





Trinity Health

Facility Overview; HVAC, Water, Fire and Related Safety Strategies for Covid-19 Virus Preparedness

12/8/2020

Don Nasko – Dir. Facilities & Infrastructure, System Office

Acknowledgements

- This information wouldn't exist without the shared expertise of many people. We are grateful to the following and apologize if we missed anyone herein:
- Jonathan Flannery, ASHE 
- Traci Hanegan, Coffman Eng – 
 - Chair ASHRAE Tech Comm for Healthcare
- ASHRAE Standard 170 Committee especially Kevin Scarlett / John Williams (Wash State) and Ken Mead (CDC)
- Michael Sherrin – Chair, 170 & Principal - TLC Engineering
- Trinity Health Infection Prevention and Clinical Care Covid response team

Contents

- ❑ Heating Ventilating and Air Conditioning (HVAC) and Airborne infection isolation rooms (AIIRs)
- ❑ Temporary negative air pressurization
- ❑ CDC recommendations
- ❑ Water safety
- ❑ Filtration
- ❑ Fire egress safety
- ❑ Patient placement
- ❑ Appendix

Facilities Action Plan for COVID-19 Preparedness & Response

☐ Air/HVAC:

- ☐ Verify performance of existing airborne infection isolation rooms (AIIRs)
- ☐ Verify Emergency Dept waiting HVAC is 100% exhaust (no return air)
- ☐ Locate a supply source (vendor) if portable negative air HEPA machines for spaces that need supplemental air filtration are desired
- ☐ Ensure critical equipment is powered on critical or equipment branch power
- ☐ Evaluate options to create additional, temporary negative pressure rooms (**slides 21 thru 24**)
- ☐ Evaluate HVAC economizer mode to increase air change per hour (ACH) of outside air (OA). (**Slide 18**)

CDC Recommendations, HVAC, 11/4/2020

- **Optimize the Use of Engineering Controls and Indoor Air Quality**
 - Optimize the use of engineering controls to reduce or eliminate exposures by shielding HCP and other patients from infected individuals. Examples of engineering controls include:
 - Physical barriers and dedicated pathways to guide symptomatic patients through triage areas.
 - Remote triage facilities for patient intake areas.
 - If climate permits, outdoor assessment and triage stations for patients with respiratory symptoms.
 - Vacuum shrouds for surgical procedures likely to generate aerosols.
 - Reassess the use of open bay recovery areas.
- Explore options, in consultation with facility engineers, to improve indoor air quality in all shared spaces.
 - Optimize air-handling systems (ensuring appropriate directionality, filtration, exchange rate, proper installation, and up to date maintenance).
 - Consider the addition of portable solutions (e.g., portable HEPA filtration units) to augment air quality in areas when permanent air-handling systems are not a feasible option.
 - Source: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html>

CDC recommendations, continued

- **No Surge:** place persons under investigation (PUI) for or those with confirmed COVID-19 into private rooms
Give priority to placing those who will need aerosol generating procedure (AGP) into airborne infection isolation room (AIIR)
- **Small scale surge :** create additional, temporary negative pressure rooms/space and supplemental use of portable HEPA devices for spaces where temporary negative pressure is not feasible
- **Large scale surge:** establish dedicated cohort units and/or alternative care sites and apply applicable infection prevention and control guidance for clinical care and support services, e.g. EVS

Water Safety

Trinity Health Water Safety Requirements

Please refer to your water management safety plans when opening new areas for patient care

- ❑ Culturing of potable and non-potable water for Legionella
- ❑ Monitoring of potable water systems for Legionella (biannually), residual chlorine (quarterly), and water temperature (quarterly)
- ❑ Evaluation of external factors in hazard analysis
- ❑ Use definition of positive detection as ≥ 1 CFU/mL Legionella
- ❑ Implement corrective actions if $\geq 30\%$ of fixtures in a single hot water loop detect Legionella
- ❑ Use testing laboratories that participate in CDC's ELITE competency verification program with additional capability to detect Legionella at a concentration of ≥ 0.1 CFU/mL
- ❑ Use control limits of 0.2 to 4.0 ppm of residual chlorine
- ❑ Domestic hot water tank storage temps are required to be $\geq 120^{\circ}\text{F}$
- ❑ Removal, or minimize installation of faucet aerators as much as possible for new construction design
- ❑ Exceed ASHRAE standard for new construction/ renovations and start up flushing and testing prior to occupancy
- ❑ Define flushing and testing for occupancy of fixtures in inactive patient care areas / zones prior to being brought back on-line
- ❑ Identify a water safety leader at each RHM with training and certification in Legionella water management risk mitigation

Filtration

Core HVAC Filters Recommendation

- Use MERV 8 – 13 filters when appropriate
- Required minimum outdoor air ventilation per ASHRAE 62.1
- Maintain HEPA filtration maintenance programs in existing HEPA designed air handling units
- Supplemental
 - Emphasis on installing MERV 13a where HEPA filters are not feasible
 - Install standalone portable HEPA units
 - Evaluate power source, tripping hazard, noise before installation
 - 120v power is preferred
 - Limit extension cord use across trafficked areas
 - Decibel levels (DbA) above 55 begin to make conversations difficult
 - Promote Increased ventilation when possible

Filters

- High efficiency filters can remove respiratory aerosolized droplets
 - Install MERV 8 to 13 rated filters
 - Can upgrade to MERV 13 without appreciable air flow loss
 - Use true MERV 13 “A” rating
 - Some MERV ratings count on static electric charge
 - If charge is lost, filter will revert to MERV 8
 - Studies have shown MERV 13 is 4X more effective than MERV 8 for FLU aerosolized droplet capture

Fire Egress Safety

Fire Egress Safety

- ☐ All means of egress paths are unobstructed
- ☐ All doors in the means of egress and fire doors are working properly and not physically damaged
- ☐ All doors are operable from egress side
- ☐ All doors are not physically blocked
- ☐ All fire doors swing in the direction of egress
- ☐ Ensure all magnetically hold open fire doors are unobstructed
- ☐ Ensure all corridor fire doors are not wedged open

Patient Placement

CDC recommendations: Patient Placement

Please follow your Incident Command and clinical leadership direction

- If admitted, place a patient with suspected or confirmed SARS-CoV-2 infection in a single-person room with the door closed. The patient should have a dedicated bathroom.
 - Airborne Infection Isolation Rooms (AIIRs) should be prioritized for patients who will be undergoing aerosol generating procedures (See Aerosol Generating Procedures Section in PPE Guidebook).
 - Link to PPE Guidebook;
 - [https://www.trinity-health.org/covid-19-resources/_assets/documents/clinical-guidance/personal-protective-equipment-\(ppe\)/ppe-guide-booklet.pdf](https://www.trinity-health.org/covid-19-resources/_assets/documents/clinical-guidance/personal-protective-equipment-(ppe)/ppe-guide-booklet.pdf)

CDC recommendations; Patient Placement

- CDC has provided recent guidance that “facilities could consider designating entire units” to care for known or suspected COVID patients. These units would be staffed with dedicated healthcare personnel to limit exposure risk.
- We strongly advise against cohorting suspected and confirmed patients in the same unit/suite, to avoid the potential for conversion. Work with clinical staff on this matter.

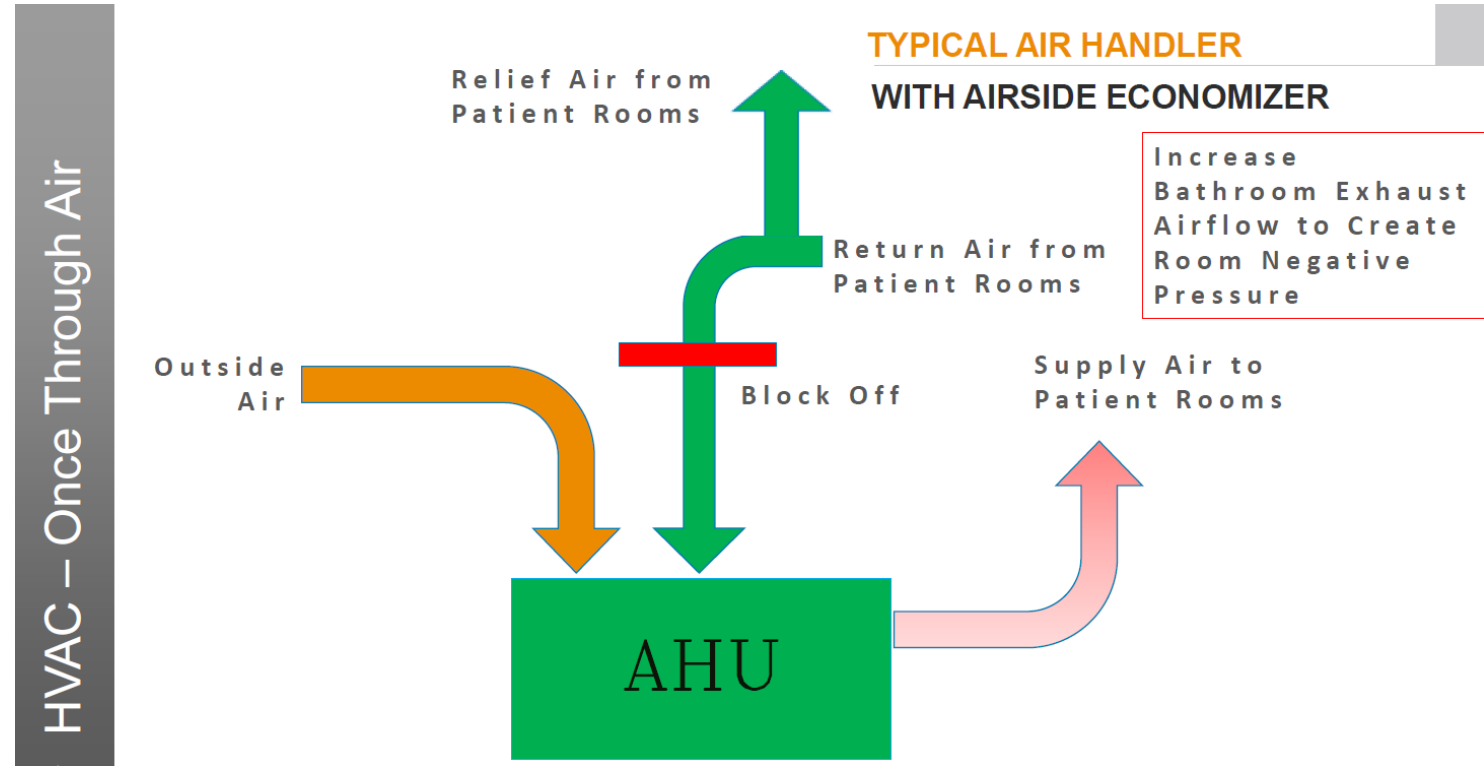
See also System Guide, Cohorting Inpatient Units for PUI and COVID-19

https://www.trinity-health.org/covid-19-resources/_assets/documents/clinical-guidance/infection-control-prevention/cohort-units-for-pui-and-confirmed-covid-19.pdf

Appendix

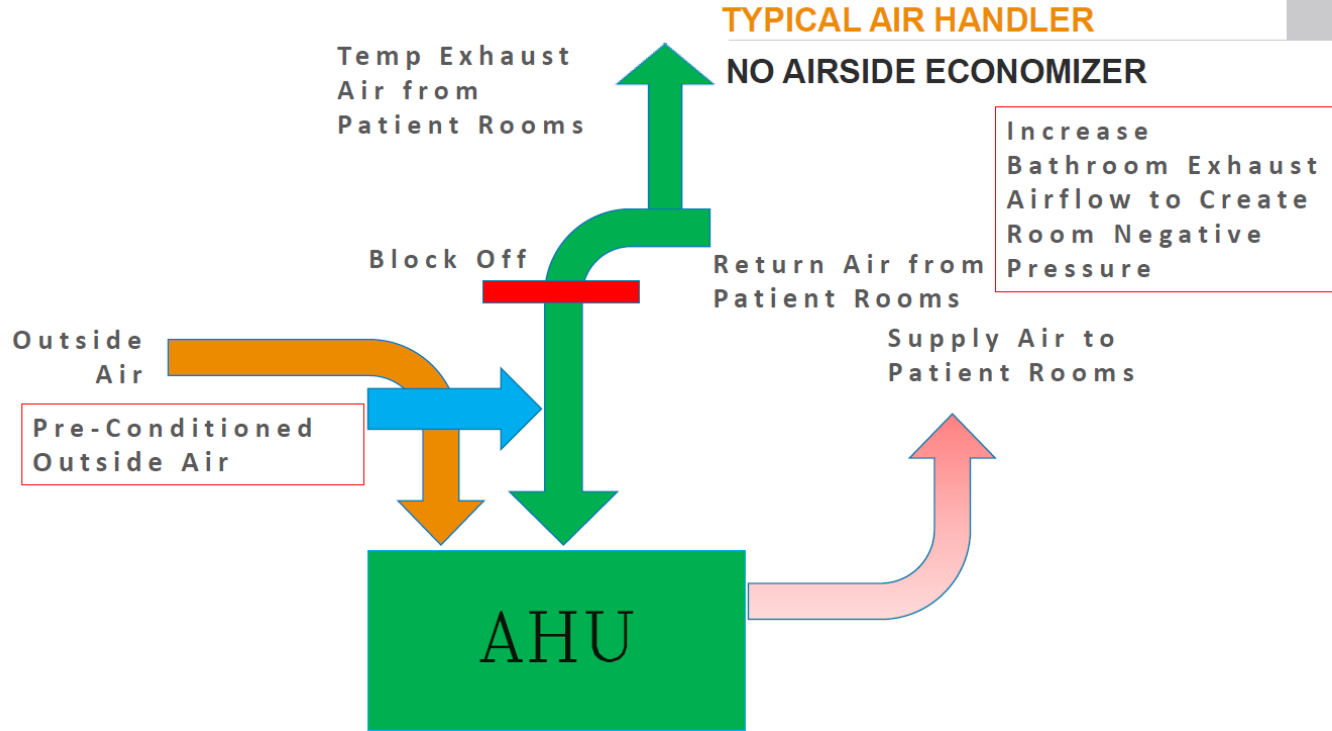
HVAC ventilation and negative air options

Economizer mode



No airside Economizer

HVAC – Once Through Air



Examples of Creating Temporary Negative Pressure Rooms / Space

Important: the following are possible strategies however the ministry Facility Management Team and HVAC engineer must oversee conversion of patient care spaces

Example 1., Temporary Negative Pressure Room, ASHE

HEPA to Corridor

- Single patient room with dedicated bathroom
- Create “sealed” vestibule to patient room
 - Vestibule should be a minimum 3'-0" x 6'-0"
 - Need minimum 5'-0" egress clearance in the corridor
- Seal off return air grill in patient room
- Place HEPA filtered negative air machine in vestibule
- Duct through the vestibule to corridor
- Keep door to vestibule closed but door to patient room open
 - Verify that patient room door is not a rated fire door! Any door over 20 minute rating may be a necessary fire door. These doors should be kept closed or on magnetic hold open.
- Verify negative pressure prior to placing room in service and monitor negative pressure while in service
- Limit patient transport and patient transfers in and out of the room



Example 2. Temporary Negative Pressure, ASHE

HEPA to Outside

- Single patient room with dedicated bathroom.
- Seal off return air grill in patient room.
- Place HEPA filtered negative air machine in patient room.
- Duct through exterior to outside.
- Remove window and enclose opening.
- Keep door to patient room closed.
- Verify negative pressure prior to placing room in service and monitor negative pressure while in service.
- Limit patient transport and patient transfers in and out of the room.



Example 3. Temporary Negative Pressure, ASHE

HEPA to Return

- Single patient room with dedicated bathroom.
- Place HEPA filtered negative air machine in patient room.
- Duct to return air grill.
- Seal off remaining part of return air grill.
- Verify impact that this will have on the overall air handling system (negative pressure in other patient rooms).
- Choosing rooms closest to the air handler may reduce impact.
- Keep door to patient room closed.
- Verify negative pressure prior to placing room in service and monitor negative pressure while in service.
- Limit patient transport and patient transfers in and out of the room.



Time & Air Changes / Hour for Clearance of Submicron Particles, CDC

- Ventilate the Room and Terminal Clean before Re-use
- Follow CDC Air Change Clearance Rates:

Table B.1. Air changes/hour (ACH) and time required for airborne-contaminant removal by efficiency *		
ACH § ¶	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6 ⁺	46	69
8	35	52
10 ⁺	28	41
12 ⁺	23	35
15 ⁺	18	28
20	14	21
50	6	8

Decommission

Upon cessation of cases: Establish disinfection plan before returning HVAC system to normal operations.

- Clean grilles, ducts

- Replace AHU filters

- Replace in room PTAK filters (if applicable)

- Return VFDs to normal settings

Additional System Guides Related to HVAC

- https://www.trinity-health.org/covid-19-resources/_assets/documents/clinical-guidance/infection-control-prevention/cohort-units-for-pui-and-confirmed-covid-19.pdf
- https://www.trinity-health.org/covid-19-resources/_assets/documents/resources-by-department/facilities/air-quality-guidelines.pdf
- https://www.trinity-health.org/covid-19-resources/_assets/documents/resources-by-department/facilities/in-room-ac-unit-filter-maintenance.pdf