommendations for 2-person patient rooms:
	  ○ Isolation curtains
	  ○ Do not recirculate air
	
	Air Filtration
	• Work with your HVAC provider to implement filtration systems that match the layout and clinical goals of your facilities.
	• High Efficiency Particulate Air (HEPA) filtration is recommended for use in special-care areas. HEPA filters are usually fixed into the HVAC system serving those areas.
	• Air from Airborne Infection Isolation Rooms should be exhausted directly to the outside or be filtered through a HEPA filter directly.
	• Utilize portable HEPA filtration units in special-care areas that are not served by the HVAC system.
	• Notify Healthcare workers that HEPA units cannot be turned off once in place as this may result in an unsafe condition with the room becoming positively pressurized to the corridor.
	• Prefer Minimum Efficiency Reporting Value (MERV) higher than 13 for systems serving patient treatment areas of health care facilities.

Special considerations for clinical	• Define risk areas within the facility. Risk areas might include rooms where aerosol generating procedures are performed, and rooms where COVID-19 confirmed patients are located.

management and medical procedures in settings using natural ventilation, with no HVAC systems	• Separate areas with aerosol generating procedures from other areas where patients are seen, keeping patients separated according to symptomology, in order to reduce transmission. • Maintain doors closed in risk areas. • Assess ambient air quality conditions (air pollution, allergens such as pollen count and fungi etc.) prior to deciding whether to keep windows open in Intensive Care Units. • If outdoor air is clean, keep external windows open when performing aerosol generating procedures. • Separate suspected and confirmed patients. • Establish security perimeters to avoid airflow from areas with confirmed patients to other areas (consider both vertical and horizontal airflows). • Provide medical personnel in direct contact with COVID-19 confirmed patients with adequate and sufficient Personal Protective Equipment (PPE). • Use N95 respirators in areas without ventilation where aerosols are generated.
Maintenance	• Use PPE for maintenance activities. • Start with areas of least potential contamination and move to Intensive care units of COVID-19 positive cases last. • After maintenance activities, wash hands with soap and water or use an alcohol-based hand sanitizer. Change clothes between facilities. • Filters should be disinfected with a sodium hypochlorite solution at 10% or another appropriate disinfectant approved for use against SARS-CoV-2, allowing it to act for at least 5 minutes before removal. Filters can then be bagged and disposed of in regular waste[5].

Other important considerations	• Implement mold control measures.
	• Avoid additional emission sources:
	  ○ Cool-mist humidifiers should be avoided, since they can disseminate aerosols containing allergens and microorganisms.
	  ○ Do not use air fresheners, perfumed candles or essential oil diffusers.
	  ○ Do not use of solid fuels for cooking activities or burn incense.

Climate Change and Environmental Determinants of Health Unit
Communicable Diseases and Environmental Determinants of Health Department

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[5] https://www.ashrae.org/technical-resources/filtration-disinfection#replacement