

Health Care Operations: Implications & Actions from COVID-19

Tuesday, April 14, 2020

3:00 PM - 4:30 PM ET

1.5 LU – HSW AIA Credits



GBI INTRODUCTION

The Green Building Initiative (GBI) is a nonprofit organization dedicated to accelerating the adoption of building practices that result in resource efficient, healthy, resilient, and environmentally sustainable buildings.

Collaborative Process. Proven Results.

Our certification programs exist under two umbrellas:



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AIA REGISTERED COURSE

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COURSE DESCRIPTION

COVID-19 has placed an enormous strain on our healthcare and long-term care systems. The dramatic increase in number of patients requiring advanced medical care and the concern of rapid transmission exposes vulnerabilities in hospitals, outpatient settings, long-term care nursing homes, and senior living facilities. The lessons learned from the early response to COVID-19 create implications for ongoing responses, policies & procedures, future designs, immediate needs to support adequate staffing and the potential for transforming temporarily vacant spaces near hospitals to service essential services; i.e. convention centers, hotels, etc.

The Green Building Initiative is hosting a webinar, featuring expert panelists, to provide resources and expertise to those working in or supporting the healthcare or long-term care industry. The goal is to provide participants with an opportunity to learn about some of the recent protocols and planning recommendations being put in place to help the healthcare sector manage their facilities during this time, and some thoughts about what we as an industry can learn from this situation about the future of healthcare facility management, engineering, and design.

INTRODUCTION

Learning objectives

- **Ventilation / Filtration** - Understand how ventilation and filtration must be altered and monitored to ensure a safe, clean and healthy indoor environment;
- **Materials & Surfaces + Cleaning & Disinfecting** - Learn the latest in protocols for cleaning and disinfecting surfaces where COVID-19 may live for a period of time.
- **Transforming Space / Mobile Unit** - Discuss spaces that have been converted to COVID-19 treatment centers, and the use of open-air popups and mobile medical units where needed. Examine opportunities to provide necessary space and resources for healthcare professionals, including day care facilities.
- **Lessons Learned for Emergency Preparedness** - Apply these lessons learned toward future design and operations of healthcare and long-term care facilities.

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*Whose time
and talent
support GBI's
education and
outreach
programs*



ADDITIONAL ITEMS

Using the technology today and follow up resources

- Expect some slide delays, continue with audio should slides freeze
- Just under 600 registrants today
- Post questions as we go using Q&A feature
- Any questions we don't get to we will capture and include written Q&A in our follow up resources materials
- Follow up resources will include detailed slides, a resources packets, and any Q&A supportive of the goals of this program

DISCLAIMER

GBI and our guest panelists are pleased to be able to share information and ideas surrounding concepts and best practices related to addressing the COVID-19 issue now and in the future. Information presented does not represent official opinions of the Green Building Initiative. Additionally, none of the information, ideas, or concepts provided in this presentation should be viewed as a substitute for individualized legal, engineering, facility management, or medical advice, nor as an endorsement of any specific products or materials.

For full speaker bios, please visit:
www.thegbi.org/hcwebinar



PANELISTS



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VENTILATION & FILTRATION

Michael P. Sheerin

CEO, TLC Engineering Solutions

VENTILATION & FILTRATION

VENTILATION AND FILTRATION



Chair ASHRAE Standard 170

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ACKNOWLEDGEMENTS

- This information wouldn't exist without the shared expertise of many people. We are especially grateful to the following :
- Jonathan Flannery, ASHE
- ASHRAE Standard 170 Committee especially Kevin Scarlett / John Williams (Wash State), Ken Mead, and Richard Hermans
- Traci Hanegan, Coffman Eng – Chair ASHRAE Tech Comm for Healthcare
- TLC Engineering Solutions Healthcare Center of Excellence Team including Aaron Johnson, Mark Costello, Jeff Stone and Ben Roseborough along with COO Jim Ferris and EVP Bob Danner

BASICS

- General Parameters:
 - Do No Harm
 - System Arrangement Should Protect Workers
 - System Arrangement Should Protect Other Patients
 - Airflow from Clean to Less Clean

AEROBIOLOGY

- COVID 19 Patients Will Typically Have Respiratory Conditions Resulting in Coughs, Sneezes
- Virus Most Commonly Spread Through Contact Exposures (Sickened People Touching Door Handles, Countertops, etc.) and Related Cough/Sneeze Droplets Collecting on These Surfaces
- Aerosolized Virus Is a Limited but Possible Vector of Transmission*
- Recognize That Virus May Be Aerosolized During Toilet Flush
 - Housekeeping May Need to Consider this Condition

[NEW INFO: *https://www.medrxiv.org/content/10.1101/2020.03.23.20039446v2](https://www.medrxiv.org/content/10.1101/2020.03.23.20039446v2)

[*https://www.livescience.com/coronavirus-can-spread-as-an-aerosol.html](https://www.livescience.com/coronavirus-can-spread-as-an-aerosol.html)

AEROBIOLOGY & WHAT YOU SHOULD DO

- HVAC Systems Can Protect Healthcare Workers and Instill Confidence By Providing Safe Environment for their Interactions with Most Contagious Patients and Reduce Exposure When Patients Discharge Contaminants During Procedures.
- Basic Approaches:
 - A.I.I. Rooms Require 12 Air Changes, Air Exhausted Directly (see Std 170)
 - Establish Solutions Beyond A.I.I. Rooms as Needed:
 - Air Changes Dilute Contaminant Level
 - Exhaust Removes Contaminants
 - Filtration Removes Contaminants
 - Negative Relative Pressure Helps Contain Contaminants

BASICS - HEPA

When We Refer to a “HEPA Unit”:

Portable HEPA Machine



Pre-Assembled System



Ad Hoc Assembly

- HEPA Filter in Frame, Preferably Bag In/Out But As Needed/Available
- Off Shelf Exhaust Fan and Associated Power
- Sealed Connections, Rack or Wheel Mounted



HEPA FILTERS & N95 MASK FILTERS

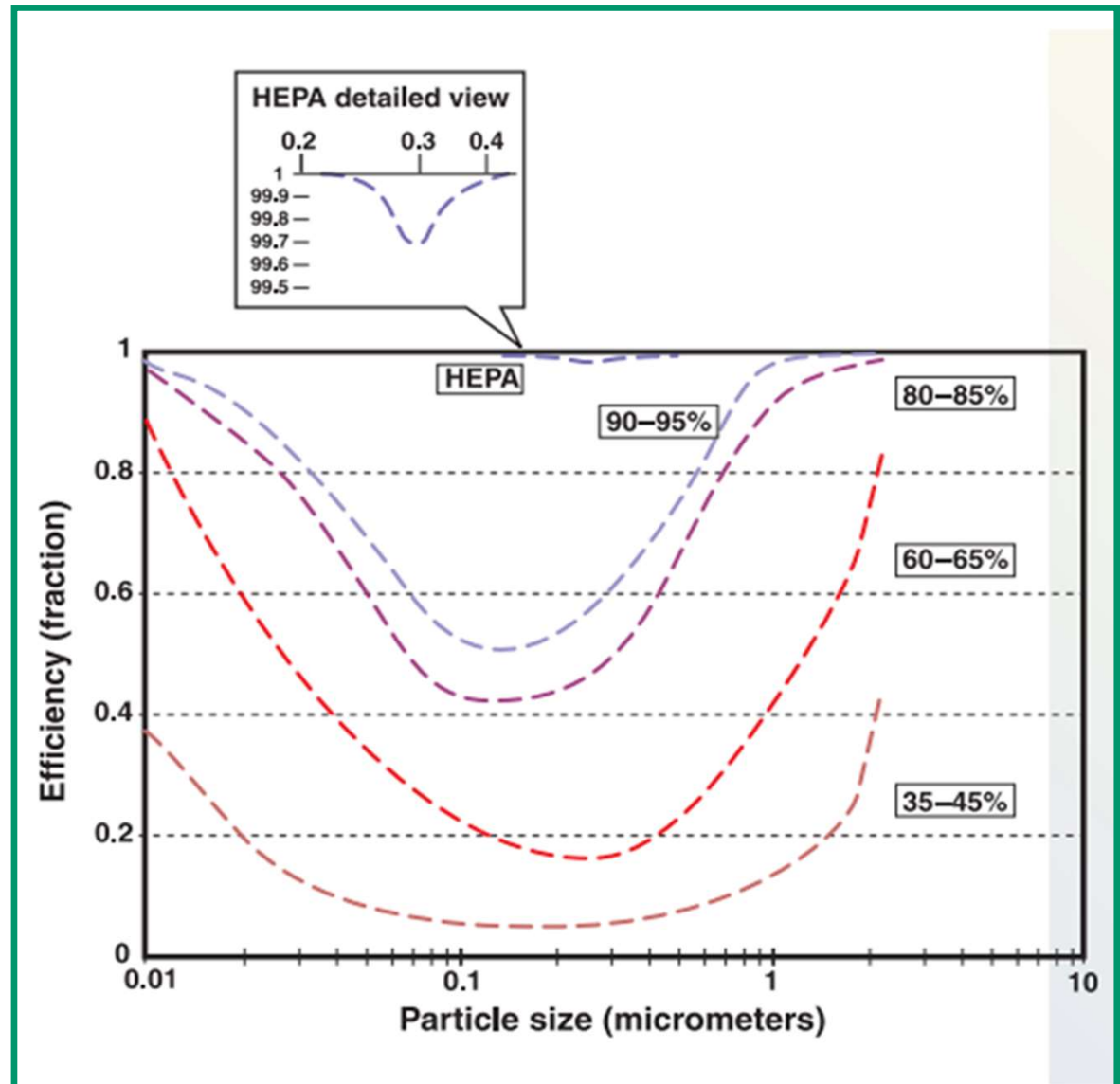
HEPA Filters

- Yes, the Virus particles can be .1 micron or smaller.
- Infectious Patient airborne discharges (cough/sneeze) are typically greater than .1 micron as virus is passed on/in liquid/mucous !
- HEPA is at least 99.97% effective for .3 micron particles (see chart)
- HEPA is an effective tool for contaminant removal.

N95 Mask Filters

- N95 require fit testing and a competent pulmonary efficiency.
- N95 are TESTED with .3 micron particles.
- N95 is certified to filter at least 95% of airborne particles.
- N95 is an effective tool for worker protection. Sterilize for Reuse :
- <https://www.apsf.org/news-updates/potential-processes-to-eliminate-coronavirus-from-n95-masks/>

BASICS – HEPA



BASICS – KEEP IT SIMPLE

- Resource Management:
 - Recognize That You Have Limited Time, So Focus Your Efforts
 - Do Not Waste Time, Mental Energy, or Dollars Without Clear Goals & Plan
- Set Goals:
 - ✓ Work With Clinicians
 - ✓ Establish Minimum Standards
 - ✓ Define Key Areas and Designated Rooms, Suites
 - ✓ Maintain Life Safety Protections
 - ✓ Make a Floor Plan / Map – Ensure Everyone Knows

PASSIVE ISOLATION

- As Prescribed in CDC Guidance*
- Most Basic Approach
 - One Patient per Room
 - Close the Door
 - Implement Related CDC Safety Protocols
- Work with Clinicians, Anticipate Patient Load and Establish Layered Approach As Needed

*https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html

LAYERED APPROACH

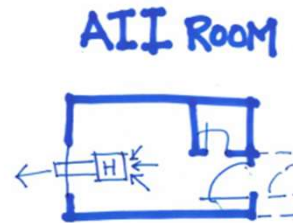
Hospitals Should Be Aware of the Clinical Modes:

- Normal mode - Follow CDC Guidelines
 - Clinical Plan May Limit A.I.I. Rooms to Patients Receiving AGP
- Small Scale Surge Capacity Mode –May Be Asked to Create Additional Dedicated A.I.I. or Temporary Patient Observation/Segregation Rooms with HEPA and negative pressure.
- Large Scale Surge Capacity Mode – May Be Asked to Establish Dedicated Ward/Suite(s) and Establish Protocols with Clinical and Environmental Action Plans
- Inform Clinicians that Temporary Patient Observation/Segregation areas are not True A.I.I. Rooms.

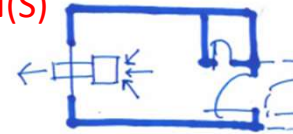
PATIENT ROOM

VARIETY OF APPROACHES – EVALUATE WHAT WORKS BEST FOR YOUR CONDITION(S)

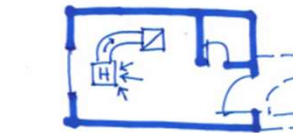
- Consider:
- Door Closer
 - Ability to Monitor Room Pressure
 - Limit Patient Transfers
 - Ventilate and Terminal Clean Before Re-Use



OPTION 1.
COMPLIANT W/ CDC, ASHRAE, F&I



OPTION 2.
IN ROOM HEPA, DISCHARGING DIRECTLY TO EXTERIOR.

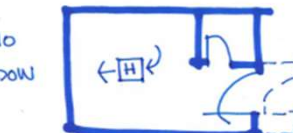


OPTION 3.
IN ROOM FAN (NON-HEPA) DISCHARGING DIRECTLY TO EXTERIOR -OR- USE EXISTING TLT ROOM EXHAUST.



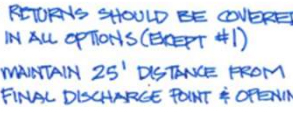
OPTION 4.
IN ROOM HEPA DISCHARGING TO RETURN. MUST BALANCE SYSTEM TO PREVENT DOWN STREAM AFFECTS

NO WINDOW



OPTION 5.
HEPA UNIT SCRUBS AIR FROM ROOM AND DISCHARGES TO CORRIDOR. NEED TO RELIEVE PRESSURE FROM CORRIDOR.

NO WINDOW



OPTION 6.
HEPA UNIT RECIRCULATES AIR IN ROOM AFTER SCRUBBING. NOT NEGATIVE, SUPPLY SHOULD BE COVERED TO PREVENT + PRESSURE.

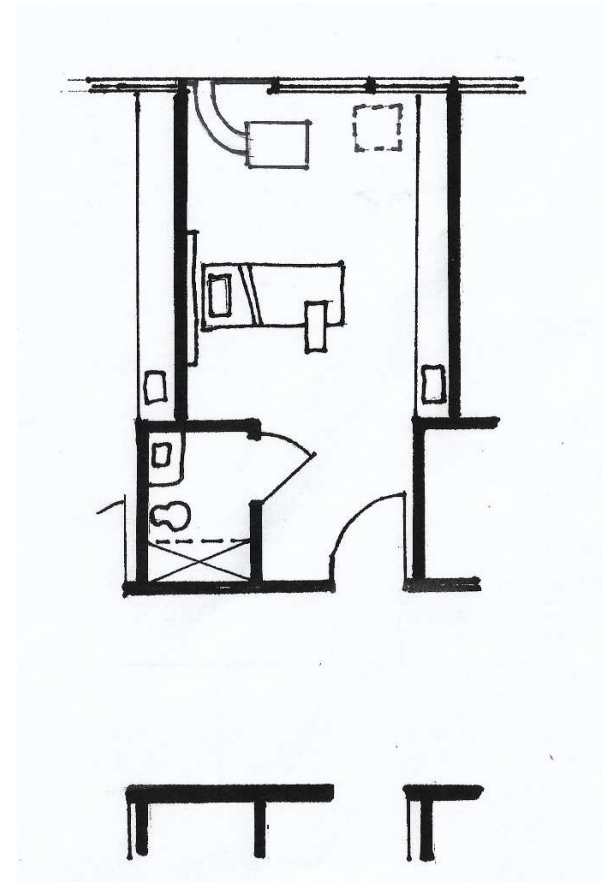
- * RETURNS SHOULD BE COVERED IN ALL OPTIONS (EXCEPT #1)
- * MAINTAIN 25' DISTANCE FROM FINAL DISCHARGE POINT & OPENINGS INTO BUILDING.

Hazard:
-Notify Healthcare Workers that HEPA units cannot be turned off once in place as may result in unsafe condition with room becoming positive pressure to corridor.

EXAMPLES – PATIENT ROOMS SMALL SCALE SURGE

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
- Terminal cleaning after ACH removes potentially infectious particles

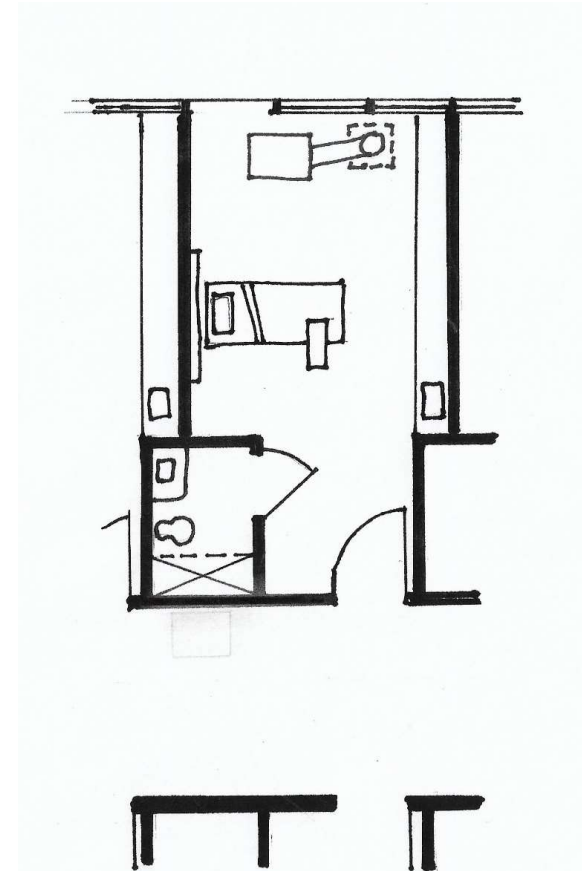


The most preferred recommendation is to co-locate all patients to an area served by a single air handling unit and to modify that unit to create negative pressure for the entire area being served. If it is possible the filters on this system should be replaced with HEPA filters. Prior to placing the unit into service the negative pressure of the area should be verified and it should be monitored throughout the time COVID-19 patients are treated within the area.

EXAMPLES – PATIENT ROOMS SMALL SCALE SURGE

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 to the overall air handling system – 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
- Terminal cleaning after ACH removes potentially infectious particles

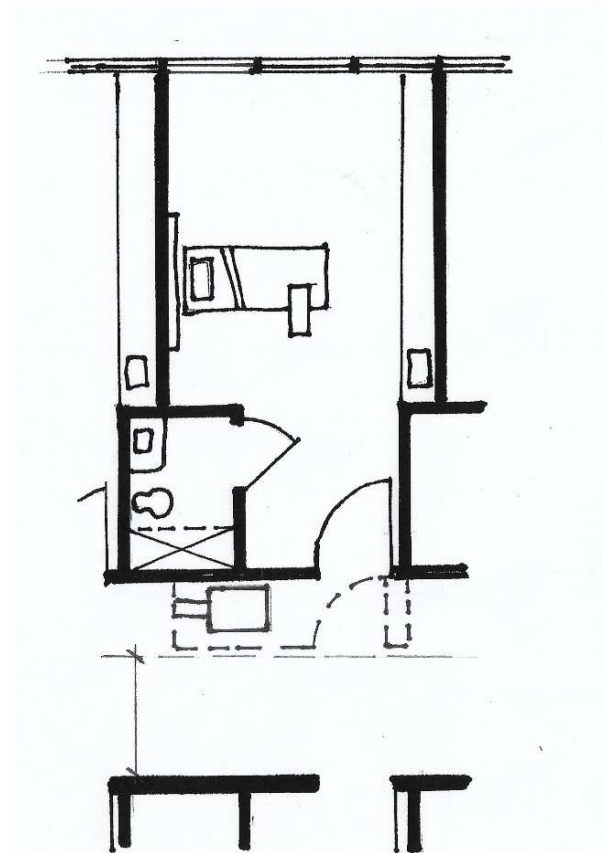


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EXAMPLES – PATIENT ROOMS SMALL SCALE SURGE

HEPA to Corridor

- Single patient room with dedicated bathroom
- Create “airtight” vestibule to patient room
 - 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 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!
- Verify negative pressure prior to placing room in service and monitor negative pressure while in service
- Limit patient transport and patient transfers
- Terminal cleaning after ACH removes potentially infectious particles



The most preferred recommendation is to co-locate all patients to an area served by a single air handling unit and to modify that unit to create negative pressure for the entire area being served. If it is possible the filters on this system should be replaced with HEPA filters. Prior to placing the unit into service the negative pressure of the area should be verified and it should be monitored throughout the time COVID-19 patients are treated within the area.

ALTERNATE STRATEGY – SOURCE CONTROL

- Consider Local Exhaust Source Control at Patient Head for Patients on CPAP, Nebulizer, or other AGP
- Demistifier Patient Tent w HEPA
<https://www.peacemedical.com/2000A%202014.pdf>



- Portable Snorkel Exhaust SentryAir (i.e. soldering equipment) <https://www.sentryair.com/portable-floor-sentry.htm>

WHAT ARE ROOM RECIRCULATING UNITS?

- Variety of In-Room Cooling/Heating Units

- Fan Coil Units



- Heat Pump Units



- Packaged Terminal Air Conditioner (PTAC)

- DX and Mini-Split DX Units



- Special Case: Induction Units (Seek Expert Guidance)

- Special Case: Active Chilled Beam (Seek Expert Guidance)

- RR Unit Typically Has ≤ 6 ACH Air Changes, Minimal Filtration

WARNING – ROOM RECIRCULATING UNITS

Avoid Use for COVID Patients IF YOU CAN

- IF YOU MUST:
 - Consider Option 7 (previous slide) as Best Approach
 - If No Other Option Than Using RR Unit, Then Increase Room Exhaust
 - Create Negative Relative Pressure to Corridor
 - May Be Accomplished By Adding Supplemental Local Exhaust Fan per Room
 - Consider System Level Approach By Increasing Gen'l/Toilet Exhaust Airflow
 - Consider Means of Sanitizing RR Unit Between Patients – Peroxide Fog, Other?
 - Deep Decontamination of RR Unit's Coil After Event Is Over

FURTHER CONSIDERATIONS

- 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

LATEST UPDATE

- See ASHRAE Resources: <http://tc0906.ashraetcs.org/>

Announcements

ASHRAE COVID-19 resource

<https://www.ashrae.org/technical-resources/resources>

COVID 19 Guidance from ASHRAE 170

Also see the special publications section in the [documents tab](#) for additional resources.

The Committee

Healthcare facilities include hospital (acute care, psychiatric, rehabilitation), primary care outpatient facilities, ambulatory care facilities, small primary outpatient facilities, outpatient surgical facilities and assisted living facilities. TC 9.6 also addresses energy conservation, environmental comfort, infection control, and life safety issues in these facilities.

- See ASHE WEBSITE FOR MORE INFO - PUBLIC ACCESS:
<https://www.ashe.org/COVID19resources>



MATERIALS & SURFACES

Debra Harris, Ph.D.,

Associate Professor, Family & Consumer Sciences, Baylor University

MATERIALS & SURFACES

SARS-CoV-2 Outbreaks on Cruise Ships

Identified on a variety of surfaces in cabins

- Symptomatic passengers
- Asymptomatic infected passengers
- RNA present up to 17 days after cabins were vacated prior to disinfection

This study does not indicate whether transmission occurred from contaminated surfaces

This study does not indicate virus viability

Further study of surface transmission of SARS-CoV-2 aboard cruise ships is warranted.



CDC Morbidity and Mortality Weekly Report Photo by Carl Court/Getty Images
<https://www.cdc.gov/mmwr/volumes/69/wr/mm6912e3.htm>

MATERIALS & SURFACES

SARS-CoV-2 (COVID-19) compared to SARS-CoV-1

Media	SARS-CoV-1	SARS-CoV-2
Aerosols	3 hours	3 hours
Plastic	72 hours	72 hours
Stainless Steel	48 hours	48 hours
Cardboard	8 hours	24 hours
Copper	8 hours	4 hours

Holbrook, M.G., Gamble, A., Williamson, B.N., et al. (2020) Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. New England Journal of Medicine, Correspondence [nejm.org](https://www.nejm.org).

Evaluated aerosol and surface stability

- Aerosols remained viable for 3 hours (duration of the experiment)
- Surface viability

Aerosol and surface transmission of SARS-CoV-2 is likely

Similar transmission pattern to SARS-CoV-1:

- Nosocomial spread
- Super-spreading events

MATERIALS & SURFACES

Non-Critical Surfaces

Defined by the CDC:

- Come in contact with intact skin but not mucous membranes
- Soiled environmental surfaces and equipment that may have contact with the patient – furniture, textiles

Non-critical surfaces play a *critical role* in pathogen transmission

Current cleaning practices may not control biofilm development, leaving pathogens to thrive after cleaning and disinfecting.



Photo by Henry Domke

MATERIALS & SURFACES

Non-Critical Surfaces

Cleaning: surfactants – soaps and detergents

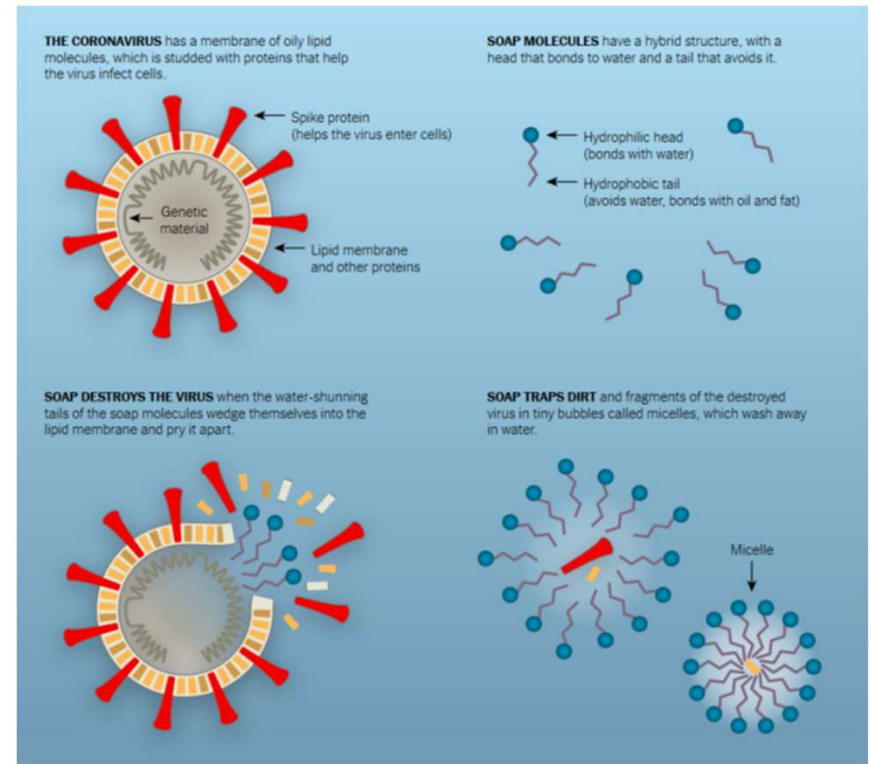
Disinfecting: hydrogen peroxide, alcohols, quaternary compounds, and many others

Protocols that include cleaning and disinfecting

SARS-CoV-2: one of 7 human coronaviruses. Not hard to kill outside of a human host.

Evidence shows that combination disinfectants may be more effective, for instance a combination of surfactant, hydrogen peroxide, and quaternary compounds.

Alcohols, Aldehydes, Glucoprotamin, Halogens, HINS, Peroxygens, Phenols, Quaternary Compounds, Silver, Copper



By Jonathan Corum and Ferris Jabr



MATERIALS & SURFACES

Surface Material Performance Characteristics

Textiles

- Curtains, bedding, bath towels upholstery, wallcoverings

Nonwoven Fabrics – bonded fibers.

- Polyethylene (PET), polypropylene – bonded thermally or with a resin

Woven Fabrics

- Typically synthetic in healthcare – nylon, polyester, acrylic, microfiber, aramid, thermoplastics

Durable Coated Fabrics

- Polyurethane, silicone, thermoplastic elastomers

Future of Textiles – smart textiles?



Photo by Henry Domke

MATERIALS & SURFACES

Surface Material Performance Characteristics

Durability

- Abrasion resistance
- UV resistance
- Crocking resistance
- Flame resistance
- Strength – tearing, seam, tensile
- Finishes for antimicrobial, flame resistance, stain resistance

Cleaning and Disinfection

- Is the textile flexible in cleaning chemicals to be used?
- Does it require “special” cleaners?
- Easy on / easy off?



Photo by Henry Domke

MATERIALS & SURFACES

Surface Material Performance Characteristics

Work Surfaces and Casework

- Laminate, solid surface, stainless steel, copper

Durability

- Withstand impact from equipment
- Smooth surfaces
 - Easier to clean and disinfect
 - Tends to have heavier contamination
- Seams, grout, gaps – avoid



MATERIALS & SURFACES

Surface Material Performance Characteristics

Flooring – impactful surface

- Vinyl (homo-and heterogeneous), LVT, rubber, linoleum, carpet
- Performance – easy to clean, minimize growth of microbes, durable to withstand cleaning and disinfection
- Smooth surfaces are easier to clean and disinfect, but may still be heavily contaminated
- Carpets have quality attributes but have been shown to act as a sink
- Novel disinfection products may open the door to easier and more successful disinfecting of surface materials.



Photo by Henry Domke

MATERIALS & SURFACES

Surface Material Performance Characteristics

- Heavy metals have antimicrobial properties.
- Destroys microorganisms at the cellular level
- Compliance – continually active if cleaned appropriately and not sealed.
- Copper – wound care, sinks, hardware, counters, disinfectants
- Silver – wound care, common health ailments, paint, textiles, disinfectants



MATERIALS & SURFACES

Surface Material Performance Characteristics

- Know what the specifications are and the impact on environmental surface professionals (ESP)
- Work with ESP during planning to understand what their challenges are and how design can assist.
- Evaluate material choices for performance, life-cycle, life-cycle cost, and long-term impact.



MATERIALS & SURFACES

SARS-CoV-2 (COVID-19) Evaluation of Survival on Common Environmental Surface Materials and Efficacy of a Combination Disinfectant

Material testing

- A variety of environmental surface materials commonly found in healthcare environments
 - VWC, HPL, solid surface, non-woven textile, copper products, stainless steel, vinyl (homogeneous), LVT, carpet
- N95 masks

Test Decon7 for disinfection efficacy against SARS-CoV-2

- 100%
- 1:5 ratio diluted with water

Methods

- Virus survival rates on materials
- D7 disinfection efficacy
- D7 disinfection of materials at 30 (s), 1 (m), 5 (m), 10 (m) contact time
- D7 disinfection of N95 masks

Completion expected April 30, 2020





CLEANING & DISINFECTION

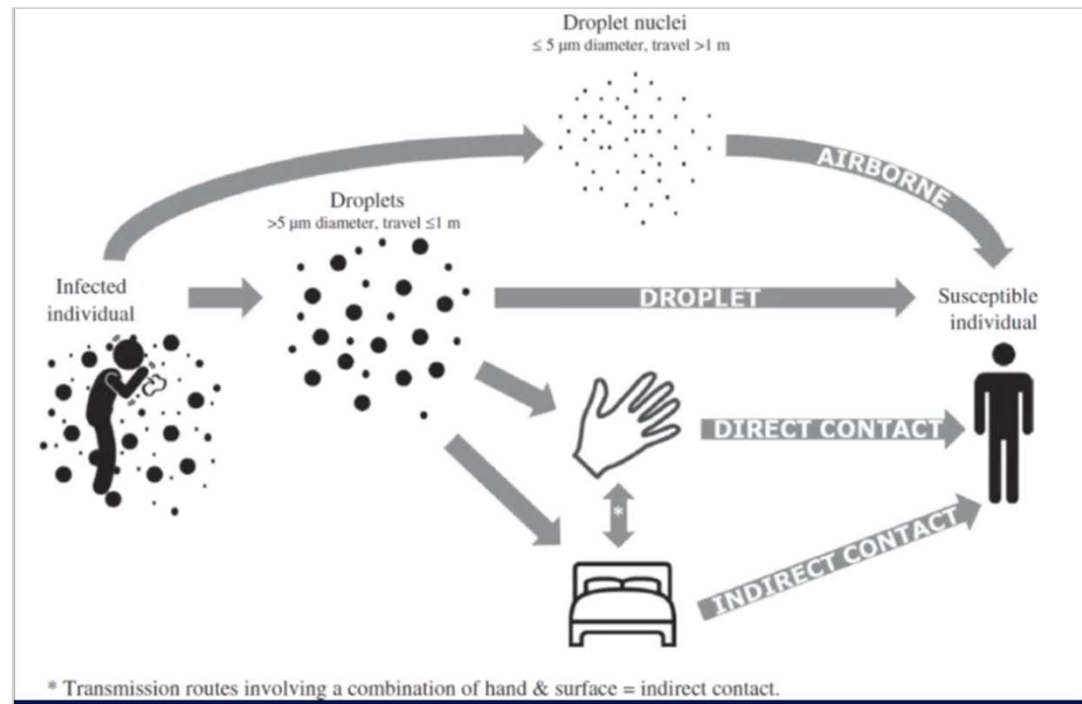
Shari Solomon, ESQ.

President & Founder, CleanHealth Environmental, LLC

CLEANING & DISINFECTION

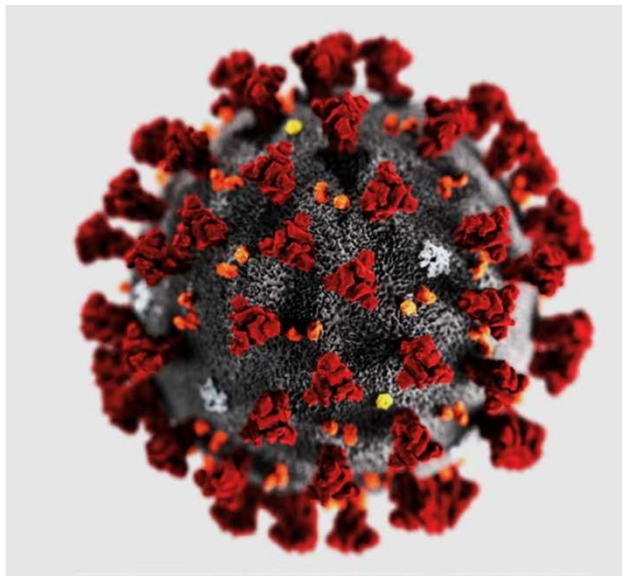
How does COVID-19 Spread?

- Person-to-person
 - Between people who are in close contact with one another (within about 6 feet)
 - Via respiratory droplets produced when an infected person coughs or sneezes.
- Contact with infected surfaces or objects
- Through feces



CLEANING & DISINFECTION

Surface Contamination

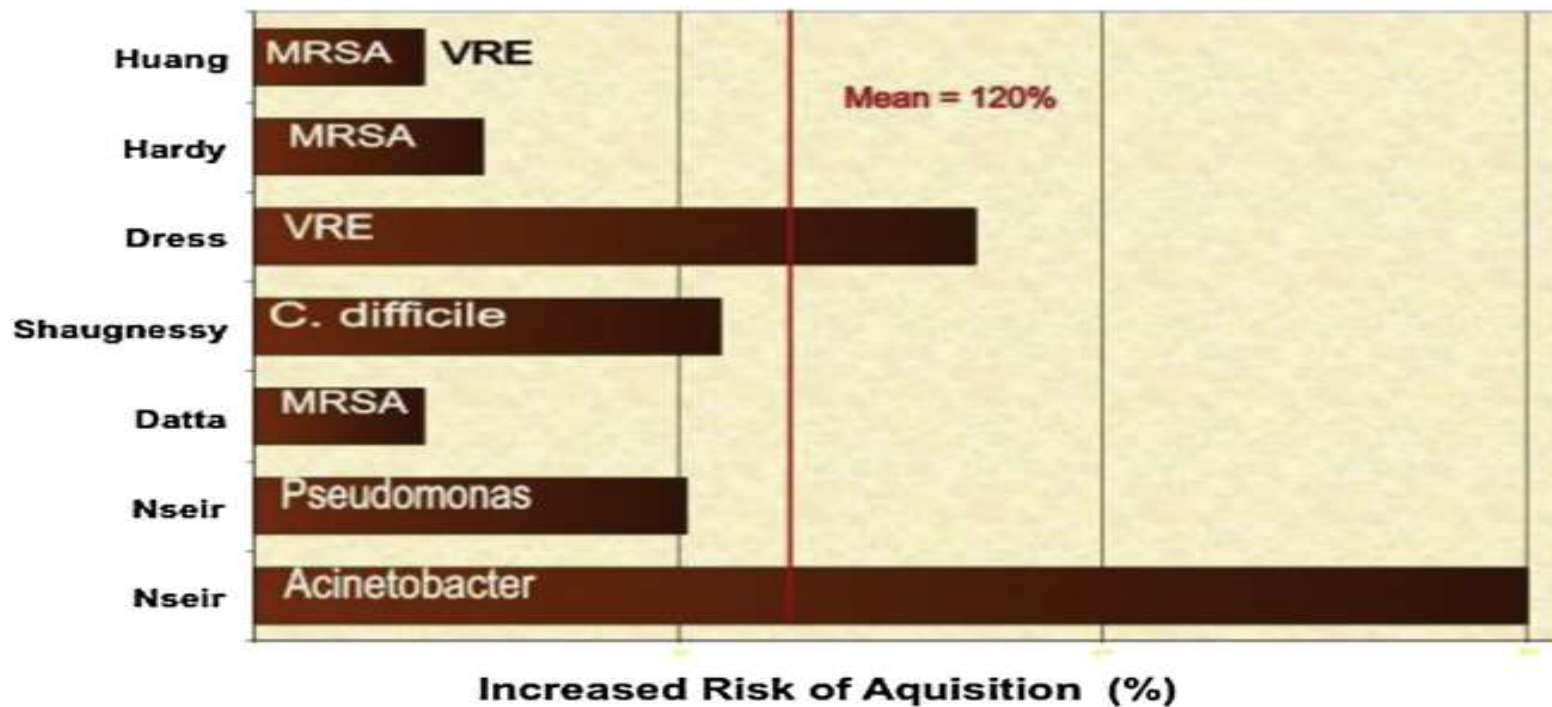


Over the past decade, substantial scientific evidence has accumulated indicating that contamination of environmental surfaces plays an important role in the transmission of several key healthcare-associated pathogens.

Understanding and Preventing Transmission of Healthcare-Associated Pathogens Due to the Contaminated Hospital Environment
- David J. Weber, MD, MPH (May 2013)

CLEANING & DISINFECTION

Increased HAP Acquisition Risk from Prior Room Occupant



Carling P. Methods for assessing the adequacy of practice and improving room disinfection. AJIC. 2013.

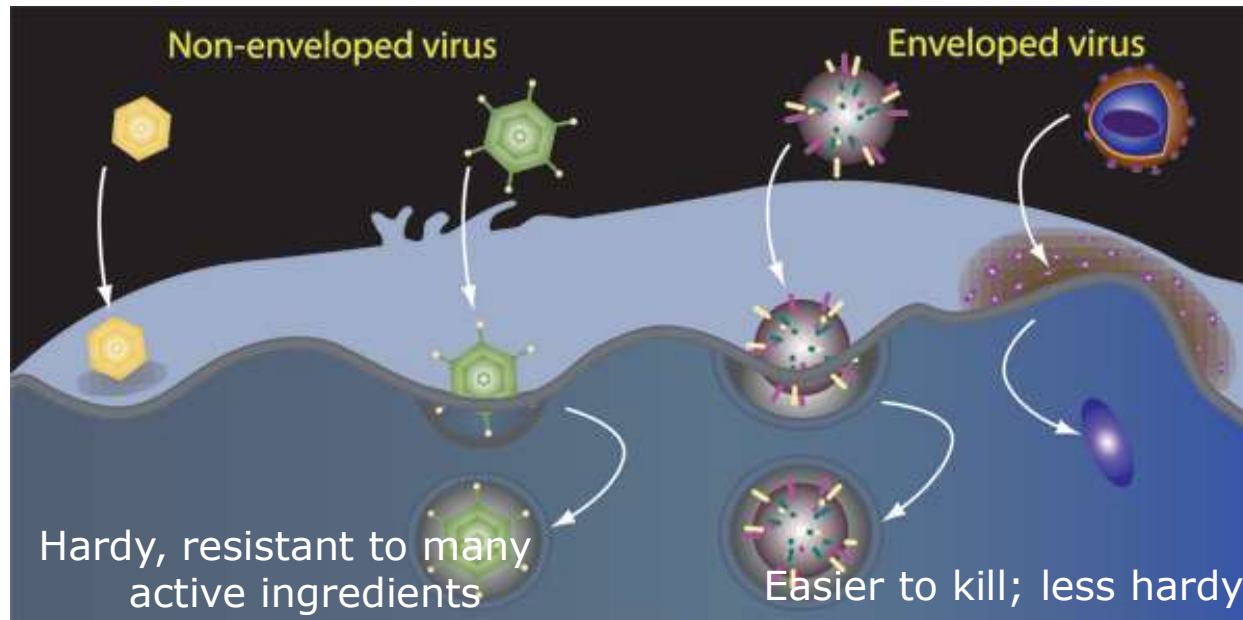
CLEANING & DISINFECTION

NIH's National Institute of Allergy and Infectious Diseases (NIAID) Study

- Active on plastic and stainless-steel surfaces for 2 to 3 days under the conditions in this experiment.
- Infectious for up to 24 hours on cardboard and
- Infectious 4 hours on copper.
- Detectable in aerosols for up to 3 hours

These times will vary under real-world conditions, depending on factors including temperature, humidity, ventilation, and the amount of virus deposited

CLEANING & DISINFECTION



- Picornoviridae (Polio, Enterovirus, Hepatitis A , Rhino)
- Calicivirus, Norovirus
- Adenovirus
- Rotavirus

- Coronavirus
- Hepatitis C
- Hepatitis B
- Influenza
- HIV-1

CLEANING & DISINFECTION

Cleaning vs. Sanitizing vs. Disinfecting

Cleaning

- The removal of material like dust, soil, and blood and body fluid.
- Physically removes rather than kills microorganisms. Accomplished with water, detergents, and mechanical action.
- Always essential prior to disinfection or sterilization.
- A surface that has not been cleaned effectively cannot be properly disinfected or sterilized.

Sanitizing

- Carry a general claim of germ control, but generally not organism specific.
- There are two basic kinds of sanitizers; food contact and non-food contact sanitizers:
 - food contact surfaces 99.999% (a 5-log reduction) within 30 seconds.
 - nonfood contact surfaces 99.9% (a 3-log reduction) within 30 seconds.

Disinfecting

- Disinfection is the process of inactivation of pathogens.
- Usually involves chemicals, heat or UV.
- Sterilization destroys microbial life including bacteria, viruses, spores and fungi.
- Most common disinfectants used are quaternary ammonium compound products, hydrogen-peroxide-based products, and sodium hypochlorite (bleach).

CLEANING & DISINFECTION

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Cleaning & Disinfection

Used with permission from



Resistance of pathogens to disinfectants

Hard-to-Kill



Easy-to-Kill

Pathogens	Example	Disinfectants		
		Low-level Disinfection	Intermediate-level Disinfection	High-level Disinfection
Prions	Mad Cow Disease			
Bacterial Spores	Clostridium difficile			Peracetic acid / hydrogen peroxide blends
Mycobacteria	Tuberculosis		Quat / alcohol	Bleach and Hydrogen peroxide
Nonlipid or small viruses	Norovirus		Quat / alcohol blends	
Fungi	Athletes foot	Quats		
Vegetative bacteria	MRSA, VRE			
Lipid or medium viruses	HIV			

Certified Healthcare Environmental Services Technician

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CLEANING & DISINFECTION

U.S. Centers for Disease Control and Prevention

- Environmental Cleaning and Disinfection Recommendations:
 - Interim Recommendations for US Community Facilities with Suspected/Confirmed Coronavirus Disease 2019:
<https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/cleaning-disinfection.html>
 - Interim Recommendations for US Households with Suspected/Confirmed Coronavirus Disease 2019:
<https://www.cdc.gov/coronavirus/2019-ncov/prepare/cleaning-disinfection.html>

CLEANING & DISINFECTION



U.S. Centers for Disease Control and Prevention

- Interim Infection Prevention and Control Recommendations for Patients with Confirmed Coronavirus Disease 2019 (COVID-19) or Persons Under Investigation for COVID-19 in Healthcare Settings:

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control.html>



CLEANING & DISINFECTION

CDC: Interim Infection Prevention and Control Recommendations

Definition of Healthcare Personnel (HCP) – For the purposes of this guidance, HCP refers to all persons, paid and unpaid, *working in healthcare settings engaged in patient care activities*, including: patient assessment for triage, entering examination rooms or patient rooms to provide care or clean and disinfect the environment, obtaining clinical specimens, handling soiled medical supplies or equipment, and coming in contact with potentially contaminated environmental surfaces.



CLEANING & DISINFECTION

CDC: Implement Environmental Infection Control: Medical Equipment

- All non-dedicated, non-disposable medical equipment used for patient care should be cleaned and disinfected according to manufacturer's instructions and facility policies.
- Ensure that environmental cleaning and disinfection procedures are followed consistently and correctly.
- Management of laundry, food service utensils, and medical waste should also be performed in accordance with routine procedures.



Detailed information on environmental infection control in healthcare settings can be found in CDC's [Guidelines for Environmental Infection Control in Health-Care Facilities](#) and [Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings](#)[section IV.F. Care of the environment].

CLEANING & DISINFECTION

CDC: Implement Environmental Infection Control cont.

Routine cleaning and disinfection procedures (e.g., using cleaners and water to pre-clean surfaces prior to applying an EPA-registered, hospital-grade disinfectant to frequently touched surfaces or objects for appropriate contact times as indicated on the product's label) are appropriate for COVID-19 in healthcare settings, including those patient-care areas in which aerosol-generating procedures are performed.

CLEANING & DISINFECTION

List N: Disinfectants for Use Against SARS-CoV-2

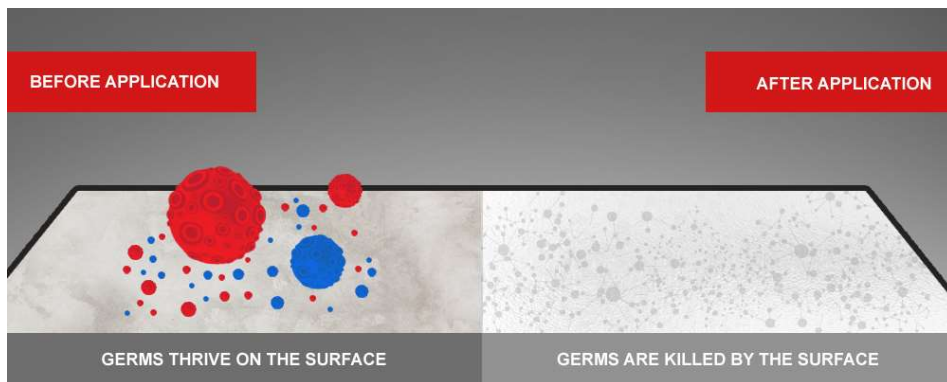
<https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>

- List N includes products that meet EPA's criteria for use against SARS-CoV-2, the novel coronavirus that causes the disease COVID-19.
- When purchasing a product, check if its **EPA registration number** is included on this list. If it is, you have a match and the product can be used against SARS-CoV-2. Products may be marketed and sold under different brand names.
- **Note: Inclusion on this list does not constitute an endorsement by EPA.**

CLEANING & DISINFECTION

Emerging Technologies: Getting Ahead of the Next Outbreak

Trends and Technologies: Antimicrobial Surfaces



CLEANING & DISINFECTION

Emerging Technologies: Getting Ahead of the Next Outbreak

- Disinfecting Unit: Inserted into the ducts of an HVAC system, The system reacts with the H₂O molecules found in the air to continuously create highly effective oxidizing molecules, which are delivered at safe levels to all surfaces.
- High-intensity Narrow-spectrum (HINS) Light - composed of violet light from the visible spectrum with a wavelength of 405 nanometres (nm)





TRANSFORMING SPACE / MOBILE UNIT

Jane Rohde, AIA, FIDA, ASID, ACHA, CHID, LEED AP BD+C, GGA- EB
Principal, JSR Associates, Inc.

ALTERNATE CARE SITES

Identify Clinical Goals as These Dictate Needed Infrastructure

- COVID Suspected Patients ?
- Non-COVID Patients ?
- Acuity Level ?
- Adequate Skilled Care Providers and Support Staff ?
- Access and Proximity to Hospital, Infrastructure, and Areas of Demand ?
- Consider Liability Issues if Diverging from FGI/State Guidelines

ASHE Note: During emergencies, it is important that activities be coordinated through the organization's incident command system. Activities outside of an organization's command structure should be coordinated with the local, county and state incident command systems. This enables effective and efficient incident management within common organizational structures.

See ASHE Resources: <https://www.ashe.org/converting-alternate-care-sites-patient-space-options>

ALTERNATIVE CARE SITES

Key Determining Factors

- Gases – fire rated storage for O₂ canisters if centralized
- Power – portable vacuum pumps / ventilator / monitors / IV pumps / equipment charging / generator (UPS backup) / IT – Internet
- Sinks/Plumbing – handwashing / alternative of hand sanitizer / adequate toilet access
- Clear Floor Space – DPH min. 6'-0" versus FGI 5'-0" min.
- Patient Privacy – portable screen walls / cubicle curtains
- Soiled/Clean Separation – disposal routes including dedicated service elevator

Source: Boston Society of Architecture: <https://www.architects.org/covid-19-resources/make-shift-alternative-care-sites/additional-key-words-for-facility-suitability-by-building-typology>

ALTERNATIVE CARE SITES

Key Determining Factors

- Corridor Width – bed and stretcher movement / accommodation for PPE zone outside patient bed areas
- Support Staging – safe / secure rooms / areas to prepare and store medication and equipment / supply storage
- Life Safety – egress, sprinkler coverage, and fire alarm
- Cleanability of Materials – clean and disinfect surfaces – reinforcing smooth, solid, non-porous surfaces
- Negative Airflow – negative pressure with direct exhaust desirable / temporary vestibule to enable use of negative pressure (portable HEPA filtered negative pressure machines).

Source: Boston Society of Architecture: <https://www.architects.org/covid-19-resources/make-shift-alternative-care-sites/additional-key-words-for-facility-suitability-by-building-typology>

ALTERNATIVE CARE SITES (ACS)

Isolation Sites (Tier 1)

Patient population

- Symptomatic COVID-19+
- Exposed but no symptoms

Limited monitoring

Facility type

- Hotel – private room and bath
- Dormitory – private room and bath

Low-Acuity Alternate Care Sites (Tier 2)

Patient population

- COVID-19+ convalescing

Higher level of monitoring & assistance

Facility type – open layout

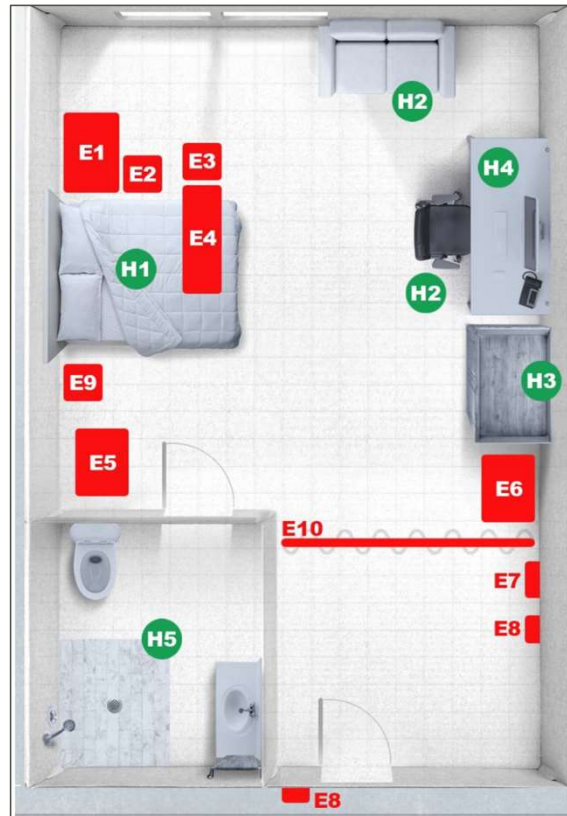
- School gymnasium
- Arena
- Convention hall

HOTEL ROOM TO HEALTHCARE ROOM



H2HC

- DoD UFC Criteria
- 1990 or later
- Single room with attached bathroom
- Install exhaust on exterior wall if required
- Sprinklers / meets Fire Code
- 3-Phase / 3-Wire Power



HOTEL PROVIDED

- H1. HOTEL BED
*WITH MEDICAL LINENS
- H2. HOTEL/RECLINING CHAIR
- H3. HOTEL DESK
- H4. HOTEL WARDROBE
- H5. HOTEL PLUMBING FIXTURES

ENGINEERING CHANGES

1. REMOVE CARPET
2. INSTALL VINYL FLOORING OR EPOXY
3. *REVISE HVAC DUCTING AND HEPA FILTERING*
4. ADD EMERGENCY BACK-UP POWER & UPS
5. ADD ELECTRICAL OUTLETS
6. ADD PRIVACY CURTAIN

SPECIAL MEDICAL EQUIPMENT – TO BE PROVIDED BY OTHERS (NON-USACE)

- E1. VENTILATOR CAPABLE; STORAGE CABINET
- E2. TELEMTRY/PUMP ON IV STAND
- E3. STOOL
- E4. OVER BED TABLE
- E5. MOBILE WORK STATION
- E6. LINEN HAMPER
- E7. SHARPS/GLOVES
- E8. HAND SANITIZER STATION
- E9. INFECTIOUS WASTE
- E10. CUBICLE CURTAIN

PHASES

1. SITE (State)
2. BUILD (USACE)
3. SUPPLY (FEMA)
4. STAFF (State)

STANDARD DESIGN

*COVID
Non-COVID
Scalable, Tailorable,
Site Adaptable

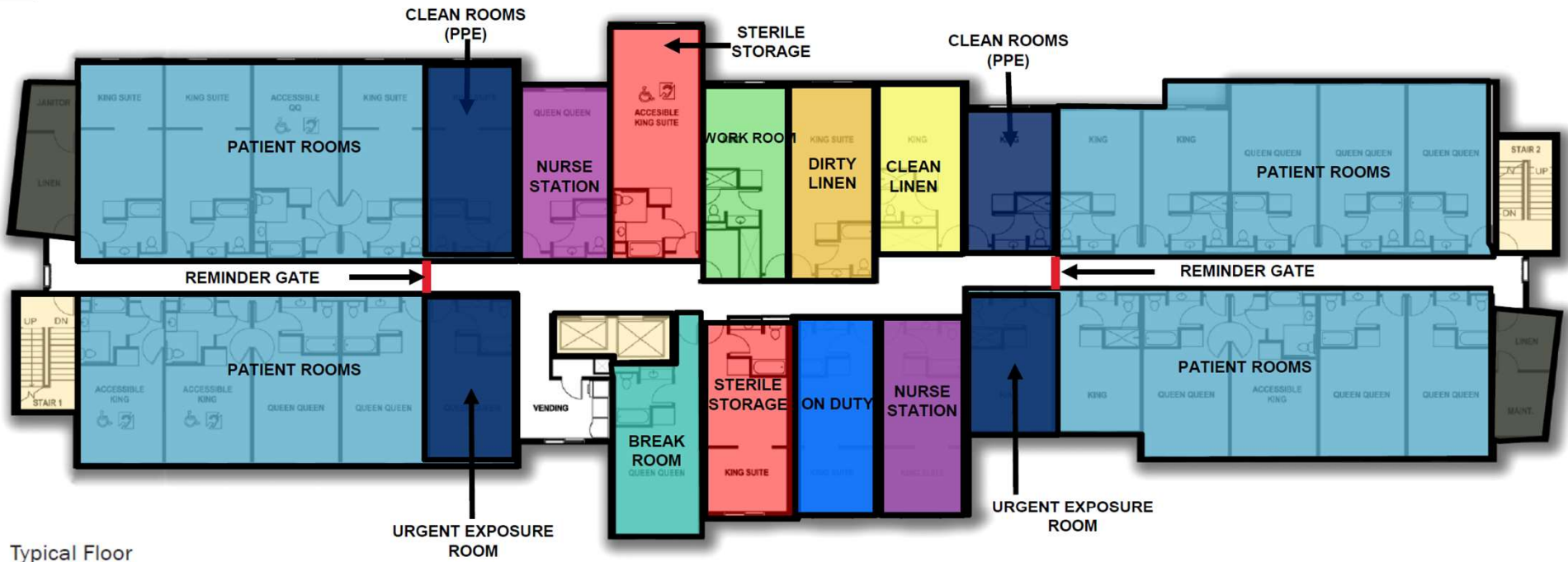
Sourced from US Army Corp of Engineers Update on COVID-19 Response: March 27, 2020

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H2HC - TYPICAL FLOOR PLAN



Typical Floor

HOTEL PROVIDED

1. HOTEL WI-FI
2. HOTEL PHONE SYSTEM
3. HOTEL IN-HOUSE NETWORK/TVs
4. HOTEL ICE MACHINE/VENDING
5. HOTEL PACKAGED HVAC

ENGINEERING CHANGES

1. MODIFIED ELEVATOR CONTROLS

STANDARD DESIGN

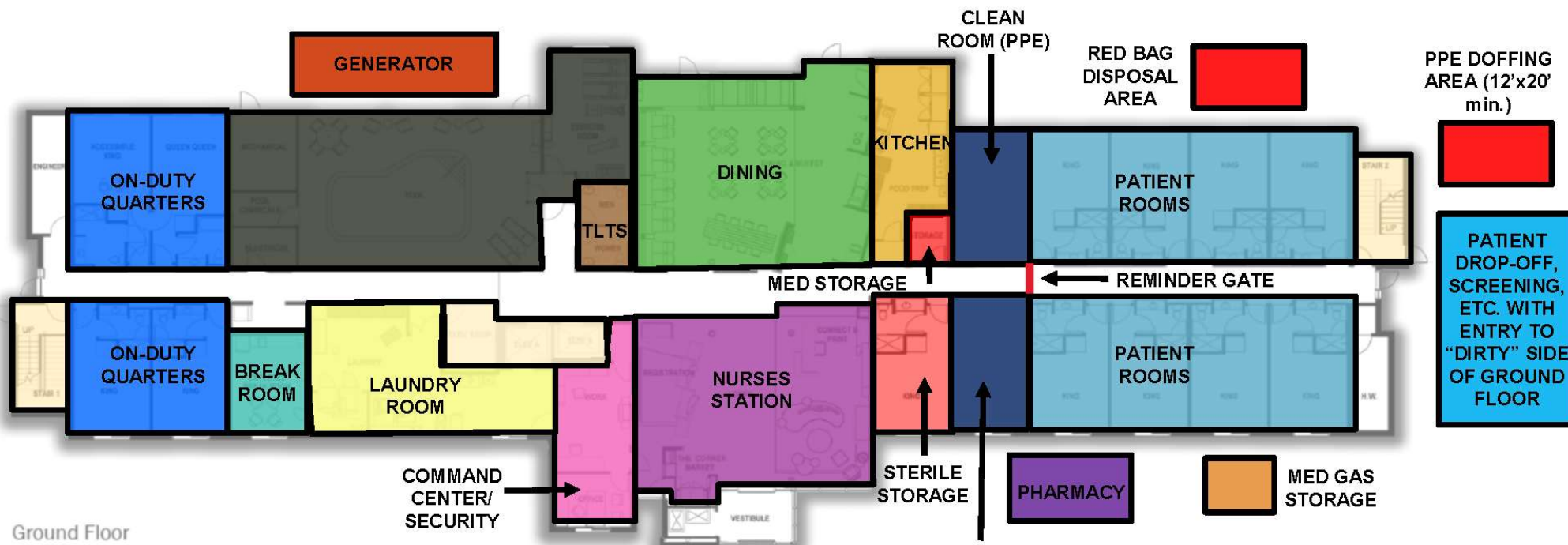
*COVID
 Non-COVID
 Scalable, Tailorable,
 Site Adaptable

SPECIAL MEDICAL EQUIPMENT

1. NURSE CALL
2. STORAGE SHELVING
3. WORKSTATIONS
4. MED DISPENSING UNITS
5. # VENTILATORS / FLOOR
6. "CRASH" CART / FLOOR
7. REMINDER GATES
8. EYE/HAND WASH STATIONS



H2HC - GROUND FLOOR PLAN



Ground Floor

HOTEL PROVIDED

- HOTEL FURNITURE FOR STAFF QUARTERS
- HOTEL KITCHEN
- HOTEL DINING
- HOTEL VESTIBULE
- HOTEL CCTV FOR SECURITY
- HOTEL CARD READERS

STANDARD DESIGN

*COVID
Non-COVID
Scalable, Tailorable,
Site Adaptable

ENGINEERING CHANGES

- ALL TYPICAL FLOOR PLAN ADDITIONS
- PLUS GENERATOR

NEW EQUIPMENT

- METAL DETECTOR
- VTC FOR COMMAND CENTER
- CONTROLLED ACCESS
- INFECTIOUS/CLEAN
- REMINDER GATES
- EYE HANDWASH STATIONS

Sourced from US Army Corp of Engineers Update on COVID-19 Response: March 27, 2020

STUDENT HOUSING / DORMITORIES

Holmes Student Center

North Illinois University

Alternative Housing

- Those awaiting test results
- Those tested positive but no where to isolate or quarantine

Illinois Emergency Management Agency & DeKalb County Health Department

Coordination of healthcare, nutrition, transportation, social and personal needs of individual patients



Photo Friday, April 3, 2020.
NIU / Source: WNIJ News



CONVENTION CENTERS / ARENAS

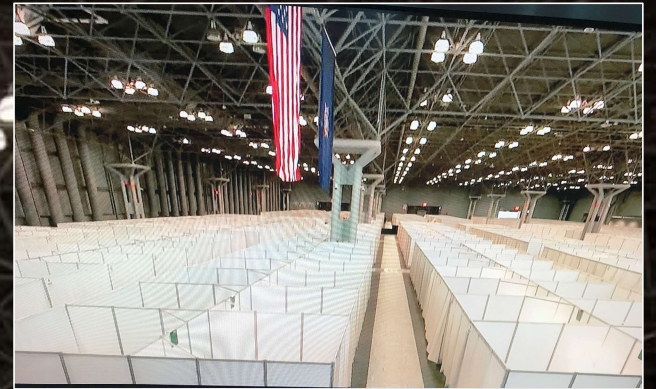
Ernest N. Morial Convention Center in New Orleans, Louisiana

- Step down units set up to be used after being released from the hospital – positive from COVID-19
- Testing units separated for patients awaiting testing results
- All halls set up to accommodate 1000 beds looking at surging to 2000 beds by the end of April 2020



4:08 80°
FOX 8
LOCAL FIRST





Post Acute Care: Javits Convention Center

PORTABLE CONTAINERS – MOBILE ICUs



exterior

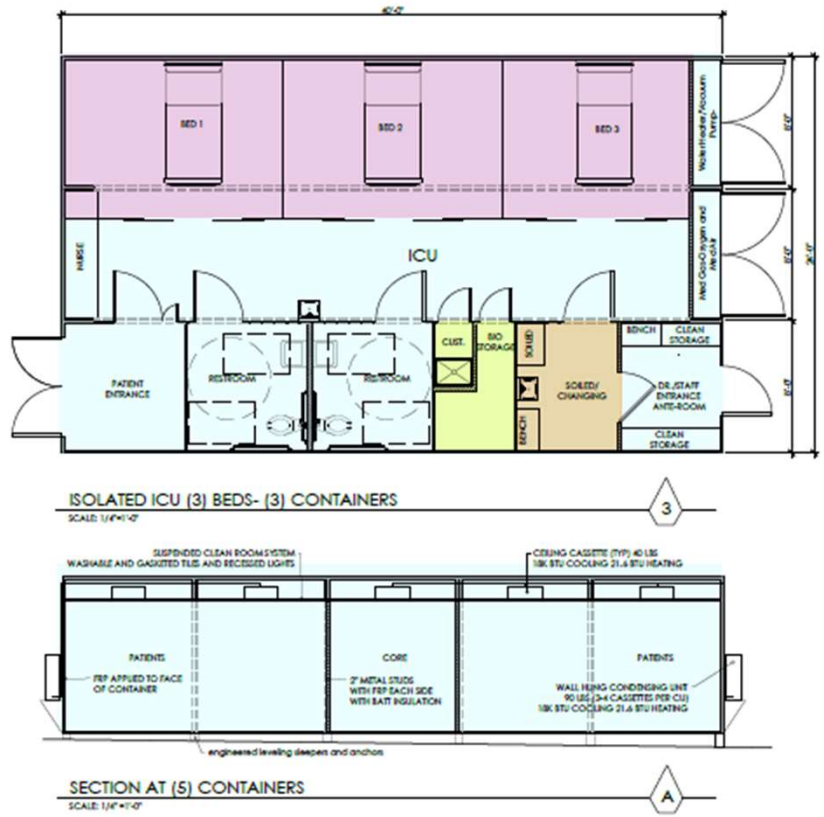


exterior

Sourced from KHI Medical / ARK Studio Architecture Planning



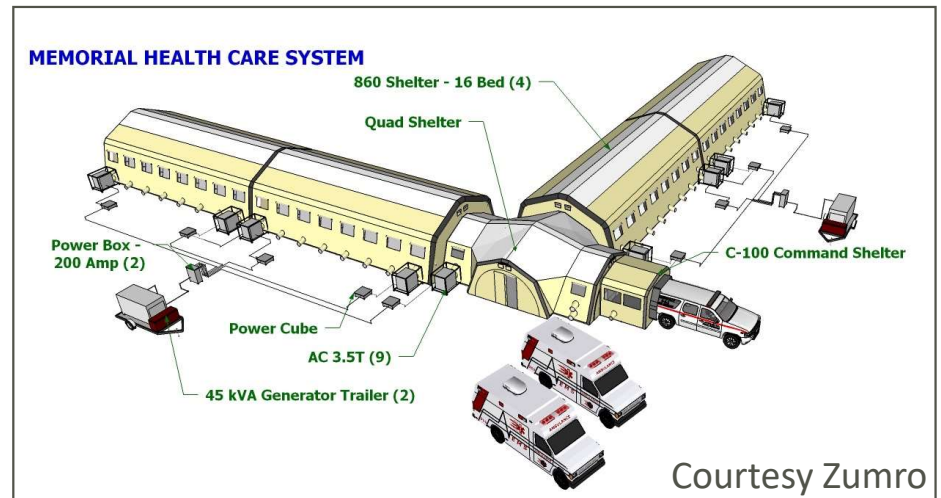
PORTABLE CONTAINERS – MOBILE ICUs



Sourced from KHI Medical / ARK Studio Architecture Planning
Health Care Operations: Implications and Actions from COVID-19 | 75

SCREENING / TRIAGE AREA NEAR ED

- Pre- Emergency Dept Screening Area of COVID-19 Positive / Suspected
- Consider Weather Factors



TREATMENT BAY



- Limited Resources
- Pressurized / Airflow Past Patient



Future Lessons Learned for Emergency Preparedness

Jane Rohde, AIA, FIDA, ASID, ACHA, CHID, LEED AP BD+C, GGA- EB
Principal, JSR Associates, Inc.

EMERGENCY PREPAREDNESS

Post-COVID-19: Planning & Preparation

- In the Pre-occupancy / Functional Programming Process – discussions to include:
 - Resilience
 - Need plan for surging to higher number of beds
 - Testing “zones” for all types of healthcare settings
 - Alternative care sites because hospitals can no longer have patients step down to nursing homes
 - Evaluation of care models within long term care settings – reduced number of residents in groups with consistent staffing to reduce spread of infection, illness, and death
 - PPE ‘kits’ and secured supplies available at point of service
 - Training and education – cleaning and disinfection of touch points
 - HVAC equipment and filtration training for facility staff to accommodate potential patient surge and protect healthcare workers, family/friends, and EMT workers

EMERGENCY PREPAREDNESS

Post-COVID-19: Planning & Preparation

- In the Pre-occupancy / Functional Programming Process – discussions to include:
- Materials and Surfaces
 - Performance
 - Multiple attributes evaluated for specifications
 - Product service life
 - Match product application to appropriate product use
 - Material Toolkits to include questions for product manufacturers, distributors, and healthcare providers including minimum testing requirements
 - Testing materials for cleaning and disinfection
 - Educating staff on cleaning and disinfection – not only related to touchpoints, but also materials and surface information

Question & Answer Session

Questions?

Please type your questions for the panelists into the Q&A box and we will answer them as we are able with the time remaining.

Question & Answer Session



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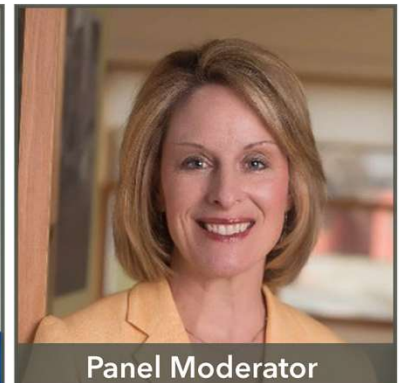
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*President & Founder,
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Environmental, LLC*



Panel Moderator

Vicki Worden,
*President & CEO,
Green Building
Initiative, Inc.*



Resources and Q&A

AVAILABLE RESOURCES

- GBI and the expert panelists have compiled a list of supporting resources pertinent to the topics covered on this webinar.
- These resources are available for download via the GBI website: <https://thegbi.org/hcwebinar>.
- This webinar recording will be available via the GBI website here: <https://thegbi.org/training/credited-courses/webinars/>

GBI and our guest panelists are pleased to be able to share information and ideas surrounding concepts and best practices related to addressing the COVID-19 issue now and in the future. Information presented does not represent official opinions of the Green Building Initiative. Additionally, none of the information, ideas, or concepts provided in this presentation should be viewed as a substitute for individualized legal, engineering, facility management, or medical advice, nor as an endorsement of any specific products or materials.

This concludes The American Institute of Architects Continuing Education Systems Course.

THANK YOU!

GBI will report AIA CES learning units if you provide(d) your AIA number.



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