The American Institute of Architects

Reopening America: Strategies for Safer Buildings

May 28, 2020

Briefing overview

The American Institute of Architects (AIA) launched an initiative to assist design professionals, public officials, building owners, and businesses with strategies for mitigating transmission risk of SARS-CoV-2 in the built environment.

Physical distancing practices and stay-at-home orders were implemented in the US on a state-by-state basis in an effort to slow the spread of the virus. However, as state authorities have allowed businesses to reopen, there is limited guidance on how to modify the built environment to reduce the likelihood of transmission and to avoid recurring cycles of outbreak during the pandemic. Simple adjustments within buildings offer businesses the opportunity to resume operations and reduce risk, but such ideas require exploration.

AIA convened architects along with experts from the fields of public health, engineering, and facilities management using a virtual-design charrette method to develop tools addressing: 1) risk assessment and management for the built environment; 2) preparedness for building re-occupancy; and 3) design and space planning strategies emphasizing the health, safety, and welfare of the public in occupying US buildings.

Key messages

Safer re-occupancy requires guidance: Quarantine is not a viable long-term strategy for our economy nor mental health. Yet building owners and operators need guidance to understand what aspects of their buildings pose the greatest risk for virus transmission, along with practical strategies to mitigate risk, before opening their doors to children, families, and employees. Strategies must be based on leading scientific agencies and authorities, such as the Centers for Disease Control and Prevention (CDC).

Designing for risk: Building owners and design teams need a building risk management process to increase the likelihood of maintaining safe operations during the pandemic. The process includes identification and analysis of suspected hazards and identifies strategies to reduce the negative impacts.

Sharing science and design: Sharing design strategies that proactively mitigate virus transmission is critical to facilitating design innovation resilient to a myriad of risks and meeting operational goals.

Background

Since the first cases of COVID-19 were diagnosed in December 2019, an unprecedented number of daily lifestyle changes have been necessary to reduce the likelihood of disease transmission in the US. Physical distancing requirements forced the cancelation of all school activities, transitioning children and young adults to learn from home. Many commercial office buildings were abruptly closed, pushing workers into home office environments. And nonessential businesses were closed to avoid unnecessary gatherings of people, impacting restaurants and bars, shopping malls, and entertainment and sport venues. Lastly, public amenity spaces in many multi-family or senior living units had been closed or restricted to avoid exposure to the virus.

In order to return to a more normal life, including school, work, socialization, and entertainment, a vaccine must be widely available or the risk of exposure to the virus significantly reduced. A vaccine is not expected to be available for 12-18 months from spring 2020, making alternatives to quarantine desirable. However, most US buildings and business operations were not designed to meet the current occupancy guidelines on physical distancing or removal of virus droplets. If buildings can be occupied while simultaneously managing risk of exposure to employees or customers, a balance of economic and lifestyle goals can be met. However, a variety of building modifications would need to be made to reduce the risk of COVID-19 exposure.

Architects use critical-thinking and problem-solving skills to design environments that address a variety of programmatic goals and create spaces that can reduce harm, adapt to evolving conditions, and more readily, effectively, and efficiently recover from adverse events. Since 1972, AIA has been preparing its members and leading a Disaster Assistance Program to address stresses and shocks like pandemics. Similarly, AIA spearheaded an initiative on design for human health and an associated research consortium.

In the immediate response phase to COVID-19, architects mobilized and created a tool for evaluating alternative care sites for patient care surge capacity. Meanwhile, essential facilities like grocery stores embraced temporary design interventions, including one-way directional aisles, plexiglass at registers, and signage to promote physical distancing. Many of these built environmental actions were an impromptu response. Environmental science terms this the “precautionary principle,” in which measures are taken to reduce the threat of harm to human health even in the absence of scientific evidence.

The need

Federal guidelines, as well as many state and local guidelines, call for continued physical distancing measures as people return to buildings. The CDC recommends maintaining a minimum physical distance of six feet; however, this dimension can vary depending upon length of exposure, air flow, activity, and other factors. California Governor Gavin Newsom's plan to reopen his state identifies the ability of schools and businesses to redraw floor plans to allow for greater physical distancing as one of six indicators for modifying the current stay-at-home order.

Additionally, there are a number of public health and risk management strategies for addressing COVID-19. The CDC uses the "hierarchy of controls" to determine how to implement feasible and effective solutions to hazards. When applying this model to the COVID-19 virus, the following is identified:

- Elimination—the most effective measure, elimination means physically removing the hazard (COVID-19) by either a reliable vaccine or indefinite social isolation (stay-at-home orders), assuming all occupants are not ill and have not been exposed to the virus.
- Substitution—replacing the hazard (COVID-19) with a less hazardous condition. In this pandemic response, substitution is not applicable.
- Engineering (or physical controls)—reducing exposure or separating occupants from the hazard. This takes the form of physical interventions, including spatial, material, and HVAC-related solutions.
- Administrative controls—implementing policy to influence changes in human behavior. Examples are work from home, homeschooling, or curbside pick-up; enhanced hygiene protocols; or working in shifts daily or weekly to reduce the number of occupants at a facility at a given time.
- Personal protective equipment (PPE)—PPE is the least effective method because of the need for adequate supplies as well as proper and continuous use.

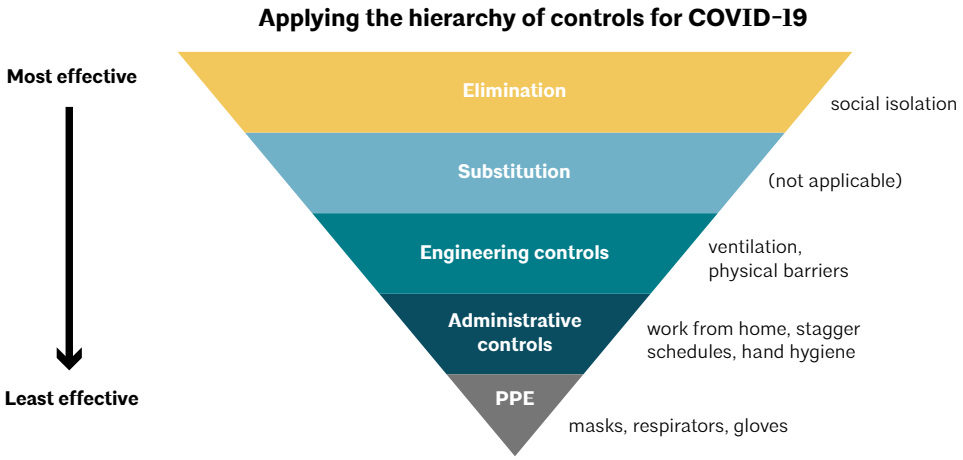


Figure 1: Applying the hierarchy of controls for COVID-19 (adapted from NIOSH)

During this pandemic, an emphasis has been placed on administrative policies (frequent hand washing) and PPE (face masks, face shields, and gloves). Engineering controls, however, have been minimally explored and lack the definition of architectural controls—the distinct skills associated with architectural re-planning and redesigning of the built environment.

Additionally, hazard control is commonly evaluated within a context of environmental risk management. According to the US Environmental Protection Agency (EPA), "environmental risk management seeks to determine what environmental risks exist and then determine how to manage those risks in a way best suited to protect human health and the environment." In addition to the lack of defining architectural and engineering hazard control for this pandemic, there has been minimal discussion of how a building owner, building operator, or employer can determine whether these controls are operating effectively. Business owners have expressed financial and ethical concerns over reopening only to potentially close operations again due to cyclical outbreaks in their community. A risk management program for the built environment could provide business owners with a tool to continually evaluate the ongoing effectiveness of architectural and engineering controls while demonstrating to state or local authorities having jurisdiction that they have taken a responsible approach to business operations during the transition phase of the pandemic.

Intended audience

This brief introduces guidance developed for:

- Building management professionals, such as building owners, businesses, employers, human resource professionals, and facility managers;
- Design professionals, such as licensed architects, spatial planners, technical experts in fire and life safety, and engineers; and
- Federal, state, county, and local governments, including departments of emergency management, public health, as well as community and economic development.

Method

The AIA multidisciplinary team conducted virtual charrette workshops—a method used to study specific issues in a limited time frame using an intense brainstorming session—to develop strategies that reduce the risk of virus transmission in buildings. Typically, charrettes include easels and large white pads for sketching and note taking; however, this pandemic required new virtual collaboration methodologies. In an online meeting platform with presentation, webcam, and "white board" capabilities, the charettes focused on retail, restaurants, offices, schools, multi-unit dwellings, and senior care facilities—all of which have unique requirements and considerations.

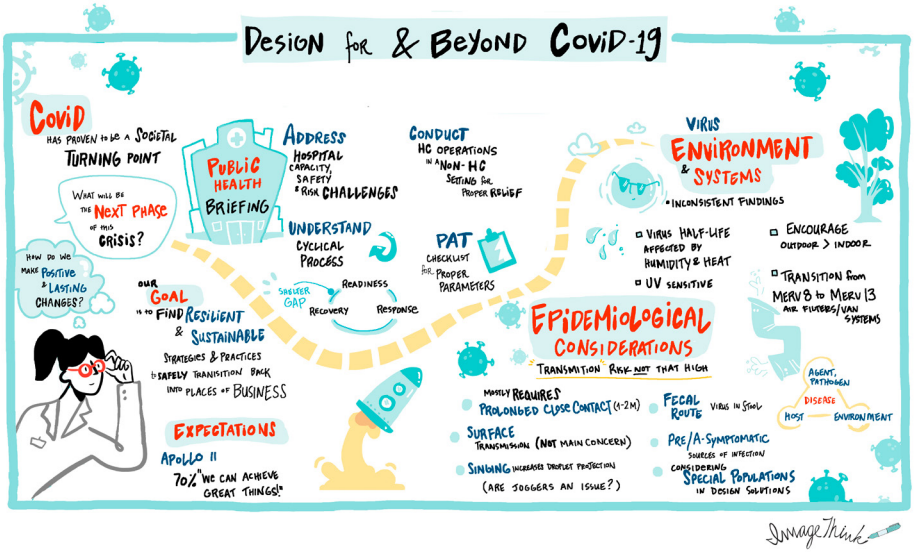


Figure 2: Graphic recording of AIA COVID-19 virtual charrette discussion.

As part of the sessions, a team of physicians, public health experts, and environmental health experts provided an independently developed 90-minute briefing on SARS-CoV-2 infectious disease transmission, epidemiological models, and insights into the most current research of the virus as of early May.

Industry guidance and resources were also provided. Using the AIA Re-occupancy Assessment Tool framework, the team identified virus transmission hazards, characterized risk in buildings, and developed strategies (e.g., controls) to minimize those risks.

Successful strategies reduce the spread of pathogens, accommodate physical distancing guidance, promote mental well-being, and otherwise meet the demands of a pandemic-informed new day-to-day lifestyle norm. Strategies range from temporary to permanent and include:

- Architectural and engineering features: spatial, finishes, furniture, partitions, additions, facilities, mechanical, systems, plumbing, and electrical.
- Administrative: policies and procedures related to how people occupy and function within space.
- PPE: requiring the use of personal protective equipment.

Outcomes

Using outcomes from the charettes, AIA is providing three tools to assist with building re-occupancy during the pandemic.

Tool 1: Risk management plan

Outcomes from the charette also identified the need for a risk management plan for buildings. Risk management is an organized, transparent process recommended as a means of assessing hazards and managing risk. This process can be utilized when identifying issues and design solutions for building re-occupancy either within a design practice or for design projects with clients (building owners and operators). It is practical, logical, defensible, and replicable. It uses an evidence-based design approach, memorializes design decisions, and functions as a repository for coordinated work with building owners.

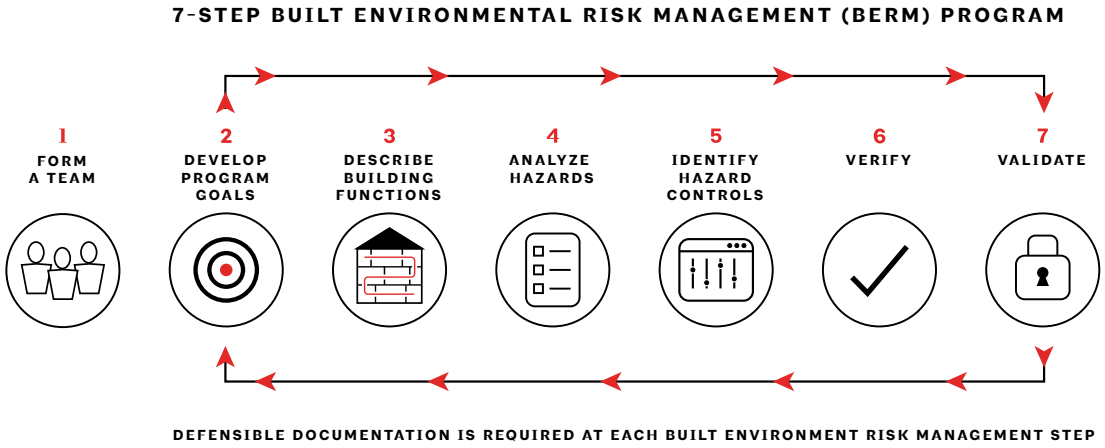
It is consistent with tools already being used by a wide variety of US agencies (e.g., CDC, EPA, and the US Food and Drug Administration) and internationally with the WHO, as well as client types familiar with:

- health care design and construction,
- health care operations,
- the food service industry,
- the airline industry,
- hotels and commercial enterprises using water management, and
- emergency management and resilience planning.

The systematic process incorporates prescriptive steps to meet measurable goals and metrics. Through use of the building risk management process, the design team acquires and compiles decisions and communications, which are useful for establishing and fulfilling expectations that align with the building owner or operator's acceptable level of risk tolerance.

The process focuses attention on the most impactful and probable hazards, leading to insights on how best to characterize and manage risk while avoiding unintended consequences of latent conditions. It can also be used to identify gaps in critical information regarding the level of risk associated with specific project elements.

The building risk management plan should be regularly reviewed, updated, and documented through all stages of design and construction and post-occupancy to ensure expectations are met.



In brief, the process involves a seven-step decision-making process with each step requiring documentation:

1. Assemble a multidisciplinary team
2. Establish goals and objectives
3. Describe the building flow process
4. Hazard analysis for the design with risk characterization
5. System hazard controls
6. Verification
7. Validation

The specific building risk management process proposed for use during the pandemic is available in the form of a risk management plan with typical considerations for building types and a process to document hazards, establish risk characterization, and define options for controls.

Tool 2: AIA Re-occupancy Assessment Tool

Input from the charette teams was used to enhance AIA's Re-occupancy Assessment Tool with strategies that are applicable to schools, offices, commercial retail, restaurants, multi-unit dwellings, and senior care facilities. The tool will continue to be developed as research and knowledge of the virus evolves.

E Education	F Restaurant	R Retail
O Office	S Senior living	H Housing

AIA's Re-occupancy Assessment Tool was developed by AIA's Disaster Assistance Committee, which synthesized more than 100 evidence-based strategies after reviewing guidance from the CDC, Occupational Safety and Health Administration, World Health Organization (WHO), and published research.

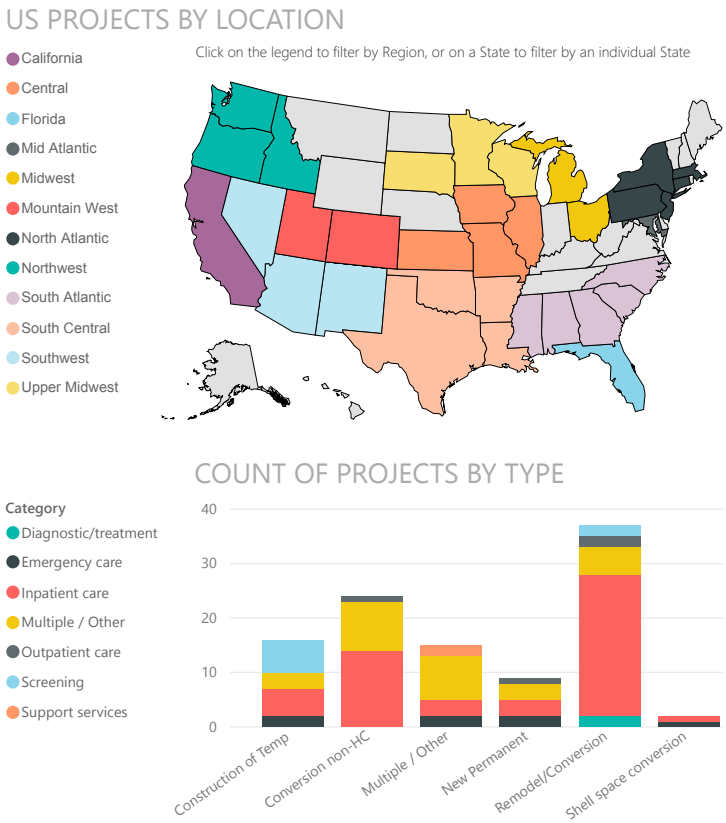
The tool is intended to provide design professionals, public officials, building owners, employers, and business operators with a framework of strategies (controls) that address baseline parameters for occupancy, reduce the spread of pathogens, and support physical distancing. Strategies (or controls) are based on the CDC's hierarchy of controls framework. The tool also aims to provide a range

of possible mitigation strategies to consider, with the understanding that the risk of infection can only be reduced and not eliminated entirely. Where evidence is not available to support these strategies, the tool falls back on the precautionary principle of environmental health science, which states that measures should be taken to reduce the threat of harm to human health even in the absence of scientific evidence. The Re-occupancy Assessment Tool also provides context and consideration of other goals, such as budget, staffing, safety, and comfort, as well as other hazard risks associated with shocks and stresses.

Tool 3: ArchMap 3.0

In order to facilitate knowledge and development of design strategies that reduce risk of the disease in buildings, AIA is expanding its COVID-19 ArchMap beyond health care and alternate care facility designs.

The map—produced in partnership with the University of Kansas' Institute of Health + Wellness Design and AIA's task force on alternative care sites—will now host all building design projects, including education, food service, lodging, housing, and public venues, that enhance safety in the built environment during the pandemic. Projects are searchable by state, building type, location, and other characteristics.



Ultimately, the tool is intended to facilitate the creation of cutting-edge design concepts that respond to the cyclical outbreaks occurring in each state in the context of this pandemic, help communities return to a more normal daily lifestyle, and inform future crisis responses.

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Conflicts of interest

All authors and charrette participants declare no conflict of interest while acknowledging all persons work in associated fields related to the content and creative ideas generated (architecture, engineering, or public health disciplines). However, the work presented here and in the tools for this effort do not involve any proprietary product or service from their firms unless otherwise noted.

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