VINYL SUSTAINABILITY COUNCIL

The Role of Material Selection in Cleaning and Disinfection of Public Spaces

The Vinyl Sustainabiliy Council

COVID-19 Content Document

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Introduction

Everyone's daily lives have been disrupted by the COVID-19 pandemic. Some more severely by requiring care and services from a hospital to save their own or a loved one's life. The most vulnerable populations have become isolated, while family members seek creative ways to stay connected at a safe distance. Stress on the healthcare and long-term care workers has increased; some utilizing hospitality settings for alternative living arrangements to protect their own families from the spread of the disease. "Work travel" has stopped for all but essential travel. Schools and daycares have turned homes into not only workplace settings, but also centers of education and play time for children. In-person shopping and the retail experience was walloped, relying on delivery, curb-side pick-up, and reduction of any unnecessary contact with others. New signage including the term 'six feet' has an entirely new meaning for compliance with social distancing recommendations. Constant cleaning is the new norm.

In this COVID-19 pandemic, what can we do in our existing settings to stay safe and protect others in the built environment?

What is next?

Answers will vary from geographical area and the impact of the virus including local authorities' decisions to focus on protecting those living in their jurisdictions while balancing the economic needs of their constituents. The availability of testing and tracing of the virus is critical to better understanding the potential spread and control measures needed. Everyday research is being completed that includes understanding the efficacy of cleaning and disinfection on surfaces, identifying and designing types of air filtration that can reduce infection spread, evaluating nonporous surfaces and antimicrobial effectiveness and related product specifications, and re-designing of the overall built environment to reduce the viral spread. Science-based knowledge will allow informed decisions about changes in business practices for all types of businesses. There are many moving parts and evolving information, but the use of data to drive informed decisions assists in maintaining the focus on the health and safety of individuals and the public, if evaluated in a systematic manner.

Collaborative Systematic Approach for Successful Solutions

As with all performance and sustainable improvement processes, stakeholder collaboration using an integrated, multidisciplinary team approach provides a pathway to successful solutions. The benefit of design professionals coming together with various combinations of trade associations, manufacturers, policy makers, community officials, and clients provides a broader platform for solving larger issues; by tapping into all types of available technical expertise and perspectives. Coupled with research and life cycle approaches to product, material, and system selection and design, exceptional, innovative, and collective solutions can be achieved that demonstrate the best possible specification and related outcome.

Material Selection: Collaboration Process

One example of successful collaboration occurred in 2017 when the Vinyl Institute was approached and subsequently spearheaded a group to discuss product issues that were developing in existing healthcare settings. The task group includes healthcare designers (health system based and practice based), trade associations, product manufacturers and distributors,

cleaning and disinfecting chemical manufactures, environmental services representatives, furniture manufacturers, and others who have an interest in durable coated fabrics and pre-mature failure of these products used in healthcare settings. The Durable Coated Fabrics Task Group (DCF) has grown into a full, robust initiative group supported by the American Academy of Healthcare Interior Designers (AAHID), an organization that certifies interior designers qualified by education, examination, training and experience to provide interior design services to the healthcare industry.[1]

The Vinyl Institute has been a long-standing Industry Partner and supporter of the evidence-based design approach to healthcare design that is promulgated by AAHID. The academy has continued to support all of the DCF collaborative efforts to provide resources to healthcare interior designers that assist with durable coated fabric selections based upon appropriate application, research, minimum performance standards and relevant test methods. The collaboration includes the Chemical Fabric and Films Association (CFFA), whose participation resulted in the development of the CFFA-Healthcare-201 Recommended Minimum Performance Standards for Vinyl-Coated and Other Chemical Coated Upholstery Fabrics – Healthcare (August 2020). This standard includes minimum performance testing methods for healthcare durable coated fabrics. As part of the collaborative initiative with the healthcare system-based designers, a new standard CFFA-142: Stain Resistance in Healthcare Environment has been developed and incorporated into CFFA-Healthcare-201 Standard.

These documents, along with a checklist are part of the Durable Coated Fabric Selection Process and Programming Guide developed as a toolkit for the selection of Durable Coated Fabrics. The DCF task group of design professionals came together with manufacturers and trade associations, to use their technical expertise with research to solve a specific client need. They promote a dialogue and create relationships that developed an innovative, consensus-based response to a problem. The task force's work will become the "toolkit template" for other interior product categories. This collaboration can assist designers with standard-based performance information to make better informed specification decisions for healthcare, and other environments that are impacted by the pandemic.

Manufacturers should use this same approach. Using this document as a starting place, designer, specifiers and architects, must collaborate to develop safe, high performance, and cleanable surroundings.

When designers are seeking performance information on the compatibility of cleaning and disinfection chemicals for interior products, materials, and surfaces, directly from distributors and/or manufacturers, trade associations can also provide valuable resources that cover an entire segment or family of products. Each of these resources also address and provide resources related to COVID-19 and their relevant product sectors. These include, but are not limited to:

1. The Vinyl Institute (VI) and The Vinyl Sustainability Council (VSC)

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1   American Academy of Healthcare Interior Designers (AAHID): Mission and Values: available online at https://aahid.org/about-aahid/mission-values/. (Unless otherwise noted all links provided herein are current as of June 29, 2020)

2. [Resilient Floor Covering Institute (RFCI)](#)

3. [Wallcovering Association (WA)](#)

4. [Chemical Fabric and Films Association (CFFA)](#) and [CFFA Performance Products Publications/Standards](#)

5. [Business and Institutional Furniture Manufacturer's Association (BIFMA)](#) — specifically the [BIFMA Health Care Furniture Design – Guidelines for Cleanability](#).

COVID-19 Background

There are two types of viruses, enveloped and non-enveloped.[2] SARS-CoV-2 (aka novel coronavirus) is a positive sense, single stranded enveloped RNA virus responsible for the disease, COVID-19.[3] Norovirus is an example of a non-enveloped virus. Enveloped viruses are easier to kill versus non-enveloped viruses, which are hardier.[4] As shown in the diagram below, enveloped viruses are bound by a lipid bilayer (cell membrane), where non-enveloped viruses are surrounded by a proteinaceous capsid (a capsid is the protein shell of a virus enclosing its genetic material).[5] Viruses, unlike bacteria, lack the necessary mechanism to self-replicate and are, therefore, dependent on the host cell machinery for propagation (i.e. the human host)[6] for
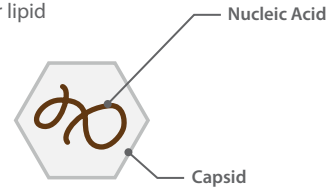
Enveloped Virius
- Enclosed within a lipid
- Sensitive to heat
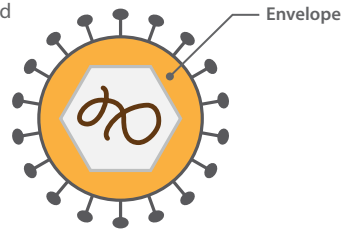
Envelope

Non-enveloped Virius
- Lacks a bilayer lipid membrane
- Heat-resistant

Nucleic Acid

Capsid

2   Thorley, J. A., McKeating, J. A., & Rappoport, J. Z. (2010). Mechanisms of viral entry: sneaking in the front door. *Protoplasma, 244*(1-4), 15–24. Available online at: https://doi.org/10.1007/s00709-010-0152-6 and https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3038234/

3   Zheng J. (2020). SARS-CoV-2: An Emerging Coronavirus that Causes a Global Threat. *International journal of biological sciences, 16*(10), 1678–1685: available online at https://doi.org/10.7150/ijbs.45053

4   Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for environmental cleaning for prevention and control of infections in all health care settings. 3rd ed. Toronto, ON: Queen's Printer for Ontario (2018). Public Health Ontario acknowledges the financial support of the Ontario Government. © Queen's Printer for Ontario (2018). Available online at https://www.publichealthontario.ca/-/media/documents/B/2018/bp-environmental-cleaning.pdf

5   Thorley, J. A., McKeating, J. A., & Rappoport, J. Z. (2010). Mechanisms of viral entry: sneaking in the front door. *Protoplasma, 244*(1-4), 15–24. Available online at: https://doi.org/10.1007/s00709-010-0152-6 and https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3038234/

6   Zheng J. (2020). SARS-CoV-2: An Emerging Coronavirus that Causes a Global Threat. *International journal of biological sciences, 16*(10), 1678–1685: available online at https://doi.org/10.7150/ijbs.45053
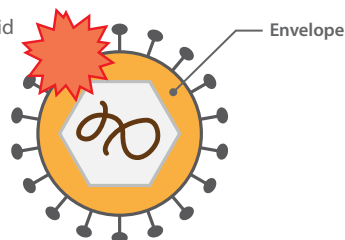Cascella M, Rajnik M, Cuomo A, et al. Features, Evaluation and Treatment Coronavirus (COVID-19) [Updated 2020 Apr 6].
In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 January: available online at https://www.ncbi.nlm.nih.gov/books/NBK554776/
Schoeman, D., Fielding, B.C. Coronavirus envelope protein: current knowledge. *Virol J 16*, 69 (2019): available online at https://doi.org/10.1186/s12985-019-1182-0

survival. The structure of SARS-CoV-2 includes a lipid membrane, which is easily compromised by cleaners and disinfectants. Once the envelope is disrupted or damaged, the virus is compromised and is no longer able to infect humans, as shown in the diagram below.[7]
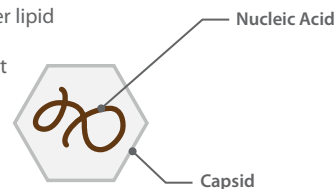
Enveloped Virius

- Enclosed within a lipid
- Sensitive to heat

Envelope

Non-enveloped Virius

- Lacks a bilayer lipid membrane
- Heat-resistant

Nucleic Acid

Capsid

The coronavirus (SARS-CoV-2) is considered both a healthcare acquired (or associated) infection (HAI), which is an infection patients get while they are receiving health care for another condition and occur in any healthcare facility (hospital, ambulatory surgical centers, end-stage renal disease facilities, and long-term care facilities)[8] and a community acquired (or associated) infection (CAI), which arises within the general population and an individual acquires the infection while being out in the community at-large.[9]

SARS-CoV-2 spreads from person to person, mainly through respiratory droplets produced when an infected person coughs, sneezes, or talks. These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs. Spread is more likely when people are in close contact with one another, which is defined as, "within 6 feet of an infected individual." The COVID-19 disease (as a CAI) can spread easily and sustainably in the community ("community spread") in many affected geographic areas. Community spread means people have been infected with the virus in an area, including some who are not sure how or where they became infected. Asymptomatic individuals can also spread the virus unknowingly as carriers.[10]

Other possible routes of transmission, currently under investigation, include touching virus-contaminated surfaces and then introducing the pathogen to one's eyes, nose or mouth, or

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7   United States Environmental Protection Agency (EPA), Guidance to Companies on referring to Registered Disinfectant Products that Meet the CDC Criteria for Use Against the Ebola Virus: available online at https://www.epa.gov/pesticide-labels/guidance-companies-referring-registered-disinfectant-products-meet-cdc-criteria-use
Patient Safety & Quality Healthcare (PSQH), Analysis: COVID-19: EPA Releases List of Registered Disinfectants (March 12, 2020): available online at https://www.healthleadersmedia.com/covid-19/covid-19-epa-releases-list-registered-disinfectants

8   Definition of health care associated infections: U.S. Department of Health and Human Services (HHS): Office of Disease Prevention and Health Promotion (ODPHP): available on line at https://health.gov/our-work/health-care-quality/health-care-associated-infections

9   Definition of *community acquired infection (CAI)*: Merriam-Webster: available online at https://www.merriam-webster.com/dictionary/community-acquired

10   Centers for Disease Control and Prevention (CDC): Coronavirus Disease 2019 (COVID-19): Frequently Asked Questions: Spread: available online at https://www.cdc.gov/coronavirus/2019-ncov/faq.html

breathing in clouds of tiny "aerosolized" virus particles that may be traveling on air currents.[11] Research to date suggests that coronavirus can stay active for hours or days on various types of surfaces, as the chart below suggests comparing SARS-CoV-1 and SARS-CoV-2 viruses.[12]

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	8 hours
Copper	8 hours	4 hours

Understanding Terminology: Cleaning, Sanitizing, and Disinfection

Because of the potential of indirect transmission from surface contamination, maintenance, as an overall system, is important for surfaces to be cleaned and sanitized (generally porous or soft surfaces) or cleaned and disinfected (generally hard or nonporous surfaces). CleanHealth Environmental, LLC adapted the following chart on cleaning, sanitizing, and disinfecting definitions from the U.S. Centers for Disease Control and Prevention (CDC) guidelines and the U.S.

Cleaning	Sanitizing	Disinfecting

• The removal of material like dust, soild, and blood and body fluid.
• Physically removes rather than kills microorganisms. Accomplished with water, detergents, and mechanical action.
• Always essential prior to disinfection.
• A surface that has not been cleaned effectively cannot be properly disinfected.
	• Carry a general claim of germ control, but generally not organism specific.
	• There are two basic kinds of sanitizers: food contact and nonfood 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.
		• 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).

11   Huang, P., Gharib, M., Jacewicz, N. The Coronavirus Crisis: Essential Vocab for COVID-19: From Asymptomatic to Zoonotic (June 27, 2020). Abraar Karan, a physician at Harvard Medical School was a source for this glossary of terms: National Public Radio (NPR). Available online at https://www.npr.org/sections/goatsandsoda/2020/06/27/883975628/essential-vocab-for-covid-19-from-asymptomatic-to-zoonotic

12   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. N Engl J Med 2020; 382:1564-1567, Correspondence, DOI: 10.1056/NEJMc2004973, Available online at https://www.nejm.org/doi/pdf/10.1056/NEJMc2004973

Food and Drug Administration (FDA)[13] providing the differences between cleaning, sanitizing, and disinfecting. For a surface to be sanitized or disinfected, it needs to be cleaned first for the subsequent step to be effective.[14]

Healthcare Lessons Learned: Performance Equals Sustainability

Lessons learned from the healthcare sector are important, as they can assist design professionals, building operators, and business owners to understand the challenges of cleaning and disinfection in other setting types. Healthcare operations can provide three considerations when evaluating surface cleaning and disinfection: 1) heighten the awareness that there is a concern for environmental services technicians (inhouse or contracted) end-users, and consumers, and their relative safety in handling and using cleaning and disinfecting chemicals, 2) the efficacy of cleaning and disinfecting protocols to successfully inactivate pathogens, and 3) the potential impact of chemicals on materials and surfaces that are being cleaned and disinfected.

Within healthcare settings, the CDC identifies three categories of items and surfaces related to cleaning and disinfection within healthcare settings. Environmental surfaces are defined as a product or material surface used within the built environment.

1. Critical Items: confers a high risk of infection if contaminated with any microorganism; this category includes surgical instruments, and anything inserted within a sterile tissue or body cavity. These items do not include environmental surfaces and require sterilization prior to use.

2. Semicritical Items: makes contact with mucous membranes or nonintact skin; this category predominantly includes medical devices but could include environmental surfaces if nonintact skin comes into direct contact with a bed rail or mattress cover (otherwise considered a noncritical item). This is less likely because of products used for wound protection. Semicritical patient care equipment that touches either mucous membranes or nonintact skin require high-level disinfection.

3. Noncritical Items: makes contact with intact skin but not mucous membranes; this category is divided into noncritical patient care items (i.e. bedpans, blood pressure cuffs, computers, etc.) and noncritical environmental surfaces (i.e. door knob, bedside table, patient furniture, and floors). Noncritical surfaces require low-level disinfection.[15, 16]

Although the term "noncritical items" may denote that environmental surface is not important, this is not true – "noncritical" is referenced as outside of the body and a potential high-touch

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13   Centers for Disease Control and Prevention (CDC) and US Food and Drug Administration (FDA): https://www.cdc.gov/infectioncontrol/guidelines/disinfection/introduction.html, https://www.cdc.gov/healthywater/emergency/cleaning-sanitizing/household-cleaning-sanitizing.html, and https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFR-Part=110&showFR=1

14   Courtesy of Clean Health Environmental: www.cleanhealthenv.com. Contact: Shari Solomon: solomon@cleanhealthenv.com.

15   CDC: A Rational Approach to Disinfection and Sterilization: Guideline for Disinfection and Sterilization in Healthcare Facilities (2008): available online at https://www.cdc.gov/infectioncontrol/guidelines/disinfection/rational-approach.html

16   CDC: Infection Control, Disinfection and Sterilization: 3. Indications for Sterilization, High-Level Disinfection, and Low-Level Disinfection: available online at https://www.cdc.gov/infectioncontrol/guidelines/disinfection/

surface that can be contaminated and a means for indirect transmission of pathogens, whereas "critical" and "semicritical" are most often related to inside the body or exposure to a mucous membrane that could provide transmission of infection into the body. "Noncritical items" include environmental surfaces that require cleaning and low-level disinfection. A high-touch surface that is contaminated is called a fomite. This could be a doorknob, a light switch, a TV remote or nurse call, or any other surface that is potentially touched frequently by multiple people. Floors are considered noncritical items within healthcare settings because of the maintenance methods; for example, if the water and cleaning chemical and device or microfiber cloth is not changed at appropriate intervals to maintain the efficacy of the chemical solution and/or the cleanliness of the cloth or mophead, a heavy burden of pathogen / microbes can be spread between rooms.[17] Low-level disinfectants used on noncritical items include U.S. Environmental Protection Agency (EPA)-registered hospital disinfectants designed for housekeeping purposes in patient care areas.[18]

How does cleaning and disinfection of healthcare facilities impact other settings like hospitality, education, restaurants, retail, and workplace?

As a result of potential indirect transmission through the contamination of high-touch surfaces and subsequently touching the mouth, eyes, or nose, CDC guidance is provided to clean and disinfect all community spaces[19] (those other than healthcare and outside the home[20]) to inactivate SARS-CoV-2. High-touch surfaces are the priority for cleaning and disinfection after taking steps to create operational policies and procedures around personal protective equipment and individual responsibilities for safety and hygiene.

What is available for disinfecting surfaces to inactivate the coronavirus?

The EPA is the regulatory authority for registered disinfectants. For SARS–CoV–2 disinfection the EPA List N is the recognized source.[21] EPA has developed a tool for looking up registered disinfectants[22] that are searchable by EPA Registration Number, Active Ingredient, Use Site, Contact Time, Browse All, and Keyword Search. The customized search tool allows a search of the current 490 disinfection chemicals listed (as of 9/10/2020).

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17   CDC: Healthcare-associated Infections (HAI): Preventing HAIs: Environmental Cleaning in Resource-Limited Settings. 4. Environmental Cleaning Procedures: Best Practices for Environmental Cleaning in Healthcare Facilities in RLS: https://www.cdc.gov/hai/prevent/resource-limited/cleaning-procedures.html

18   CDC: Infection Control, Disinfection and Sterilization: 4. Selection and Use of Low-Level Disinfectants for Noncritical Patient-Care Devices and 5. Cleaning and Disinfecting Environmental Surfaces in Healthcare Facilities: available online at https://www.cdc.gov/infectioncontrol/guidelines/disinfection/

19   CDC: Coronavirus Disease 2019 (COVID-19): Cleaning and Disinfection for Community Facilities; Interim Recommendations for U.S. Community Facilities with Suspected/Confirmed Coronavirus Disease 2019 (COVID-19): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/cleaning-disinfection.html

20   CDC: Coronavirus Disease 2019 (COVID-19): Cleaning Your Home; Everyday Steps and Extra Steps When Someone is Sick, available online at https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/disinfecting-your-home.html
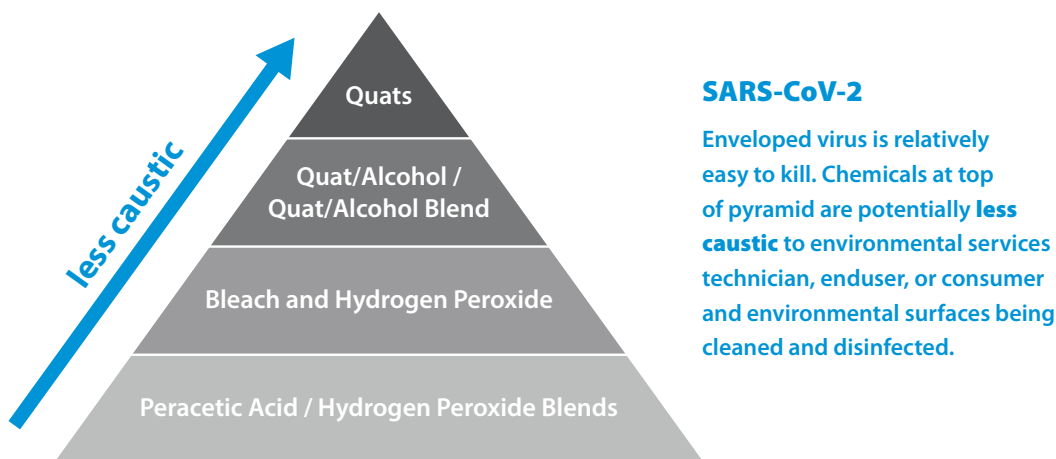
21   United States Environmental Protection Agency (EPA): Pesticides Registration: List N: Disinfectants for Use Against SARS-CoV-2 (COVID-19: All products on this list meet EPA's criteria for use against SARS-CoV-2, the virus that causes COVID-19: available online at https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2

22   EPA: List N Tool: COVID-19 Disinfectants: available online at https://cfpub.epa.gov/giwiz/disinfectants/index.cfm

What is the approach to disinfection chemical selection?

Often the first reaction for untrained staff or consumers is to go with bleach (sodium hypochlorite) for disinfection; however, other chemistries that are less caustic to environmental services technicians, end users, and/or consumers are effective in killing the SARS–CoV–2. The diagram below illustrates the most (at the bottom of the pyramid) to the least caustic (at the top of the pyramid) of the generic disinfectant chemicals listed within the EPA List N.

less caustic

Pyramid (top to bottom):
- Quats
- Quat/Alcohol / Quat/Alcohol Blend
- Bleach and Hydrogen Peroxide
- Peracetic Acid / Hydrogen Peroxide Blends

SARS-CoV-2

Enveloped virus is relatively easy to kill. Chemicals at top of pyramid are potentially **less caustic** to environmental services technician, enduser, or consumer and environmental surfaces being cleaned and disinfected.

Using a less harsh chemical or formula decreases the potential for disinfecting chemicals to degrade or compromise a material, product, or surface.[23] Based upon the work completed by the Durable Coated Fabrics Task Group, the use of disinfection chemicals on materials, preconceptions about sustainable materials without verification of required performance characteristics, and the inappropriate selection of materials for a specific application can create premature product failure. Not meeting the anticipated product service life established with the client or owner can result in millions of dollars of unplanned replacement capital costs. A premature failure is not sustainable—a high performance product is resilient and sustainable — meeting the needs of the Owner Project Requirements (OPR) including service life. A product, material, surface, or system failure can lead to a cascading effect of costly issues. It is not only the replacement of the failed product, but the other associated costs. For example, if an upholstery fails, it requires staff time (contracted or inhouse) to find and implement solutions to correct the failure, the evaluation of the upholstered furniture piece—discard entirely as compromised and not componentized, replacement of the upholstery and the downtime to a facility without the needed/required furnishings that could result in decrease from revenue generating spaces. Monies for these replacements must be reallocated from other operational budget line items, such as funds meant for additional improvements, education and training, equipment purchases or preventative maintenance. There can also be negative health outcomes from a premature product failure. Using the same durable coated fabric example, if an upholstery or an arm finish fails, it provides a reservoir for pathogens, potentially spreading in-

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23   Information for diagram based upon chart from ©2015 Association for the Healthcare Environment from Kimberly-Clark Professional and CleanHealth Environmental: www.cleanhealthenv.com. Contact: Shari Solomon: solomon@cleanhealthenv.com

fection by touch of a contaminated surface. If degradation of a high-touch surface occurs that prevents it from being cleaned and disinfected, it can be an indirect means of transmission to hands and subsequent to mouth, eyes, and nose of not only SARS-CoV-2 but other pathogens including non-enveloped microorganisms that are more difficult to kill.

What is the approach to material and product selection?

When selecting materials, it is not performance versus sustainability, but performance equals sustainability. A product should be evaluated from a multiple-attribute perspective – performance characteristics, desired product service life, sustainable characteristics established from life cycle assessment impact categories (i.e. Environmental Product Declaration), and a health and safety perspective. A 'red list' or 'deselection' approach is inappropriate, because science is not used to evaluate a chemical or chemical formulation to understand if there are health and safety risks of an installed product. Singling out one chemical or constituent without fully understanding chemistry and formulations is not evidence or science-based. The ASTM Standard Practice for Preparing an Occupant Exposure Screening Report (OESR) for Substances in Installed Building Products provides guidance to manufacturers to develop a comprehensive hazard and risk assessment based upon exposure. This process is the basis of new Product Risk Assessment criteria being incorporated into the Green Building Initiative's GBI/ANSI 01-2019 continuous maintenance updates. The ANSI standard is the basis for the content of the Green Globes – New Construction rating system and an ANSI standard is in process for the Green Globes – Existing Building rating system.

The process that can be used to mitigate material and product failures includes balancing criteria:

1. Understand performance requirements for a material, product, or surface.
2. Select a product based upon multiple attributes, versus a single attribute approach without context of all product characteristics.
3. Evaluate impact categories included within a product specific or an industry average Environmental Product Declaration (EPD).[24]
4. Identify and verify product service life expectations.
5. Select an appropriate product based upon the application requirements.
6. Understand the types of cleaning and disinfection protocols that are going to be used within the setting (particularly in consideration of all community environments and homes using CDC guidance to clean and disinfect to limit the spread of COVID-19).
7. Work collaboratively with manufacturer and/or trade association(s) to understand technical information about a product, including performance characteristics and chemistry.

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24   Definition of Environmental Product Declaration (EPD): an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products. As a voluntary declaration of the life-cycle environmental impact, having an EPD for a product does not imply that the declared product is environmentally superior to alternatives: The International EPD® System: available online at https://www.environdec.com/What-is-an-EPD/

8. Follow and provide all manufacturer cleaning and disinfection recommendations to owner or client (including environmental services).

9. Complete a product mock-up to compare minimum performance testing results and real-world conditions.

How does COVID-19 influence material and product selection for all public spaces?

Based upon the CDC guidelines, all public spaces have essentially come under the same infection prevention scrutiny for cleaning and disinfecting environmental surfaces as healthcare settings. This places a focus on nonporous or 'hard' surfaces versus porous or 'soft' surfaces being used in all public spaces – hospitality, restaurants, education, retail, and workplace. Surfaces for evaluation include high-touch surfaces directly touched by hands and flooring based upon the need for adherence to maintenance protocols that reduce spread of pathogens during the cleaning process. Hard or non-porous surfaces such as resilient flooring, durable coated vinyl fabrics, solid surface or thermally fused countertops, furniture tops, and chair arms as utilized in healthcare settings, are now also, appropriate for specifying within all types of public spaces. Soft or porous surfaces including woven upholstery (without moisture back), pillows, window treatments, and carpet can be cleaned, but are difficult if not impossible to disinfect. The CDC guidance for cleaning and disinfection for public spaces, workplaces, businesses, schools, and homes is to 1) develop a plan, 2) implement the plan, and 3) maintain and revise the plan. There is a flow chart provided on _Making Your Plan to Clean and Disinfect_ that includes the following guidance specifically on hard and non-porous materials versus soft and porous materials.[25]

What type of material is the surface or object?

Hard and non-porous materials like glass, metal, or plastic.

Visibly dirty surfaces should be cleaned prior to disinfection.

Consult EPA's list of disinfectants for use against COVID-19, specifically for use on hard, non-porous surfaces and for your specific application need. More frequent cleaning and disinfection is necessary to reduce exposure.

Soft and porous materials like carpet, rugs, or material in seating areas.

Thoroughly clean or launder materials.

Consider removing soft and porous materials in high traffic areas. Disinfect materials if appropriate products are available.

Figure 1: Centers for Disease Control and Prevention, _Making Your Plan to Clean and Disinfect_

There is a caveat for soft and porous materials noted in the chart above to disinfect materials if appropriate products are available. **Typically, disinfection chemicals are not recommended for soft and porous materials**. It is not recommended due to damage to the materials and lack of efficacy because of a texture or weave that does not allow a surface to be wiped down without being absorbed into the material or substrate. If possible, depending upon the material, laundering is advised. For all surfaces, non-porous and porous, evaluation of the cleaning

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25   CDC: Guidance for Cleaning & Disinfecting Public Spaces, Workplaces, Businesses, Schools, and Homes: Making Your Plan to Clean and Disinfect: available online at https://www.cdc.gov/coronavirus/2019-ncov/community/cleaning-disinfecting-decision-tool.html

and disinfecting chemicals and the impact to a surface or material should be verified with both the product manufacturer and the cleaning and disinfecting chemical manufacturer **prior** to using any chemicals on a surface for cleaning or disinfection. It is imperative to follow the label for use of all chemicals and the recommendations from the cleaning and disinfecting product manufacturer and the surface material manufacturer.[26]

There are newer technologies that are being used for cleaning and disinfection, but they are recommended in addition to chemical cleaning and disinfection. To date there has not been extensive testing on the efficacy and log reduction of pathogen inactivation or testing on accumulative effect of these technologies on materials, surfaces, and products.

1. UV-C – portable ultraviolet C units are used for disinfection of objects as well as spaces, predominantly in healthcare, but are being considered for hospitality spaces because of the similarity of overnight stays. One study concluded that UV-C was effective at disinfecting the most contaminated surfaces tested, being a promising alternative for disinfecting hospital materials and inanimate objects that cannot be immersed in liquid biocides, reducing the risk of pathogen transmission.[27]

2. Hydrogen peroxide vapor or mist is another technology that is currently being utilized within healthcare settings and being considered for other public spaces.[28]

3. The use of electrostatic sprayers as a delivery method for applying disinfection chemicals applications has increased in popularity because of COVID-19. This method of disinfection application may be relevant for testing materials and surfaces in addition to the types of disinfection chemicals to determine impacts.[29]

4. As these technologies, applications, and additional new products are developed and recommended, all materials and surfaces are potentially subject to degradation; therefore, appropriate performance testing is highly recommended.

How does COVID-19 influence ventilation, filtration, and plumbing systems for all public spaces?

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) through its Environmental Health Committee, created an Epidemic Task Force to provide guidance on design, operation, and maintenance of heating, ventilating, and air-conditioning systems to assist with the reduction of pathogen transmission through the air in not only healthcare facilities, but also workplace, retail, and other types of public facilities. Per ASHRAE, the "transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the

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26   CDC: Infection Control: Summary of Recommendations: 4. Selection and Use of Low-Level Disinfectants for Noncritical Patient-Care Devices and 5. Cleaning and Disinfecting Environmental Surfaces in Healthcare Facilities: available online at https://www.cdc.gov/infectioncontrol/guidelines/disinfection/#anchor_1555614087

27   Guridi, A., Sevillano, E., de la Fuente, I., Mateo, E., Eraso, E., & Quindós, G. (2019). Disinfectant Activity of A Portable Ultraviolet C Equipment. *International journal of environmental research and public health, 16*(23), 4747: available online at https://doi.org/10.3390/ijerph16234747

28   EPA, New Releases from Headquarters, Office of the Administrator (AO), Office of Policy (OP): EPA Expands Research on COVID-19 in the Environment (04/20/2020): available online at https://www.epa.gov/newsreleases/epa-expands-research-covid-19-environment

29   Id.

virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures."[30] General guidance for all public spaces includes the following strategies: 1) operating exhaust fans in addition to opening outside air dampers, 2) if a public space has operable windows, open them two hours before reoccupying a space as windows allow movement of fresh air through the space; 3) run the HVAC system to include outside air when unoccupied, and 4) change all filters, evaluating the MERV rating (lower number being the least amount of reduction in particulate) up to a HEPA filter, which allow the least amount of particulate to come through the system filter, and 5) disinfect high-touch surfaces, such as on/off switches and thermostats as part of the cleaning and disinfection protocol, and 6) disinfect the interior of refrigeration devices (i.e. refrigerators), where the virus can potentially survive for long periods of time.[31] Another aspect of re-opening buildings includes potential risk of waterborne pathogens, i.e. Legionella bacteria, within the plumbing system and associated equipment. By creating a water management plan using ANSI/ASHRAE Standard 188-2018, Legionellosis: Risk Management for Building Water Systems, a risk management plan can be established.[32] The CDC provides Guidance for Building Water Systems that provides a step-by-step process for reopening water systems after a prolonged building closure.[33] For smaller businesses that may not have access to a facilities and/or maintenance department (inhouse or contracted), it is recommended to consult with a mechanical and plumbing engineering consultant, HVAC/plumbing maintenance management company, and/or HVAC/plumbing contractor for system evaluations.[34]

Re-opening Guidance for Public Spaces

For all public settings to re-open, in addition to the CDC cleaning and disinfecting guidance, an overall plan needs to be developed as a process that includes *Plan, Prepare, and Respond*.[35] Per ASHRAE guidance, creating a strategic plan provides measures to make occupants feel safer, ensuring supply chain availability for critical items and supplies (i.e. filters, cleaning and disinfection supplies, etc.), and creation of a communication plan to distribute information to all building occupants.[36]

Similar to guidance provided by the General Services Administration (GSA) for improving health and wellness for building occupants, it is found that a combination of operational

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30   American Society of Heating, Refrigerating, and Airconditioning Engineers (ASHRAE): Environmental Health Committee (EHC) Emerging Issue Brief: Pandemic COVID-19 and Airborne Transmission: available online at https://www.ashrae.org/file%20library/technical%20resources/covid-19/eiband-airbornetransmission.pdf

31   ASHRAE: ASHRAE Offers COVID-19 Building Readiness/Reopening Guidance: available online at https://www.ashrae.org/about/news/2020/ashrae-offers-covid-19-building-readiness-reopening-guidance

32   Ibid.

33   CDC: Coronavirus Disease 2019 (COVID-19) Reopening Buildings After Shutdown: Ensure the Safety of your Occupants and Building Water System and Devices (Updated May 7, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/php/building-water-system.html

34   ASHRAE: COVID-19 (Coronavirus) Preparedness Resources: available online at https://www.ashrae.org/technical-resources/resources

35   CDC: Coronavirus Disease 2019 (COVDI-19), Cleaning & Disinfecting: Plan, Prepare, and Response: available online at https://www.cdc.gov/coronavirus/2019-ncov/community/clean-disinfect/index.html

36   ASHRAE: ASHRAE Offers COVID-19 Building Readiness/Reopening Guidance: available online at https://www.ashrae.org/about/news/2020/ashrae-offers-covid-19-building-readiness-reopening-guidance

policy and procedures that are upheld coupled with designed elements of the built environment, maximizes the potential positive outcome.[37] Therefore, for the following public space types, there is a general description and four guidance sections: 1) cleaning and disinfection, 2) operational implications, 3) design implications, and 4) future implications and resources. With the continual evolution of information and guidance updates and as research continues to be completed, the recommendations will change based upon new data and information as it becomes available.

Hospitality

Cleaning and Disinfection

Hospitality trade associations and well-known hotel brands are evaluating various means for cleaning and disinfecting public spaces and guest rooms. The American Hotel and Lodging Association (AHLA) has developed the Safe Stay Initiative and subsequent Safe Stay Guidelines and per the CDC guidance, all high-touch surfaces and flooring would include being cleaned and subsequently disinfected with hospital grade disinfectants (EPA List N). The major brands, such as Marriott[38] and Hilton,[39] have set up revised systems for cleaning and disinfecting protocols to include cleaning and disinfecting surfaces more frequently in public spaces and evaluation of training and education of staff to protect them as well as the hotel guest using the accommodations. Similar to Best Western's collaborative efforts with IDEO to develop the "I Care Clean Program" and subsequent "We Care Clean℠" Program,[40] Hilton has collaboratively partnered with RB (Reckitt Benskiser), the manufacturer of Lysol® (cleaning and disinfecting products)[41] and Dettol® (antiseptic products)[42] to assist in delivering a safer and cleaner stay for guest through the creation of the Hilton CleanStay Program.[43] Enhanced chemical application technologies are being rolled out, including electrostatic spraying technology with EPA List N disinfectants and the use of UV-C technology for disinfecting keys and devices. For guest rooms, hospital grade disinfectants are being used on all high-touch surfaces and in some cases, disinfecting wipes are placed in each room for guests' personal use.[44]

For smaller lodgings, such as smaller hotels, inns, and bed and breakfast establishments, the guidance remains the same as for other public or community spaces as identified by the CDC[45] and the recommendations for larger hotel brands. If not already established for a smaller

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37   GSA: Sustainable Facilities Tool: Buildings and Health: https://sftool.gov/learn/about/576/buildings-health

38   Marriott Bonvoy: Marriott Cleanliness Council: information available online at https://clean.marriott.com/

39   Hilton: Hilton CleanStay: Clean and Ready for You: information available online at https://www.hilton.com/en/corporate/cleanstay/

40   Best Western: We Care Clean℠ program: Information available online at https://www.bestwestern.com/en_US/hotels/discover-best-western/we-care-clean.html

41   Background information on Lysol® available online at https://www.rb.com/brands/lysol/

42   Background information on Dettol® available online at https://www.rb.com/brands/dettol/

43   Hilton: Hilton CleanStay: Clean and Ready for You: information available online at https://www.hilton.com/en/corporate/cleanstay/

44   Marriott Bonvoy: Marriott Cleanliness Council: information available online at https://clean.marriott.com/

45   CDC: Coronavirus Disease 2019 (COVID-19): CDC/EPA Cleaning & Disinfection Guidance (Updated May 7, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/reopen-guidance.html

venue, develop a standardized operating procedure, checklist, and audit system and train staff on the importance of utilization and verification. If laundry is not completed by a commercial laundry facility, evaluate the process for changing all bedding, linen, and towels to avoid cross contamination between soiled and clean. This can be achieved by utilizing different color plastic bags to reduce errors and be part of the operating procedure. Develop a communication plan for staff and media to convey with potential guests all the steps that are being taken to assure health and safety of guests and staff as essential.[46]

It is important to reinforce that utilization of cleaning and disinfecting chemicals can pose a risk of material failure when using cleaning and disinfecting chemicals. Verifying with material, surface, and product manufacturers on the compatibility of various chemistries with product finishes and topcoats is essential to reduce damage and degradation of surfaces. Even if a disinfecting chemical is included on the EPA List N for efficacy, it does not mean that the chemical will be safe on all surfaces. This includes the evaluation of providing disinfecting wipes for guest use in rooms, as based upon the work completed by the Durable Coated Fabrics Task Group and experiences found in hospital settings, bleach and alcohol wipes have had harmful impacts on chair seats and arms and in some cases furniture tops and countertops.[47] Therefore, when seeking compatibility of chemistries between cleaning and disinfecting chemicals and upholstery products, it is recommended to use CFFA-Healthcare-201 Recommended Minimum Performance Standards for Vinyl-Coated and Other Chemical Coated Upholstery Fabrics – Healthcare (August 2020). Requesting this information by the designer from the distributor and/or manufacturer and/or trade association as part of the performance evaluation is critical.

Operational Implications

With the development of policies and procedures, the goal is to reduce person-to-person contact to reduce the risk of transmission of SARS-CoV-2 virus. Policies on signage reminding building occupants of distancing requirements and providing seating that further supports social distancing within lobby and restaurant areas would be examples of policy goals. Supporting keyless entry by using smart phone applications would allow the guest to go directly to their room without having to interact with front desk staff by completing early check-in and electronic check-out, receiving receipt through an email. This reduces contact between guests and staff associates. If contact with staff associates is necessary, the hotelier provides plastic gloves and masks to associates as well as having them available for guests upon request.[48] Within guest rooms, unnecessary items, such as decorative throw pillows, bed scarves, paper notepads and pens, menus, etc. will be removed, and guest will rely on their own technology to digitally find relevant hotel information.[49]

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46   American Industrial Hygiene Association (AIHA): Reopening: Guidance for Small Lodging Establishments: available online at https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/Reopening-Guidance-for-Small-Lodging-Establishments_GuidanceDocument.pdf

47   Durable Coated Fabrics Task Group (DCF): Expert panel prresentation for the Center for Health Design: slides and information available online at https://www.durablecoatedfabrics.com/presentations

48   Marriott Bonvoy: Marriott Cleanliness Council: information available online at https://clean.marriott.com/

49   Best Western: We Care Clean℠ program: Information available online at https://www.bestwestern.com/en_US/hotels/discover-best-western/we-care-clean.html

Guests could also use their phones to order room service and it could be specially packaged to be delivered to the door with contactless delivery and notification through a smart phone.[50] Providing a "seal" at the door of each guest room that is placed across the edge of the door and extends across the door jamb after cleaning and disinfection is being used by some hoteliers as a means to provide assurance to guests. Once a guest rooms has been cleaned and disinfected, the seal would be installed and would only be broken by a guest and no one would enter the room while the guest is staying in the room, without the guest's request and/or permission. If additional supplies are needed, these can be delivered in plastic protective packaging and placed outside the door for retrieval with electronic notification to the guest.[51]

Design Implications

Plastic "sneeze guard" barriers can protect staff associates at reception and check-in. They provide opportunities for various types of separation – panels could be both clear as well as digitally printed with vinyl graphics to support branding and reusability once infection risks are reduced, in preparation for future pandemics and reduction of spread of infection. Locations and designed areas for glove dispensers, masks, and hand sanitizers to be developed within existing settings, including a process for dispensing to avoid alcohol-based sanitizers unintentionally damaging surfaces or materials adjacent or beneath a dispenser unit. With hand sanitizers having a 60% or higher alcohol content for effectiveness, the gels and foam dispensers require a catch tray or a means to avoid contact with surrounding materials.

If carpet is being replaced for ease of maintenance, sheet vinyl or LVT products should be considered. If carpet is going to continue to be used because of acoustic considerations or the desired aesthetic of guest rooms, carpet with vinyl backing would be recommended to enhance the cleanability by extracting the carpet to maintain as clean of an environment as possible.

If decorative textile items are being considered to enhance the aesthetic and livability of guest quarters, it is recommended that these items can be easily laundered at the minimum 160-degree temperature used for commercial laundry application. There are products available for bed throws, pillow coverings, and window treatments that could be included within the design if they can be laundered. Further, if shades are utilized with plastic or metal wands, verify that they can be cleaned and disinfected as a high-touch surface. If removing fabric window coverings entirely, commercial grade vinyl rolling shades (both those that are smooth or have a slight texture) provide a uniform surface for ease of cleaning versus blinds or multiple component window treatments The ease of use with a single point for adjustment is another advantage of using vinyl rolling shades. Simplifying the window treatment solution reduces environmental services time for cleaning and disinfecting.

Future Implications and Resources

Specific guidance for future new construction and renovation of hospitality settings include the following additional steps in providing designs that include a COVID-19 lens:

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50   Marriott Bonvoy: Marriott Cleanliness Council: information available online at https://clean.marriott.com/

51   Hilton CleanStay: Clean and Ready for You: information available online at https://www.hilton.com/en/corporate/cleanstay/

1. Programming of all spaces to consider alternative layouts and square footages required to support social distancing.

2. All materials and surfaces to be evaluated based upon their performance to withstand the cleaning and disinfection protocols developed by the hotelier, including public spaces and guest rooms. For food service venues, see the Restaurant and Bar section below.

3. Balance the use of non-porous materials with acoustic applications to control noise and support privacy within public spaces and primarily between rooms (next to and above/below). Consideration and specification of non-porous materials for all high-touch surfaces is essential for durability and reduction of spread of infection. Consideration of simpler designs to reduce opportunities for reservoirs to be formed for harboring pathogens. For example, not using extra piping, button details, or studding when upholstering coupled with using durable coated fabrics for soft goods throughout guest rooms and public spaces would be recommended.

4. Filtration and ventilation systems to be evaluated, as often hotels utilize packaged terminal air conditioners (PTACs) that are through wall HVAC units that recirculate air and do not have outdoor air as part of the package system and very minimal MERV filtration ratings. Therefore, a centralized, zoned system with individual room control may be more appropriate.

As an industry overall, repurposing hospitality properties may become part of the strategy for some brands as they evaluate their assets once the industry 'restarts' and travelers begin to need accommodations once again.[52]

Other impacts to the recovery of the hospitality industry include individuals continuing to work virtually. Many businesses have had to evaluate travel policies and are finding that remote meetings work the same or even better than traveling and meeting in person. This may impact business travelers and their demands for accommodations provided by the hospitality industry. AHLA provides historic and current perspectives on the entire hospitality industry in relationship to post COVID-19 impacts through the eyes of industry leaders and hotel CEOs available at https://www.ahla.com/covid-19s-impact-hotel-industry.[53]

The following specific resources are related to the re-opening and on-going operation of hospitality accommodations:

American Hotel & Lodging Association: Safe Stay Guidelines

Best Western: We Care Clean℠ Program

Hilton: CleanStay: Clean and Ready for You

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52   Information provided is opinion based with some authoritative references from an article on HospitalityNet™ completed by Drees & Sommer, a consulting practice in the hospitality industry. The article is not peer reviewed. Article is available online at https://www.hospitalitynet.org/news/4098465.html

53   AHLA: Hear from Industry Leaders: Hotel CEO's share the historic damage on their businesses and our entire industry. Interviews available online at https://www.ahla.com/covid-19s-impact-hotel-industry

Restaurant and Bars

The restaurant and bar industry has been severely impacted during the pandemic, often entire workforces being laid off, unless a portion was maintained to provide meals for curbside, contactless pickup. Outdoor dining venues have begun to reopen, and these outdoor spaces require special cleaning and disinfecting measures. The localized safety requirements are taking precedent because the outbreak and hospitalization rate changes drastically based upon geographic location.

If venues are reopening, restaurants and bars are responding to health officials' requirements and guidance to keep their staff and patrons as safe as possible by selecting appropriate types of tables, wallcoverings, flooring, tableware, serving protocols, mask compliance adherence, and social distancing.

The following are CDC Guiding Principles that conclude, the more an individual interacts with others, and the longer that interaction, the higher the risk of COVID-19 spread. The levels of risk of COVID-19 spread increases in the following order within the food industry:

1. Lowest risk includes food service limited to drive-through, delivery, take-out and curbside pickup.
2. Risk increases when using drive-through, delivery, take-out, and curbside pick- up is emphasized, but also includes on-site outdoor seating with tables spaced minimally 6 feet apart.
3. Risk continues to increase when on-site dining with both indoor and outdoor seating is provided, but with reduced capacity to allow tables to be spaced minimally 6 feet apart.
4. Highest risk includes on-site dining with both indoor and outdoor seating where capacity is not reduced, and tables are not space minimally 6 feet apart.[54]

Cleaning and Disinfection

Clean and disinfect high-touch surfaces, such as door handles, cash registers, workstations, sink handles, bathroom stalls, etc., minimally daily, or as frequently as possible and follow all food safety requirements from the FDA. Any shared objects or surfaces, such as payment terminals, tables, countertops/bars, receipt trays, condiment holders, etc. should be cleaned between each use. Single serve condiments, utensils and menus, may be safer for customers and staff. Utilizing thermal fused tabletops and solid surface or stainless-steel countertops

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54   CDC: Coronavirus Disease 2019 (COVID-19), Community, Work & School, Considerations for Restaurants and Bars (Updated June 30, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/business-employers/bars-restaurants.html

and bars provide for surfaces that are easy to clean and disinfect.[55] For surfaces, such as wood tabletops that have experienced degradation, replacing tops with thermally fused vinyl film wrapped tops or solid surface would be optimal solutions to increase ease of cleaning and disinfecting and reduce opportunities for spread of infection. The use of extruded PVC frames or metal frames for seating with durable coated fabrics that are certified to the CFFA Healthcare Standard 201 would be appropriate choices for reducing the potential spread of infection by selecting surfaces that can be cleaned and disinfected.

All disinfection products that are on EPA List N need to be evaluated for each surface based upon the chemical manufacturer recommendations and the product and/or material manufacturer recommendations to avoid degradation of surfaces. Training and education for staff is essential to ensure safe and effective application of disinfectants to surfaces. Wash, rinse, and sanitize food contact surfaces with an EPA-approved food contact surface sanitizer is the typical method utilized within a commercial kitchen. If SARS-CoV-2 contamination is possible or likely, a deep clean would be required: 1) wash; 2) rinse; 3) apply disinfectant according to label instructions; 4) rinse; and 5) sanitize with a food-contact surface sanitizer.[56] As part of the cleaning and disinfection protocol, it is recommended to develop a schedule for increased, routine cleaning and disinfection and ensure safe, correct use and storage of disinfectants to avoid food contamination and any harm to employees or other individuals.[57]

Operational Implications

For all steps recommended by CDC Interim Guidance, establish and maintain communication with local and state authorities to mitigate spread of COVID-19. Consideration for workers at high risk (more vulnerable or more exposure potential) to complete tasks that minimize contact with customers and employees, such as managing inventory or remote working on administrative tasks.[58] Because of being a segment of public spaces that has consistent direct contact with the public, education and training is suggested to support staying home if any symptoms occur or testing positive for COVID-19. While on site, frequent handwashing with soap and water for at least 20 seconds with increased reminders and monitoring for adherence in the form of signage and cueing before, during, and after preparing food, removal of garbage, etc. Use plastic gloves when removing garbage bags or handling/disposing of trash, remove and discard gloves after disposal, and wash hands.[59]

All staff to use cloth face coverings and owner to provide adequate supplies that are made available for healthy hygiene. Evaluate policies for requesting guests to review the listing of potential symptoms to verify that they are not currently experiencing any of the symptoms and are feeling well, require guests to wear masks while inside or moving through the restau-

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55   CDC: Coronavirus Disease 2019 (COVID-19), Community, Work & School, Considerations for Restaurants and Bars (Updated June 30, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/business-employers/bars-restaurants.html

56   Ibid.

57   Ibid.

58   Centers for Disease Control and Prevention: Interim Guidance for Restaurants and Bars: https://www.cdc.gov/coronavirus/2019-ncov/downloads/php/CDC-Activities-Initiatives-for-COVID-19-Response.pdf#page=53

59   CDC: Coronavirus Disease 2019 (COVID-19), Community, Work & School, Considerations for Restaurants and Bars (Updated June 30, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/business-employers/bars-restaurants.html

rant or going to the restroom, and take guest temperature as a precautionary measure upon entry at the hostess station.[60]

Design Implications
Post signs in highly visible locations, including entrances and in restrooms to promote everyday protective measures and implement the provision of a 6' distance between tables as part of the guidance for the physical layout of a restaurant or bar. Vinyl films provide a temporary or permanent solution to cueing and signage for entrances, hostess stations, floors, and restrooms trying to efficiently prepare for re-opening for outside or inside seating. Consistent with ASHRAE recommendations, encouraging patrons to eat and drink in outside venues, open windows and doors and/or mechanically provide outside air circulation is appropriate. Bars and restaurants should seek to maintain indoor relative humidity at 40-60% and establish that restrooms are under negative pressure,[61] meaning reducing the potential of recirculation of exhausted air back into the rest of the building.[62] Depending upon the existing systems and verification of equipment and types of filters that can be used without compromising the equipment operation, portable HEPA filtration units can also be used within a bar or restaurant space.

Future Implications and Resources
In evaluating post COVID-19 implications, operational changes to include continual monitoring of patron and employee symptoms, temperature, and requirements for protective measures, including masks. Technology developments continue to include contactless payments, viewing and ordering from a personal device from an online menu, any self-ordering kiosk to become available as a no-touch solution through an app or other means, and for fast food, applications that reduce time and increase efficiency at a drive-thru used for food pick-up.[63]

The following specific resources are related to the re-opening and on-going operation of restaurants and bars:

American Industrial Hygiene Association (AIHA): Reopening: Guidance for the Bar Industry (Version 2: June 19, 2020)

American Industrial Hygiene Association (AIHA): Reopening: Guidance for the Restaurant Industry

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60   CDC: Coronavirus Disease 2019 (COVID-19), Community, Work & School, Considerations for Restaurants and Bars (Updated June 30, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/business-employers/bars-restaurants.html

61   AIHA: Reopening: Guidance for the Bar Industry (Version 2, June 19, 2020): available online at https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/Reopening-Guidance-for-the-Bar-Industry_GuidanceDocument.pdf and Reopening: Guidance for the Restaurant Industry (Version 4, June 19, 2020): available online at https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/Reopening-Guidance-for-the-Restaurant-Industry_GuidanceDocument.pdf

62   ASHRAE: ANSI/ASHRAE/ASHE Standard 170-2017 Ventilation of Health Care Facilities: available online at https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda/ansi-ashrae-ashe-standard-170-2017-ventilation-of-health-care-facilities

63   Information provided is opinion based and speculative from a blog posting and not supported by evidence or regulation. Blog is available online at https://www.evokad.com/future-restaurant-landscape-post-covid-19/

Education

The pandemic has created unique safety issues within primary, college/university, and continuing education programming.

Cleaning and Disinfection

The CDC guidance for childcare programs and schools is organized into three categories based on the level of community transmission:

1. when there is no community transmission (preparedness phase),
2. when there is minimal to moderate community transmission, and
3. when there is substantial community transmission.

Guidance is also provided when a confirmed case of COVID-19 has been identified in a school regardless of the level of community transmission identified. All decisions on implementing school-based strategies are recommended to be made locally in collaboration with local health officials.[64] Specific cleaning and disinfection guidance include closing off areas that have had individuals with or suspected of having COVID-19 and wait as long as practical before beginning cleaning and disinfection. This reduces the exposure risk to the environmental services technician responsible for the maintenance process. If a school has been closed, this provides an opportunity to maximize the closing of areas for 7 to 14 days prior to cleaning and disinfecting in preparation for reopening.

The CDC provides considerations for institutions of higher education (IHE) to protect students and employees. IHEs vary considerably in geographic location, size, and structure and recommendations need to be completed in collaboration with state and local health officials.[65] The guidance for healthcare facilities managed by IHEs are referenced to the CDC healthcare guidelines.

For both primary schools and institutions of higher education high-touch surfaces should be the main priority for effective maintenance including the review of cleaning and disinfection protocols for maintaining flooring surfaces, as a means for limiting spread of infection. EPA List N is the reference document for registered products available that are anticipated to be effective against SARS-CoV-2 inactivation. However, even if a disinfecting chemical is included on the EPA List N for efficacy, it does not mean that the chemical will not damage surfaces. Therefore all surfaces within a school being cleaned and disinfected need to be reviewed for compliance with the material, surface, or product manufacturer recommendations and the

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64   CDC: Coronavirus Disease 2019 (COVID_19), Guidance for Schools & Child Care, Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19) (Updated April 10, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/guidance-for-schools.html

65   CDC: Coronavirus Disease 2019 (COVID-19), Considerations for Institutes of Higher Education (Updated May 30, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/colleges-universities/considerations.html

cleaner or disinfectant chemical manufacturer to verify that the chemistries are compatible and will not degrade the material, surface, or product.

Operational Implications

Operationally, all types of educational settings are evaluating the virtual policies and procedures for continuing a portion of education being completed remotely as a "hybrid" model. However, with higher education at universities and colleges there is the additional concern of housing with shared amenities within dormitories, shared dining venues, athletic and recreational facilities, retail facilities, healthcare centers, and all of the other components that an individual utilizes while living essentially within a community that is the college campus. Each of these types of settings require evaluation of re-opening independently, as well as interdependently to reduce the spread of COVID-19. Dormitory space will have to also accommodate students coming from different global geographic locations and support them to allow for quarantining for a minimum of 14 days. A systematic set of operational guidelines that can be used for the development of operational policies and procedures for these various types of settings is available from the American Industrial Hygiene Association (AIHA)[66] on their COVID-19 resource website, Back to Work Safely, which has provided guidance on most of the components found on a collegiate campus. With all of the COVID-19 related complexities, virtual platforms are the predominant "go-to" for many of the educational content, but there is an experiential, as well as an interactive, collaborative portion of study that can only take place in person; such as lab studies, practicums, and various types of research.

Design Implications

Typically, educational facilities utilize hard surface flooring as part of their design; however for those that include carpet, it is likely that this will be replaced by resilient flooring – rubber sheet/tile or vinyl sheet/tile because of ease of maintenance, durability, and performance. Other surfaces that are commonly found in educational settings include countertops, desks, and seating. For classrooms, it is anticipated that solid surface countertops and desktops would be utilized, along with hard or preformed seating. For those classroom settings that utilize movable seating, group or modular seating, and various types of soft seating, vinyl durable coated upholstery fabrics would be appropriate for cleaning and disinfection. In addition, specifying upholstered items without piping or buttons would be recommended as to not impede the cleaning and disinfection process.

Future Implications and Resources

Primary educational institutions provide many community-based needs – from ensuring meal programs for students and sometimes their families, providing community voting locations, places for continuing and adult education in the evenings, sports and recreational programming, and internet access, computers, and related devices. The COVID-19 pandemic has brought full attention to the many aspects that educational systems and facilities provide, but when placed into the community with virtual learning platforms, it highlights the challenges in providing quality educational opportunities and community-based services. It is anticipated

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66   American Industrial Hygiene Association: COVID-19 Resources: https://www.aiha.org/public-resources/consumer-resources/coronavirus_outbreak_resources

that now that these needs are further highlighted by the pandemic that action will be taken by local, state, and federal public policy makers.[67]

The future of university and college campuses may look much different in the future. There is the potential of virtual learning to be the mainstay and the campuses could be evaluated as an opportunity for redevelopment into living communities that include not only students, but families, elders, and others that require services to broaden the utilization of potentially underused dormitories and student housing in the future. Campuses have all the community features that are needed to create inclusive environments. However, there is a challenge in re-developing the campuses into safe and healthy communities that are resilient – not only from disruptive events caused by nature, but also pandemics.

The following specific resources are related to the re-opening and on-going operation of educational settings:

CDC: Coronavirus Disease 2019 (COVID-19), Considerations for Institutes of Higher Education (Updated May 30, 2020)

CDC: Coronavirus Disease 2019 (COVID_19), Guidance for Schools & Child Care, Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19) (Updated April 10, 2020)

Retail

The pandemic has changed the retail experience. In-store shopping   may have been changed forever with the increased on-line shopping and delivery options.[68] From the foot traffic flow, to the products you can try-on, to the check out and bagging experience, everything is changing to protect staff and shoppers.

Cleaning and Disinfection
Retail establishments have various requirements and policies; for example some stores will allow you to bring your own shopping bags, but you have to pack them and not place them on any of the store counters or register bagging areas.; Others have cashiers and baggers that wear plastic gloves and will bag your purchases in the consumer's bags or in their store brand bags. The wiping down of the grocery cart handles and keeping a 'clean cart' and 'soiled cart' area marked by signage is one way of allowing the consumer to understand where to take and replace their cart after usage. Vinyl coated handles and metal carts and baskets make them easier to wipe down after use.

Retail establishments must constantly clean all high-touch surfaces and high traffic areas to protect staff, suppliers and customers. The National Retail Federation has a guidance document call Operation Open Doors, which provides information for retailers on safely operating

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67   CDC: Coronavirus Disease 2019 (COVID_19), Guidance for Schools & Child Care, Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19) (Updated April 10, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/guidance-for-schools.html

68   Evans, M. Contributor: Forbes, 7 Predictions for How COVID_19 Will Change Retail in the Future. This is not a peer-reviewed article. Article available online at https://www.forbes.com/sites/michelleevans1/2020/05/19/7-predictions-for-how-covid-19-will-change-retail-in-the-future/#4006b60c5be3

stores, including a Checklist.[69] High-touch surfaces should be the main priority for effective maintenance including the review of cleaning and disinfection protocols for maintaining countertops, register and cash wrap areas, payment technology surfaces, and flooring surfaces, as a means for limiting spread of infection. EPA List N is the reference document for registered products available that are anticipated to be effective against SARS-CoV-2 inactivation. However, even if a disinfecting chemical is included on the EPA List N for efficacy, it does not mean that the chemical will not damage surfaces. Therefore all surfaces within a retail space being cleaned and disinfected need to be reviewed for compliance with the material, surface, or product manufacturer recommendations and the cleaner or disinfectant chemical manufacturer to verify that the chemistries are compatible and will not degrade the material, surface, or product. For any food service components see *Restaurants and Bars* section.

Operational Implications

As retail establishments start to re-open, the American Industrial Hygiene Association recommends continuing to encourage e-commerce and delivery or curbside pick-up and the utilization of social media to educate customers on the steps being taken to protect them throughout their transaction, whether online or in person. Training personnel on greetings to customers that include, "Thank you for coming in, we want to assist you, but we will be maintaining 6-feet of distance for your safety." Self-checkout processes assist with maintaining distancing. As outdoor venues are re-opening, 'fresh air' shopping is encouraged to maximize access to the outside. This could also be encouraged through opening doors and windows, when the outside temperature supports a reasonable temperature.[70] The CDC also provides guidance for grocery and food retail workers that includes the 6 feet distancing policy, but also guidance on wearing masks and if doing a paper or coin money transaction to not touch their face afterward and to ask the customer to place the money directly on the counter so that there is not any physical contact between the worker and the consumer.[71]

Design Implications

The marking of foot traffic directional flows, and 6 feet distance check-out markers can be achieved with vinyl graphics on the floor or with signage placement. Re-programming the layout of aisles, verification of aisle widths for safe passing, and redirection of traffic patterns to one-way flow to maintain safe distancing are all design strategies for retail settings.

For retail shops other than grocery stores, it is recommended to close changing rooms temporarily and to consider displaying a single item with back stock/storage used for specific color and sizing to reduce the number of consumers touching a single item.[72] This could relate to the shopping experience that was used in the 1940s and 1950s, where an individual item was shown to a customer and then they were provided the correct size and color based upon view-

69   NRF Operation Open Doors: Retail's Path Forward: Checklist – Version 2.0 (updated May 15, 2020)

70   AIHA: Reopening: Guidance for the Retail Industry (Version 5, June 19, 2020): available online at https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/Reopening-Guidance-for-the-Retail-Industry_GuidanceDocument.pdf

71   CDC: Coronavirus Disease 2019 (COVID-19): Grocery & Food Retail Works (Updated April 13, 2020): available online at https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/grocery-food-retail-workers.html

72   Information provided is opinion based with some authoritative references from an article in the Harvard Business Review: Spenner, P., Freeman K., To Keep Your Customers, Keep it Simple. The article is not peer reviewed. Article is available online at Harvard https://hbr.org/2012/05/to-keep-your-customers-keep-it-simple

ing the item on a model. In 2020, this may become an opportunity for advancement in technological modeling.[73] If soft seating is included as part of the retail shopping experience, the upholstery considered should be a durable coated fabric that minimally meets CFFA-Healthcare-201 Recommended Minimum Performance Standards for Vinyl-Coated and Other Chemical Coated Upholstery Fabrics – Healthcare (August 2020).

Another feature, similar to workplace design applications, is the consideration for plastic, acrylic or plexiglass partitions being placed between and/or in front of cashiers to separate employees from one another as well as separation from the consumer shopper. These could include vinyl decorative, branded logos or images that could add to the aesthetic of the space and/or contribute to the branding. It is possible in the future that casework and cash wraps could be designed with a feature that conceals panels that could be used when needed during another pandemic or flu season or as an attachment component that can be an add-on to a prefabricated unit. Having an individual component could create issues for storage or losing the component or hardware, therefore it would be suggested that this type of protection be part of and incorporated into the design of the casework being utilized. Finishes for the casework for cleaning and disinfection would include the utilization of solid surface for horizontal surfaces and vinyl vertical panels for casework that would allow for ease of maintenance, enhance the durability, and add to the aesthetic based upon the film used for the panels.

Future Implications and Resources
The retail market had already been moving into the "experiential" side of retail – allowing pop-ups and other more theatrical means of merchandising products for consumers. This type of experience is easily adaptable to a virtual platform and has already been successful prior to the pandemic. As a result of COVID-19, it is anticipated that all retailers will have to make their in-store experiences even more extraordinary for those wanting to visit in person. This may provide an opportunity for innovative design solutions based upon high demand product to include creative use of finishes and materials to create an amazing experience for the shopper.[74] In order to be "safe" as well as "amazing", utilizing finishes such as wallcovering, flooring, and other high-touch surfaces that can be cleaned and disinfected would be appropriate.

The following specific resources are related to the re-opening and on-going operation of retail settings:

AIHA: Reopening: Guidance for the Retail Industry

CDC: Coronavirus Disease 2019 (COVID-19): Grocery & Food Retail Workers (Updated April 13, 2020)

National Retail Federation (NRF): Operation Open Doors

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73   Evans, M. Contributor: Forbes, 7 Predictions for How COVID_19 Will Change Retail in the Future. This is not a peer-reviewed article. Article available online at https://www.forbes.com/sites/michelleevans1/2020/05/19/7-predictions-for-how-covid-19-will-change-retail-in-the-future/#4006b60c5be3

74   Information provided is opinion based with some authoritative references from an article in the Harvard Business Review: Lee Yohn, D., The Pandemic is Rewriting the Rules of Retail. The article is not peer reviewed. Article is available online at https://hbr.org/2020/07/the-pandemic-is-rewriting-the-rules-of-retail

Workplace

The "home office" has an entirely different meaning as a result of the COVID-19 pandemic for many workers that can complete their work remotely. But for those considered essential workers, they have had to continue to place themselves and their families at potential risk. Manufacturing facilities have implemented workplace strategies before other types of non-essential businesses reopened. This included the need for evaluating production lines, staggering staff schedules, potentially adding shifts, and other measures to protect the workforce from contracting COVID-19. In some cases, depending upon the type of manufacturing, personal protective equipment is necessary to protect both the worker as well as the product being handled. For businesses considering re-opening, there are many considerations to achieve a safe re-entry, while other business leaders have decided to continue to work remotely as the safest option for themselves, their employees, and everyone's families.

Cleaning and Disinfection

The workplace has many high-touch surfaces that need to be cleaned and disinfected between users, particularly if a dedicated workspace is going to be shared by more than one employee. Employees that share workstations need to communicate with one another and others involved in the maintenance process to clarify the responsibility of each employee based upon the policies and procedures put in place by company leadership. This step will clarify r responsibilities for cleaning and disinfecting all high-touch surfaces, removal and disposal of trash and debris, and the floor area within and around the workstation. All employees need to be vigilant in shared break areas and those areas that include shared office equipment, control devices, and/or food storage and eating areas. Additional shared spaces, such as restrooms need to be cleaned and disinfected regularly and masks should be worn when utilizing any publicly shared space between other offices or within shared offices.

As with other public spaces, high-touch surfaces should be the main priority for effective maintenance including the review of cleaning and disinfection protocols for maintaining flooring surfaces as a means for limiting spread of infection. Fomites that are present in the office include the buttons on all copier and other equipment, the telephone, light switches, computer mouse pads, handles of coffee cups, drinking fountain and water filling station buttons, arms and backs of seating, trash cans, and purse or briefcase handles, and vending machines. These are touchpoints that workers are used to touching every day without thinking about them; however, these need to be cleaned and disinfected as a high-touch surface. The EPA List N is the reference document for registered products available that are anticipated to be effective against SARS-CoV-2 inactivation. However, even if a disinfecting chemical is included on the EPA List N for efficacy, it does not mean that the chemical will not damage surfaces. Therefore all surfaces within a workplace being cleaned and disinfected need to be reviewed for compliance with the material, surface, or product manufacturer recommendations and the cleaner or disinfectant chemical manufacturer to verify that the chemistries are compatible and will not degrade the material, surface, or product.

Operational Implications

As the country continues to grapple with COVID-19, commercial properties are seeking to re-occupy their spaces in the most efficient, yet safe manner. Organizations have to first establish their policies and procedures for re-opening any commercial setting, including 1) evaluation of number of employees returning and their appropriate schedule(s) and if staggering employee schedules, identify the days and times of each position and role, 2) requirements of testing protocols and/or options (including temperature evaluation and requiring COVID-19 swab and/or IgG antibody testing), 3) decision on requiring masks while at work including how employee areas will be designated for eating meals safely, 4) evaluation of policies, procedures, and responsibilities when continuing teleworking, 5) establishing a communication plan and virtual platform needs and requirements, 6) identify all training and education needed for of staff before and after returning to the workplace, and 7) vet policy and procedures with legal counsel and insurance companies.[75] Another means for evaluating cleanliness is to evaluate a surface through using UV markers to verify that a touchpoint has been cleaned and disinfected. This method developed by Dr. Phillip Carling and Dr. Judene Bartley has been found effective in healthcare settings for validation[76] and recommended by CleanHealth Environmental for workplace cleanliness verification.[77]

Overall development of operational process checklists would be valuable and could include, but not be limited to 1) Entry Checklist, 2) Exit Checklist, 3) Conference Space Usage Checklist, and 4) Shared Service Spaces Checklist.

Design Implications

The re-design and re-organization of the workplace environment, the prioritization of project work, and a systematic approach to evaluating existing space and programming for the desired outcomes is based on the operational policies and procedures as the other key component in a successful workplace re-opening. In healthcare, the term "functional programming" is utilized to evaluate the various operational tasks and flows. For workplace this would be "operational processes programming" that evaluates each decision point from home to any stops to work and reverse. The identification of the who, what, when, where, how, and why are critical to understanding what is needed at each decision point when 1) leaving home, 2) identifying transportation mode and potential protective steps needed, 3) stopping for a coffee or carry out, 4) arriving at the workplace, 5) participating in individual and shared tasks throughout the day—each task identified and evaluated, 6) exiting the workplace, 7) identifying transportation mode home (if different from arrival), 8) stopping for supplies or groceries on the way home, and 9) returning home. Every one of those steps have decision points and potential change in the design layout or process of each space – including but not limited to; 1) a place

75   BOMA International: Getting Back to Work: Preparing Buildings for Re-Entry Amid COVID-19 (Updated May,1, 2020): available online at https://www.boma.org/coronavirus

76   Carling, P., Bartley, J. American Journal of Infection Control, Volume 38, Issue 5, S41 - S50 Evaluating hygienic cleaning in health care settings: What you do not know can harm your patients. https://www.ajicjournal.org/article/S0196-6553(10)00406-2/pdf

77   Presentation entitled Re-Occupancy During COVID-19 – A Resource-Based Approach to Office Cleaning & Design completed by Shari Solomon (solomon@cleanhealthenv.com) from CleanHealth Environmental (https://www.cleanhealthenv.com/) and Jane Rohde (jane@jsrassociates.net) from JSR Associates, Inc. (http://www.jsrassociates.net). Presentation slides available online at http://www.jsrassociates.net/covid19-resources

for hand sanitizer, masks, and/or gloves to be stored and accessed with proper instruction, 2) circulation pathways that can separate in-going and out-going traffic, if 6 feet social distancing is not possible, 3) spacing work stations 6 feet apart or providing acrylic or plexiglass dividers with or without vinyl graphics to provide a physical separation between work spaces, 4) evaluating soft surfaces to be upholstered in vinyl durable coated fabrics, including panel systems for ease of cleaning and disinfecting areas that are frequently touched,[78] 5) for buildings that have been closed for extended periods of time, evaluate all HVAC and plumbing systems using ASHRAE's Building Readiness/Reopening Guidance.[79] The ultimate goal for the designed workplace is for the physical environment to be reflective of an efficient and safe place that assists reducing the emotional, mental, and physical stresses for the workforce as much as possible as the workforce is re-introduced into the commercial workplace.

Future Implications and Resources
The overall shift in workplace to virtual platforms is currently thought to be a trend that will continue, from video conferencing to e-commerce.[80] With the shuttering of some businesses and the evolution of new technologies that support workplace activities and collaboration, there may be more office real estate available that may be an opportunity for re-purposing into other much needed resources; such as affordable mixed-use housing, multi-family housing with workspace being part of the footprint to allow for shared meeting space care services into home settings, and other positive innovative solutions to societal issues.

Many of the recommendations for manufacturing settings are like those for re-opening other types of workplaces as indicated in the Department of Labor's Occupational Safety and Health Administration (OHSA) COVID-19 Guidance for the Manufacturing Industry Workforce.[81] Depending upon the type of manufacturing, various types of management policies would address requirements for masks and PPE, the need for locations of physical barriers, and cleaning and disinfection of controls and electronic keypads.

The following specific resources are related to the re-opening and on-going operation of workplace settings:

ASHRAE Offers COVID-19 Building Readiness/Reopening Guidance

BOMA International: Getting Back to Work: Preparing Buildings for Re-Entry Amid COVID-19

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78   BOMA International: Getting Back to Work: Preparing Buildings for Re-Entry Amid COVID-19 (Updated May,1, 2020): available online at https://www.boma.org/coronavirus

79   ASHRAE: ASHRAE Offers COVID-19 Building Readiness/Reopening Guidance: available online at https://www.ashrae.org/about/news/2020/ashrae-offers-covid-19-building-readiness-reopening-guidance

80   Berrios, D. Security: Preparing for the Long-Term Impacts of COVID-19, April 30, 2020. This is an opinion based article and not peer-reviewed. Available online at https://www.securitymagazine.com/articles/92271-preparing-for-the-long-term-impacts-of-covid-19

81   OSHA COVID-19 Guidance for the Manufacturing Industry Workforce (June 8, 2020): available online at https://www.sqfi.com/covid-19-guidance-for-the-manufacturing-industry-workforce/

[Center for Disease Control and Prevention (CDC) Coronavirus Disease 2019 (COVID-19), Communities, Schools & Workplaces: Cleaning and Disinfecting: Plan, Prepare, and Respond: Guidance for Cleaning and Disinfection](#)

[OSHA COVID-19 Guidance for the Manufacturing Industry Workforce](#)

Compiled Resource Listing

American Industrial Hygiene Association (AIHA)
[Back to Work Safely Guidelines](#)

American Hotel and Lodging Association (AHLA)
[Safe Stay Guidelines](#)

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
[ANSI/ASHRAE/ASHE Standard 170-2017 Ventilation of Health Care Facilities](#)

[ANSI/ASHRAE Standard 188-2018, Legionellosis: Risk Management for Building Water Systems](#)

[COVID-19 Building Readiness/Reopening Guidance](#)

[COVID-19 (Coronavirus) Preparedness Resources](#)

Best Western
[We Care Clean℠ Program](#)

BOMA International
[Guidance Documents – Addressing COVID-19](#)

Business and Institutional Furniture Manufacturer's Association (BIFMA)
[Business and Institutional Furniture Manufacturer's Association](#)

[BIFMA Health Care Furniture Design – Guidelines for Cleanability](#)

Centers for Disease Control and Prevention (CDC)
[Coronavirus Disease 2019 (COVID-19), Communities, Schools & Workplaces: Cleaning and Disinfecting: Plan, Prepare, and Respond: Guidance for Cleaning and Disinfection](#)

[Coronavirus Disease 2019 (COVID-19), Community, Work & School, Interim Guidance for Administrators of US K-12 Schools and Child Care Programs: Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19)](#)

[Coronavirus Disease 2019 (COVID-19), Community, Work & School, Interim Guidance for Administrators of US Institutions of Higher Education: Plan, Prepare, and Respond to Coronavirus Disease 2019 (COVID-19)](#)

[Coronavirus Disease 2019 (COVID-19), Considerations for Institutes of Higher Education (Updated May 30, 2020)](#)

[Coronavirus Disease 2019 (COVID-19), Grocery & Food Retail Workers (Updated April 13, 2020)](#)

[Coronavirus Disease 2019 (COVID-19), Preventing Getting Sick, Cleaning Your Home: Cleaning and Disinfection for Households: Interim Recommendations for U.S. Households with Suspected of Confirmed Coronavirus Disease 2019 (COVID-19)](#)

Infection Control: Introduction, Methods, Definition of Terms: Guideline for Disinfection and Sterilization in Healthcare Facilities (2008)

Interim Guidance for Restaurants and Bars (May 2020)

Water, Sanitation, & Hygiene (WASH) – related Emergencies & Outbreaks

Chemical Fabric and Films Association
CFFA Performance Products Publications/Standards

Chemical Fabric and Films Association (CFFA)

CleanHealth Environmental – Shari Solomon, Industrial Hygiene Expert
CleanHealth Environmental

General Services Administration (GSA)
Sustainable Facilities Tool: Buildings and Health

Hilton
CleanStay: Clean and Ready for You

Life Cycle Assessment of PVC Water and Sewer Pipe and Comparative Sustainability Analysis of Pipe Materials: http://www.sustainablesolutionscorporation.com/resources

Marriott Bonvoy
Marriott Cleanliness Council

Resilient Floor Covering Institute (RFCI)
Resilient Floor Covering Institute

The Vinyl Institute (VI)
The Vinyl Institute

The Vinyl Sustainability Council

U.S. Department of Labor Occupation Safety and Health Administration (OSHA)
OSHA COVID-19 Guidance for the Manufacturing Industry Workforce

U.S. Food and Drug Administration (FDA)
CFR- Code of Federal Regulations Title 21 (as of April 2, 2019)

Wallcovering Associates (WA)
Wallcovering Association

What is Asset Management?
https://www.michigan.gov/documents/deq/deq-ess-mfs-formsguidance-DWassetmngmnt-guide_426744_7.pdf