STAY SAFE MN

Heating, Ventilation, and Air Conditioning (HVAC) and Fan Considerations for Long-term Care during COVID-19

5/19/2021

Ventilation systems can work with or against infection prevention efforts in long-term care facilities. This document provides guidance to long-term care facilities on methods to increase air dilution and filtration and improve directional airflows. Improved airflow and ventilation help prevent transmission of COVID-19 and other respiratory viruses among residents and staff in long-term care facilities.

Initial considerations

Consider an analysis of the facility's heating, ventilation, and air conditioning (HVAC) structure and options with a multi-disciplinary team including the following positions and expertise:

- Mechanical and electrical engineers
- Infection prevention
- Environmental services director
- Administrator
- Director of nursing (or nurse)

Sometimes, simple changes to HVAC systems can be quite effective in reducing COVID-19 transmission risk. If changes need to be made when a COVID-19 case is diagnosed in the facility, make sure these are written into the facility emergency preparedness plan or infection prevention plans.

This guidance provides optional adjustments and practices for long-term care facilities to consider to prevent infection and respond to a rise in COVID-19 cases. These recommendations are highly dependent on the needs and capabilities of each facility and a facility's multi-disciplinary team should conduct a thorough analysis to determine the practices that should be implemented in the facility.

Easiest practices to consider

- Close doors from rooms or units that contain resident(s) with confirmed COVID-19 or symptoms of COVID-19.
- When possible, rooms should have "negative pressure." That means outside air, like from the hallway, flows into the room and not the other way around. Bathroom doors should be left open to achieve this result, as bathrooms typically have return air vents and exhaust fans.
  - A "tissue paper test" is a simple way to make sure the return vent and exhaust fan is drawing air. An engineer can conduct a more definitive assessment of airflow and ability to generate negative pressure.
- When weather and safety permit, consider opening operable windows. Depending on wind direction, wind strength, and HVAC system structure, open windows could result in air being pushed into hallways. In that case consultation with a system engineer is recommended. The use of fans can help ensure the intended direction of airflow.
  - Double-hung windows – if a room has more than one window, consider opening the upper sash on one and lower the other to facilitate airflow through the room. If there is one double-hung window, consider partially opening both the lower and upper sashes.
  - Single-hung windows can still generate fresh airflow and movement in the room, helping to dilute any viral particles.
- Consider a box fan mounted in the window to draw air outside. Any window fans must be properly secured and safe for the room's occupants.
- Review the HVAC system with your mechanical engineer and contractor partners:
  - Changes to HVAC systems may be expensive but may offer long-term benefits. There are no required changes to HVAC systems resulting from COVID-19.
  - Understand what zone control potential exists in the building(s) and any ability to selectively change ventilation to certain areas.
  - Understand where the system supply and exhausts are located.
  - Determine if exhausts and returns from bathrooms and other areas can recirculate in the facility, potentially spreading infection.
  - Ensure that exhaust is at least 10 feet from any building air intakes.
  - Verify that systems are operating as designed.
  - Verify airflows in rooms meet original design intent. If your staff does not have the capability to perform their own measurements, this may require the services of a qualified testing and balance contractor.
  - Evaluate whether the system needs updating to meet current minimum code standards.
- Hot weather and portable fan use.
  - Air conditioning should be adjusted whenever possible to avoid using fans.

- Fans used in rooms of residents with COVID-19 may be difficult to decontaminate.
- Unless properly used, fans may blow air directly from one resident to another, increasing COVID-19 infection risk.
- Don't use box fans in rooms of residents with COVID-19, unless the box fan is used to draw and exhaust air to the outside through a window.

Intermediate practices to consider

- Consider increasing air changes and air removal methods in rooms assigned to residents with COVID-19.
- Evaluate the HVAC system to see if certain areas can be adjusted to promote increased exhaust rates.
- Consider increasing exhaust in individual resident bathrooms.
  - Generally, exhaust outlets are near toilets. If a toilet is closed off from the rest of the bathroom, open any doors to the toilet room and the bathroom to increase airflow.
  - Investigate whether bathroom fan exhausts discharge outdoors in areas, like patios or sidewalks, that could cause unexpected exposure to the virus.
  - Consider installing air filters with a minimum efficiency reporting value (MERV 14) or HEPA (MERV 17) filter in the exhaust path. Review this possibility with the multi-disciplinary team.
- Consider using portable air cleaners. These units can increase overall air recirculation and can reduce airborne concentrations by capturing aerosolized microorganisms that may contain COVID-19. Choosing an appropriate size unit for the space is important to improve effectiveness.
- Refer to CDC for more information on air change rates and relative timeframes related to effective removal of airborne pathogens at Appendix B. Airborne Contaminant Removal (www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#b1).
- Consider using temporary, portable exhaust fans to create negative pressure in selected rooms or areas.
- Ensure proper distance from the exhaust to at-risk areas so that contaminated air does not go to sidewalks, patios, or any public area. If clearances are not sufficient, incorporate a HEPA filter (or use a HEPA fan) in temporary exhaust systems.
- Create negative pressure areas for infection isolation. Producing negative pressure up to established health care standard threshold of -0.01" water column (WC) is best. Any reasonable amount of cubic feet per minute (CFM), the difference between exhaust and return and supply, will contribute to pressure effect in the right direction.
- Consider equipment damper and control adjustments to provide 100% outside air (OA) supply if possible, rather than the usual mixture of fresh and re-circulated air settings. Demand control mechanisms may be able to be deactivated to allow for continuous airflow rather than variable based on temperature or other conditions. HVAC equipment can often accommodate operating in

100% OA mode when the outdoor temperature is between 45°F and 75°F and maintain relatively comfortable conditions.

- Evaluate the possibility of using MERV 13 air filters on return air to filter out viral particles. Consult with an engineer, qualified HVAC contractor, or the manufacturer to determine the highest MERV-rated filters that have comparable initial air pressure drops.
- Try to maintain humidity levels in the facility of 30-40% relative humidity (RH) minimum and 50%-60% RH maximum. Note that during winter, these levels may be too high and could contribute to mold.

Other options

Consider air treatment technologies like ultraviolet (UVC/UVGI) wall-mounted lights and monitor other evolving technologies including bi-polar ionization (BPI or NPBI). Consult with engineers and refer to ASHRAE position papers as these products continue to expand in the marketplace.

At this time, air treatment technologies for central HVAC systems remain expensive and there is little data to support their use when not built into initial construction (e.g., hospital systems).

Construction/remodeling considerations

For new and future construction and major renovations, facilities could consider the following design concepts:

- Ability to designate wing(s) or unit(s) to be surge isolation infection units with ASHRAE 170 recommended concepts integrated for HVAC, ventilation, and pressurization.
- Surge isolation units that have their own Air Handling Unit (AHU) and dedicated exhaust fans.
- Consider extra capacity provisions for extended operations with 100% outside air.
- Consider HVAC designs that can utilize HEPA air filters, either permanently or “ready-to-deploy” during emergency situations.
- Consider incorporating technologies such as UV light.
- Consider back-up generator capacity sufficient to power the HVAC system.
    - Revisit your facility’s emergency management plan to determine whether an emergency generator serves the critical HVAC systems. If not, consider adding an exterior generator docking station to allow connection of a temporary/portable generator to support the HVAC system should a failure occur.

Conclusion

The configuration of HVAC systems can either contribute to infection prevention or disease spread in long-term care facilities. Understanding the HVAC system in the facility, what its functions and capabilities are

and what other techniques may be used to control and direct airflow is an important factor in preventing infections, including COVID-19. Proper ventilation does not substitute for source control like face coverings, hand hygiene, social distancing, PPE use, and surface cleaning and disinfection.

There is not a "one size fits all" solution to HVAC system operations to improve resident and caregiver safety during these uncertain times. The solutions at hand depend on the type of HVAC system, the use of the building, and the physical space limitations of the building and HVAC system. Establishing the multi-disciplinary team is the best way to identify potential problems and solutions and ensure that the HVAC system is used as an ally in the fight against COVID-19.

Resources

Engineering Services (www.health.state.mn.us/facilities/regulation/engineering/index.html)
COVID-19 resources including ASHE links, information about temporary negative pressure ventilation strategies, and frequently asked questions.

Indoor Air Considerations: COVID-19 (www.health.state.mn.us/diseases/coronavirus/indoorair.html)

Minnesota Department of Labor and Industry: MNOSHA WSC Safety Grant Program (www.dli.mn.gov/business/workplace-safety-and-health/mnosha-wsc-safety-grant-program)

CDC: Appendix B. Air, Guidelines for Environmental Infection Control in Health-Care Facilities (2003) (www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html)

CDC: COVID-19 Collection – Ventilation in Buildings (www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html)

New Hampshire Department of Human Services: Long Term Care Facility Guidance on Fans and Air Conditioning During an Outbreak of COVID-19 (www.dhhs.nh.gov/dphs/cdcs/covid19/documents/ltcf-covid-air-cond-guidance.pdf)

American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE). Standard 170 – 2017, Ventilation of Health Care Facilities (www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda/ansi-ashrae-ashe-standard-170-2017-ventilation-of-health-care-facilities)

American Society of Health Care Engineering, COVID-19 Resources for Health Care Facilities (www.ashe.org/COVID19resources)

MINNESOTA

Minnesota Department of Health | health.mn.gov | 651-201-5000
625 Robert Street North PO Box 64975, St. Paul, MN 55164-0975

Contact health.communications@state.mn.us to request an alternate format.