Negative Pressure Patient Room Options

Updated: 03/23/2020

Patient Placement

Patient care spaces require careful consideration to ensure staff and patient safety. Space within a health care facility is designed to allow for routine situations and mitigate the spread of infection through engineering controls that address a number of different patient needs. The built environment is not designed to accommodate many patients with comparable needs, as is necessary with this pandemic. It is important to examine these changing facility needs with the assistance of qualified facilities professionals that can

assess the facilities engineering controls and patient flow and help verify that your COVID-19 response will properly protect patients. We strongly recommend using multidisciplinary approach, with professionals including but not limited to:

- Facility Manager
- Architect
- Professional Engineer
- Infection Preventionists

For patients with COVID-19 or other respiratory infections, evaluate need for hospitalization. If hospitalization is not medically necessary home care is preferred.

If hospitalization is necessary and ample Airborne Infection Isolation Rooms are available:

- CDC doesn't require placement in AIIRs, but consider using if resources allow
- Limit transport and movement of the patient outside of the room to medically essential purposes
- Patients should be housed in the same room for the duration of their stay
- Whenever possible, perform procedures/tests in the patient's room
- Aerosolizing procedures should be done in an AIIR

If hospitalization is necessary and Airborne Infection Isolation Rooms are limited, the CDC suggests placement in a single-person room with the door closed:

- Room should have a dedicated bathroom
- Limit patient transport and patient transfers
- AIIR's should be reserved for patients who will be undergoing aerosol-generating procedures

To limit staff exposure and conserve PPE:

- Facility could consider designating entire units for COVID-19 patients separate from units designated for persons under investigation (PUIs)
- Dedicated staff should be assigned to care for these patients
- If multi-patient rooms used
    - All patients should be confirmed with the respiratory pathogen
- Limit transport and movement of the patient outside of room and unit to medically essential purposes
- Patients should be housed in the same room for the duration of their stay
- Whenever possible, perform procedures/tests in the patient's room
    - AIIR's should be reserved for patients who will be undergoing aerosol-generating procedures
- Terminal cleaning should occur after sufficient time has elapsed for enough air changes to remove potentially infections particles

Air Changes Clearance Rates

Terminal cleaning should occur after sufficient time has elapsed for enough air changes to remove potentially infections particles. For information on determining ACH see this instructional video (https://youtu.be/AJCleMFTxhI). The facility should determine the desired efficiency for removal based on the table below.

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

* This table is revised from Table S3-1 in reference 4 and has been adapted from the formula for the rate of purging airborne contaminants presented in reference 1435.

+ Denotes frequently cited ACH for patient-care areas.

Surge Capacity

Individual Room Considerations

CDC does not require AIIR's but the optimal situation is to create additional AIIR's if resources allow

- AIIR's provide an extra layer of protection
    - For staff and other patients
    - COVID-19 Patients may be coughing which is an aerosolizes the virus. While the virus is not itself airborne, some studies have estimated the time which the virus can be suspended within droplets in the air. *Source: The New England Journal of Medicine (https://www.nejm.org/doi/full/10.1056/NEJMc2004973)*
    - AIIR Requirements:
        - Negative Pressure Relationship
        - 2 Outdoor ACH
        - 12 Total ACH
        - Exhausted Directly to the Outside
        - No Air Recirculation

If temporary creation of AIIR's is not practical, the next consideration is creating negative pressure patient rooms. While these rooms may not comply with all of the requirements of an AIIR, negative pressure rooms may help control the virus within the room without spreading throughout the corridors.

ASHE suggests consideration of the following methods for creating negative rooms:

- HEPA to Corridor
- HEPA to Outside
- HEPA to Return
- Multi-bed Zone-Within-Zone Room

See below for a detailed description of each type of room.

- It is important to note that each negative pressure room will affect the air balance of the entire unit. Careful testing and balancing for all areas served by the air handling unit will be required.

HEPA TO CORRIDOR

HEPA TO OUTSIDE

HEPA TO RETURN

MULTI-BED ZONE-WITHIN-ZONE ROOM

Unit Conversion Considerations

Designate entire unit or units within the facility to COVID-19 patients

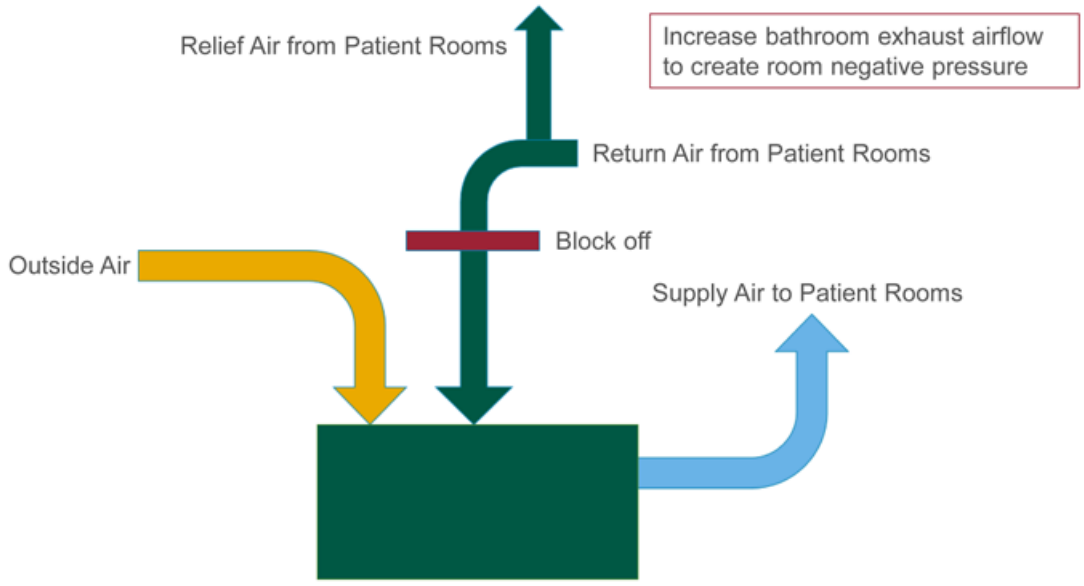
- CDC Recommendations for these units:
  - Dedicated staff should be assigned to care for these patients
  - If multi-patient rooms used
    - All patients should be confirmed with the respiratory
  - Limit transport and movement of the patient outside of room and unit to medically essential purposes
  - Patients should be housed in the same room for the duration of their stay
  - Whenever possible, perform procedures/tests in the patient's room
    - Aerosol-Generating Procedures should be performed in AIIR's
  - Terminal cleaning should occur after sufficient time has elapsed for enough air changes to remove potentially infections particles

Additional Considerations for COVID-19 Units

- If possible create negative pressure environment within unit
  - Air handler should only serve area being dedicated to COVID-19 patients
    - If possible replace filters on unit with HEPA filters
      - Will increase pressure drop so must verify T&B throughout unit
    - Need to verify impact of negative pressure to all rooms
  - Patient rooms should be made more negative than rest of unit
  - Rooms with required positive relationship should remain positive:
    - PE Rooms, Clean Linen, Clean Workroom/Holding
  - Limit access to the unit to only essential personnel
    - Create a Control Vestibule with Neg Air Machine at entrance
  - Verify negative pressure prior to placing unit in service and monitor negative pressure while in service
  - Do not place PUI's in COVID-19 Units until positive test result confirmed
- Designate units specific to triage / PUI's. It's important that these types of spaces have negative pressure rooms. Comingling patients is not recommended.

It's important to consult the facilities manager and maybe a professional mechanical engineer before these systems are altered. To make large scale unit conversions you may need to modify the air handling unit in one of the following ways:

UNIT CONVERSION EXAMPLE AIRSIDE ECONOMIZER



UNIT CONVERSION EXAMPLE WITHOUT AIRSIDE ECONOMIZER

View More COVID-19 Resources (/COVID19resources)

DISCLAIMER

This information is provided by ASHE as a service to its members. The information provided may not apply to a viewer's specific situation and is not a substitute for application of the viewer's own independent judgment or the advice of a competent professional. ASHE does not make any guarantee or warranty as to the accuracy or completeness of any information provided. ASHE and the authors disclaim liability for personal injury, property damage, or other damages of any kind, whether special, indirect, consequential, or compensatory, that may result directly or indirectly from use of or reliance on information from this webinar.

Comments, Tips or Questions?

Please fill out this form if you have a facilities related comment or question. You may also use this form if you have a tip you want to share with your facilities management colleagues.

Access Form (https://app.smartsheet.com/b/form/1ae50b037fac4bc1a19d1107132b03bb)

MY ASHE ONLINE COMMUNITY

myASHE online member community (https://my.ashe.org/home)

Trending topics **MEMBERS-ONLY**

- Permits and Compliance for Temporary Facilities for COVID19 (https://my.ashe.org/communities/community-home/digestviewer/viewthread?GroupId=43&MessageKey=a2fc9d03-d112-4fab-9387-93ba18ea2e32&CommunityKey=6334a1ea-a048-471a-bda7-71fdf10106f8&tab=digestviewer&ReturnUrl=%2fcommunities%2fcommunity-home%2fdigestviewer%3fcommunitykey%3d6334a1ea-a048-471a-bda7-71fdf10106f8%26tab%3ddigestviewer)
- COVID-19 Facility Alternatives? (https://my.ashe.org/communities/community-home/digestviewer/viewthread?GroupId=43&MessageKey=84b7edc9-0011-4bb1-9ef8-f33d7cd7aa7e&CommunityKey=6334a1ea-a048-471a-bda7-71fdf10106f8&tab=digestviewer&ReturnUrl=%2fcommunities%2fcommunity-home%2fdigestviewer%3fcommunitykey%3d6334a1ea-a048-471a-bda7-71fdf10106f8%26tab%3ddigestviewer#)
- COVID-19 Cleaning & Hepa Filter (https://my.ashe.org/communities/community-home/digestviewer/viewthread?GroupId=43&MessageKey=3177d15b-4dab-462d-9366-18a21e3d24a3&CommunityKey=6334a1ea-a048-471a-bda7-71fdf10106f8&tab=digestviewer&ReturnUrl=%2fcommunities%2fcommunity-home%2fdigestviewer%3fcommunitykey%3d6334a1ea-a048-471a-bda7-71fdf10106f8%26tab%3ddigestviewer)

(/)