# There is an Urgent Need to Implement Engineering[1] and Administrative Controls to Prevent the Spread of SARS CoV-2 Among Healthcare Workers & Patients

## Introduction

The entire nation is justly outraged at the lack of preparedness and availability of personal protective equipment for healthcare workers who are on the front line responding to the COVID-19 pandemic. Items such as face shields, surgical masks, respirators and ventilators for patient care are in critically short supply. The first impulse to protect healthcare workers is to focus on acquiring the most effective respirators and personal protective equipment for them. But experience in other epidemic situations has shown that PPE and respirators must be part of a broader continuum of worker protection methods.

Those methods include engineering controls that isolate people from a hazard and administrative controls that change the way people work. An effective system includes a mix of controls. The goal of this factsheet is to educate healthcare workers and managers about the urgency of implementing appropriate engineering and administrative controls to stop hospital spread of SARS CoV-2, especially in smaller hospitals and healthcare facilities that have less access to expertise and resources. Healthcare managers and union representatives should review and assess current processes, procedures, and facility lay-out and traffic patterns. Where the recommended engineering and administrative controls are not in place, immediate action plans should be implemented to prevent the spread of SARS CoV-2 I their facilities. Training of supervisors and employees on any new procedures and equipment should be an essential part of the action plan. University based medical centers like New York University, Maryland Medical College, and Nebraska Medicine all have these best practices in place and these approaches can be adopted by a facility of any size.

## Early identification and isolation

The first line of defense in any healthcare facility is early identification and isolation of suspect or confirmed COVID-19 patients. CDC guidelines emphasize the importance of establishing effective procedures to ensure that patients with mild symptoms stay away from the facility. This is to prevent unnecessary spread of disease by patients who will not benefit from care at the hospital or physician's office. There should be signage and direct communications to the community and its patients advising them to call and only visit the hospital if they have high fever, shortness of breath, and other severe symptoms.

Large cities anticipating surges of cases have dedicated entire facilities to the treatment of COVID-19 patients. That strategy will not work in smaller communities. Therefore, it is tantamount that all facilities have a procedure in place to safely move suspect or known COVID-

[1] Engineering controls are favored over administrative and personal protective equipment (PPE) for controlling existing worker exposures in the workplace because they are designed to remove the hazard at the source, before it comes in contact with the worker.

19 patients to an isolated area of the facility. Typically, this is accomplished by having a dedicated team to move the patient outside to a dedicated doorway that is in close proximity to the isolation area. The pathway should be clearly established to avoid exposures. Be sure to coordinate with EMS and public health authorities on any changes to procedures.

**Dedicated staffing**

A key administrative control is to have dedicated staffing for COVID-19 patients. Under no circumstances should staff assigned to COVID-19 patients also provide care to non-COVID-19 patients. This poses a high risk of staff and patient exposure to the virus. Furthermore, by limiting the number of staff assigned to COVID-19 units should provide higher quality of care and improve efficiency.

Additional work practices to limit healthcare worker exposure include minimizing the number of times they enter the patient isolation room by combining tasks and using remote sensing devices for blood pressure, temperature, etc.

**Isolation unit(s) and use of negative air pressure**

The isolation unit(s) should be in a physically separated part of the facility. Under no circumstances should COVID-19 patients should be cohorted or placed with non COVID-19 patients. COVID-19 patients should be placed in a private room, that is engineered with negative air pressure, with 12 air changes per hour, and vented directly to the outside through a high efficiency particulate air filter. Negative air pressure is achieved by exhausting at a slightly higher amount of air than is being supplied. This is called a pressure differential. The purpose of negative air pressure is so that the contaminated air does not leak into adjacent hallways and rooms, thereby exposing staff and patients. In order to maintain consistent offset airflow, the difference between exhaust and supply should create a pressure differential of about 0.01-inch water gauge (in. w.g.) or 2.5 Pascals (Pa).

**Exhaust contaminated air to the outside**

Exhausting 100% to the outside removes the contaminated air, a very effective way of reducing viral load in COVID-19 patient rooms. The contaminated air is captured by the HEPA filter to ensure that it does not re-enter the building. The return air grilles in the isolation room must be covered with poly and tape to prevent contamination. It is very important to test negative pressure. Some isolation rooms are equipped with mangehelic gauges that measure negative pressure. However, simply using a lightweight tissue paper and placing it near the door will reveal whether the air is flowing in or out of the room.

**Setting up temporary negative pressure isolation rooms**

Temporary negative pressure and venting to the outside can easily be accomplished and are a safe alternative for hospitals that lack engineered isolation rooms and during the need for surge

*Figure 1 Temporary negative air pressure and HEPA filtration.*

capacity. When properly installed and maintained, filters for clinical spaces should be able to ***remove at least 90% of particles (0.5 microns in size and larger)*** from outside and inside air. A clear and concise guide on how to set up temporary negative pressure isolation rooms is detailed in *Airborne Infectious Disease Management, Methods for Temporary Negative Pressure Isolation*, Minnesota Department of Health Office of Emergency Preparedness, Healthcare Systems Preparedness Program, https://www.health.state.mn.us/communities/ep/surge/infectious/airbornenegative.pdf

Hospital engineering and environmental safety & health personnel should be assigned to immediately plan to implement these recommendations. Consult with the State Health Department for assistance and funding. The American Industrial Hygiene Association maintains a list of available consultants at: https://www.aiha.org/consultants-directory.

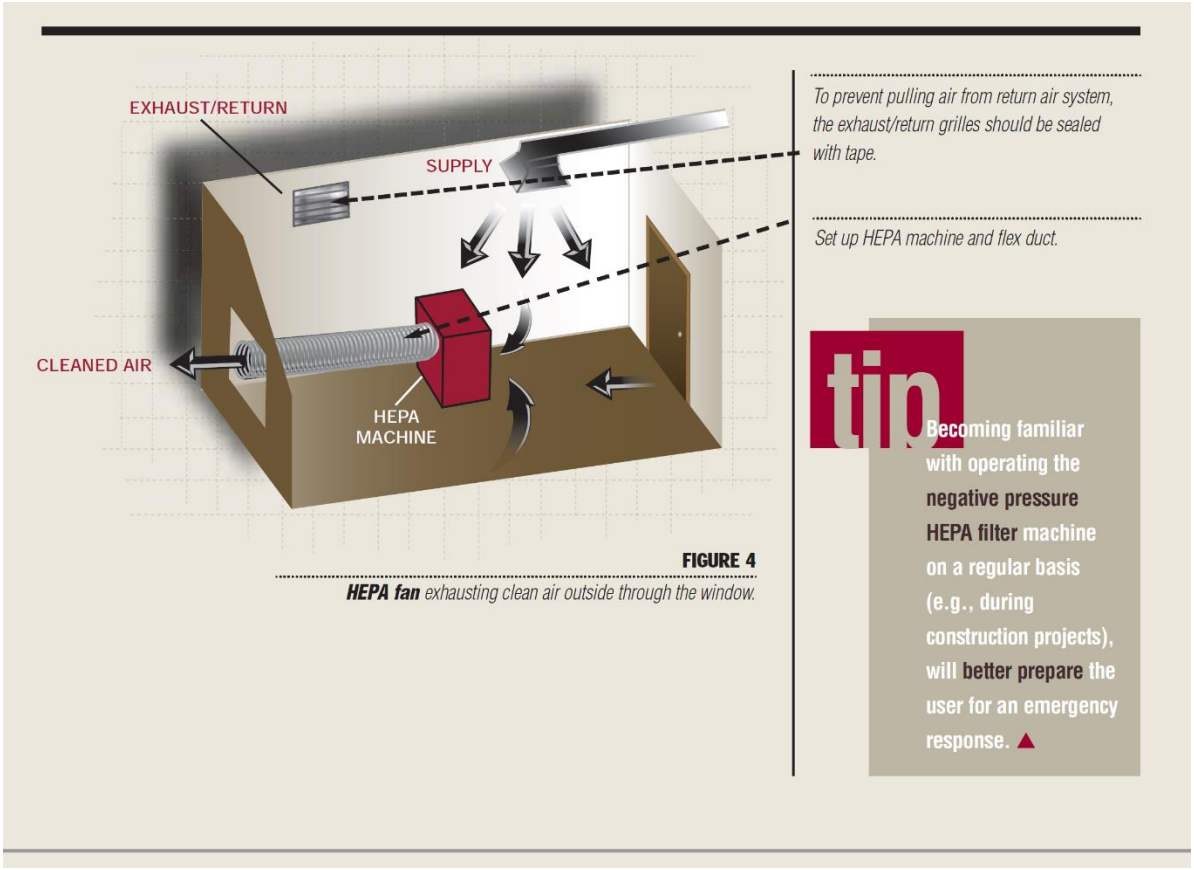


**FIGURE 4**
***HEPA fan*** *exhausting clean air outside through the window.*

References:

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2. NIOSH Hierarchy of Controls, https://www.cdc.gov/niosh/topics/hierarchy/default.html
3. OSHA, Recommended Practices for Safety & Health Program, https://www.osha.gov/shpguidelines/hazard-prevention.html
4. Airborne Infectious Disease Management, Methods for Temporary Negative Pressure Isolation, Minnesota Department of Health Office of Emergency Preparedness Healthcare Systems Preparedness Program, https://www.health.state.mn.us/communities/ep/surge/infectious/airbornenegative.pdf