

WELL HEALTH-SAFETY RATING

FOR FACILITY OPERATIONS

& MANAGEMENT



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Introduction

The WELL Health-Safety Rating for Facility Operations and Management is an evidence-based, third-party verified rating for all new and existing building and facility types focusing on operational policies, maintenance protocols, stakeholder engagement and emergency plans.

Designed to empower owners and operators across large and small businesses alike to take the necessary steps in order to prioritize the health and safety of their staff, visitors and other stakeholders, the WELL Health-Safety Rating can help guide users in preparing their spaces for re-entry in a post-COVID-19 environment, instilling confidence in occupants and the broader community. The rating, which consists of a subset of relevant features from the WELL Building Standard™ (WELL™) adapted for facility operations and management, was informed by the COVID-19 pandemic, but has broader applicability for supporting the long-term health and safety needs of people in a given space.

As organizations across the globe respond to the COVID-19 crisis by making updates to their policies and protocols, the WELL Health-Safety Rating provides an efficient and effective opportunity to guide, validate, recognize and scale the efforts of owners and operators on critical health and safety issues. The third-party review process ensures integrity and consistency, and results in a WELL Health-Safety seal, communicating leadership and a commitment to the health and well-being of the people who frequent the space.

WELL Health-Safety Rating: Rooted in Evidence and Expertise

The WELL Health-Safety Rating was created by the International WELL Building Institute (IWBI), the organization that oversees the world's premier framework for advancing health in buildings and spaces of all kinds - the WELL Building Standard (WELL). WELL is grounded in the premise that buildings, communities and organizations play a leading role in supporting our health and well-being, as well as our collective ability to prepare for and respond to global health challenges like the one we're experiencing now.

The genesis of the WELL Health-Safety Rating was feedback from IWBI's Task Force on COVID-19 and Other Respiratory Infections, a group of nearly 600 public health experts, virologists, government officials, academics, business leaders, architects, designers, building scientists and real estate professionals, which was established in late March 2020 to support IWBI's response to the pandemic. This group identified an important need for a third-party designation that would help guide owners and operators towards evidence-based best practices for mitigating the spread of COVID-19 and for navigating this crisis and beyond.

Focused on the Critical Role of Facility Operations and Management

The COVID-19 pandemic has highlighted the critical role that buildings play in supporting people's health, safety and well-being. Transmission of COVID-19 largely occurs in indoor and enclosed environments, where people spend approximately 90% of their time. While longer term design strategies are important in reducing the risks of infectious disease spread, the urgent need to meet high health and safety standards in existing buildings prompted this rating to focus on strategies that can be implemented immediately within the scope of facility operations and management to protect occupants from acute threats. Projects undergo an annual renewal process validating their on-going operations and maintenance, which helps to ensure they are meeting a consistently high standard for health and safety over the long term, and which results in an updated WELL Health-Safety seal.

WELL Health-Safety Rating Scope

The WELL Health-Safety Rating includes more than 20 features across the following core areas, a minimum of 15 of which need to be met:

- Sanitation Procedures
- Emergency Preparedness Programs
- Health Service Resources
- Air and Water Quality Management
- Stakeholder Engagement and Communication
- Innovation

The strategies within the WELL Health-Safety Rating have been informed by existing features within the WELL Building Standard, IWBI's Task Force on COVID-19 and guidance by the World Health Organization (WHO), U.S. Centers for Disease Control and Prevention (CDC), global disease control and prevention centers and emergency management agencies, as well as recognized standard-making bodies such as ASTM International and ASHRAE, and leading academic and research institutions. Industry experts and researchers across the WELL Concept Advisories, the WELL Research Advisory, the WELL Advisory for Sports and Entertainment Venues, the WELL Advisory for Hotels and Resorts and the WELL Airport Advisory also provided extensive insights for the WELL Health-Safety Rating.

Meeting the Needs of Today's Challenges

The impact of COVID-19 in relation to the places where we live, work, learn and play is unprecedented: offices, restaurants, stores, venues, schools, industrial facilities, residential common areas, places of worship and space types of all kinds have been closed across the world, in some cases for months. As these spaces and places begin to re-open, people across the world are wondering whether it is safe to return.

Organizations seeking to navigate the impacts of COVID-19 are faced with important decisions about when and how to restore their operations, how to support the safety of occupants and employees, and how to prepare for the inevitable changes to their facilities over the coming months. The WELL Health-Safety Rating is designed to help guide organizations to evidence-based best practices for operating through this crisis, as well as for long-term preparedness on other critical health and safety issues.

Preparing Organizations for an Immediate and Long-term Focus on Health and Safety

COVID-19 has taught us how important it is to be prepared for a crisis, and demonstrated that many of our organizations lacked the critical plans, resources and protocols to immediately navigate this emergency. Businesses, organizations and communities know that now is the time to focus on the urgent needs related to COVID-19 response and resilience, but also to better prepare for other emergencies and health and safety issues that will inevitably arise in the future.

To help organizations meet both immediate needs and those that are more long term, the WELL Health-Safety Rating addresses a range of acute health threats that can be mitigated by facility operations and management strategies. The rating system presents a diverse set of evidence-based strategies that can be customized to an organization's specific concerns and goals in the short and the long term. In addition to its focus on potential risks associated with infectious disease, the WELL Health-Safety Rating includes operational strategies to mitigate mold, Legionnaires' disease, and air and water quality contaminants. It also focuses on emergency planning and operations, as well as occupant communication and engagement to

ensure awareness and participation in creating a healthy, safe environment. Finally, the rating includes strategies to support occupant and employee health, with a focus on mental health during crises, sick leave policies and community immunity.

The WELL Health-Safety Rating is intended to support all space types during both emergencies and normal operating periods. To that end, its strategies are designed for broad applicability to support health and safety, while allowing for short-term measures for emergency management, including response to pandemics like COVID-19. Since the rating is renewed annually, organizations have the ability to tailor their rating strategies to align with their goals and unique health-safety considerations that evolve over time.

The WELL Health-Safety Rating is intended to complement and reference, but not replace, health-based governmental guidance and requirements. As with the WELL Building Standard, the rating is designed to grow in specificity and specialty over time, adapting to accommodate diverse space types and geographies and to respond to new evidence and ever-evolving issues within its focus on facilities operations and management and health and safety.

Creating a Seamless Entry into WELL

The WELL Health-Safety Rating features are a subset of those available through the WELL Building Standard, which addresses a more comprehensive set of health topics. Adapted to focus specifically on facility operations and management, the WELL Health-Safety Rating provides an accessible entry point to WELL Certification or the WELL Portfolio program. Owners or operators can pursue the WELL Health-Safety Rating for projects independently, seamlessly use the rating as a stepping-stone to achieve WELL Certification or integrate the rating as a milestone within their WELL Certification or WELL Portfolio journey.

Cleaning and Sanitization Procedures

COVID-19 and many other infectious diseases are spread primarily through close contact with an infected person via respiratory droplets. However, it is known that coronaviruses and noroviruses, among other pathogens, can survive on surfaces infected by droplets. For instance, research suggests that the SARS-CoV-2 virus can remain airborne for up to three hours and on some surfaces for up to 72 hours.¹ Several outbreak investigations have supported the potential of fomites (i.e., infected surfaces) to cause viral diseases.^{2,3} Similarly, pathogenic bacteria such as *Salmonella* can be transmitted through contaminated surfaces and hands, which may particularly trigger disease in children, as they are more likely to touch surfaces such as toilets.⁴ Maintaining good cleaning protocols can support organizational resilience by helping reduce the risk of infection. Similarly, hand washing promotion is an effective way to reduce the spread of infectious diseases and to confer individual resilience.⁵ Soap has been found to be more effective than hand sanitizer in community settings.⁶

While sanitization is critical, especially during an infectious disease crisis, commercial cleaning products may contain ingredients suspected to be hazardous to human health and the environment.⁷ Cleaning product ingredients may contain vapors or gasses that irritate the nose, eyes, throat and lungs and can cause or trigger asthma attacks.⁸ As a result, frequent use of household cleaning sprays is suspected to be a risk factor for adult asthma.⁹ Low-hazard cleaning products and cleaning practices reduce impacts in indoor air quality and in the health of those performing these duties, while protecting occupants, as well.⁷

1. Support Handwashing

Intent

Ensure support of hygienic hand washing practices for all individuals.

Feature Background

Summary: This feature requires projects to improve hygiene by offering hygienic soap containers and hand drying support.

Issue: All humans share the critical need to access to bathrooms and proper hand hygiene is key to reduce the incidence of gastrointestinal and respiratory diseases.⁵ Soap has been found to be more effective at removing germs than hand sanitizer in non-healthcare settings, as sanitizers' effect is impeded by dirty or greasy hands.¹⁰ Despite hand washing, hands can only become as clean as the surrounding environment. Sinks may harbor pathogenic bacteria that can migrate onto hands during washing.¹¹ Water splashing from the drain may spread bacteria to surrounding areas.¹²⁻¹⁵ Additionally, soap and the inside of liquid soap containers often remain contaminated after use; thus, best practice and research recommends that soap dispensers not be topped off.^{13,14} Lastly, once an individual's hands are cleaned, they can more easily become re-infected when wet compared to when dry.^{11,16}

Solutions: Bathrooms can be designed and furnished to ease hygiene. Visual cues that promote hand hygiene may improve compliance with established guidelines in certain segments of the population.¹⁷⁻¹⁹

Requirements

For All Spaces Except Dwelling Units:

The project provides, at minimum, the following in all sinks where handwashing is expected (e.g., bathrooms, break rooms, food prep and wellness rooms):

- a. Fragrance-free liquid hand soap dispensed through one of the following:
 1. Sealed dispensers equipped with disposable soap cartridges.
 2. Dispensers with detachable and closed containers for soap refill. Soap containers must be washed and disinfected when emptied, before refilling.
- b. One of the following methods for hand drying:
 1. Paper towels.
 2. Hand dryers equipped with a HEPA filter. Filter replacement and equipment maintenance are carried out per manufacturer's instructions. (NOTE: This method is not available for healthcare projects.)
 3. Fabric hand towel rolls with dispensers, with rolls replaced before reaching their end of service.
- c. Signage displaying steps for proper hand washing.

Verification type: Policy and/or Operations Schedule

For Commercial Kitchen Spaces and Commercial Dining Spaces:

The following requirement is met:

- a. Clear signage directing toward the nearest handwashing location is present at the entrance to all areas intended for food preparation or consumption.

Verification type: Letter of Assurance – Owner, On-site Photographs

Core notes: To earn this feature, the requirements should be met to the extent of developer buildout.

2. Reduce Surface Contact

Intent

Reduce the amount of hand contact on high-touch surfaces.

Background

Summary: Assess high-touch surfaces throughout the project and implement temporary and/or permanent strategies to reduce frequency or need for occupants to come into direct contact with surfaces.

Issue: Coronaviruses and noroviruses, among other pathogens, can survive on surfaces infected by droplets. For instance, research suggests that the SARS-CoV-2 virus can remain airborne for up to three hours and on some surfaces for up to 72 hours.¹ Several outbreak investigations have supported the potential of fomites (i.e., infected surfaces) to cause viral diseases.^{2,3}

Solutions: Reducing the instances where occupants touch surfaces can help minimize one of the vectors of disease transmission.

Requirements

For All Spaces except Dwelling Units:

Choose one of the following:

Surface touch assessment

Project provides the following:

- a. An inventory of:
 1. All high-touch surfaces (e.g., doorknobs/handles, telephones, elevator buttons, faucet handles, soap dispensers, security equipment).
 2. All person-person contact points (e.g., security check-points).
- b. Potential temporary and/or permanent measures to reduce or eliminate frequency of contact with high-touch surfaces and person-person contact, if possible (e.g., doors opened by an attendant, touch-free faucets, voice-activated elevators, ticketless entry, transparent partitions).
- c. Circumstances in which temporary measures will be implemented and timeline for permanent measures to be implemented.

Verification type: Professional Narrative

Core notes: To earn this feature, the requirements should be met to the extent of developer buildout.

OR ---

Surface touch management

The following requirements are met:

- a. Project offers hands-free operation (through foot, voice, sensor or personal electronic device) or implements other design strategies to avoid hand operation for at least three of the following:
 1. Regularly used pedestrian entry doors to the project, during regularly occupied hours.
 2. Elevators.
 3. All water bottle fillers, water faucets, soap and paper towel dispensers.
 4. Window blinds and indoor lighting switches and/or controllers.
 5. Lids of trash, recycling and reuse bins.
- b. Project supports occupants in maintaining hand hygiene near the following high-touch surfaces:
 1. Handrails, handlebars and other structures that support mobility and accessibility.
 2. Surfaces designed to help individuals with physical and/or visual disabilities to fully utilize a space (e.g., push to open door buttons, wheelchair lift controls, tactile maps or signage).
- c. Project establishes and communicates rules and expectations for the usage and cleaning of shared tools and devices (e.g., photocopiers, gym equipment, communal kitchen appliances, utensils) for all regular building occupants.

Verification type: Professional Narrative

3. Improve Cleaning Practices

Intent

Provide effective cleaning by establishing adequate cleaning protocols and practices.

Background

Summary: This feature requires the development of cleaning and disinfection plans that include instructions, training and recordkeeping.

Issue: Cleaning is fundamental for keeping a healthy indoor environment. Microorganisms such as house dust mites – ubiquitously present around the world– are directly related with asthma and allergy development.^{20,21} Surfaces may host pathogens released by sick individuals or through contact with another contaminated surface.³

Cleaning practices may cause additional health concerns. For instance, indiscriminate use of cleaning sprays is suspected to be a risk factor for adult asthma.⁹ Similarly, lack of education on the use of gloves during wet cleaning activities may explain the high prevalence of hand dermatitis in the cleaning service industry.^{22,23}

Solutions: A thorough plan for cleaning operations that considers the health of occupants and cleaning staff increases the overall efficiency of the process, while reducing environmental damage.²⁴ The plan should align with advice from public health agencies for disinfection requirements.²⁵ Along with personal protective equipment (PPE), the implementation of engineering controls (e.g., ventilation) and policies is key to reduce exposure to hazards during cleaning practices.²⁶

Requirements:

For All Spaces:

The project develops and implements a cleaning plan that meets the following requirements:

- a. Details the following:
 1. Extent and frequency of cleaning.
 2. Cleaning responsibilities of building occupants and cleaning staff.
 3. Cleaning supplies available to building occupants and where they can be accessed.
 4. Process to evaluate and document adherence to the cleaning plan.
- b. Identifies the following:
 1. Surfaces that require disinfection (e.g., high-touch surfaces).
 2. Frequency and/or other thresholds (e.g., number of hours, number users of a space, results from a swab test) for disinfection.
 3. Applicable governmental registration and directions of use (e.g., contact time and dilution rates) for disinfectants.
 4. Other non-chemical tools used for disinfection, if any.
- c. States the following documentation procedures:
 1. Record keeping practices for cleaning and disinfection activities.
 2. The chain of communications with building occupants.

3. A system to log feedback from occupants and cleaning staff.
- d. Specifies the following for cleaning materials and personal protection equipment (PPE):
 1. PPE requirements for general cleaning and specialized tasks (e.g., disinfection or dilution or chemicals).
 2. Color-coding for reusable and disposable cleaning cloths.
 3. Separate cleaning of reusable cleaning materials from other clothing or products.
- e. Includes the following precautions for storage of cleaning products:
 1. An identifiable, fit-for-purpose storage space in accordance with the manufacturers' directions; bleach stored away from other products.
 2. Color-coding and labeling of any bleach-based and ammonia-based products, indicating they are not to be mixed with one another.
- f. Specifies the following for cleaning tools and equipment:
 1. HEPA rated filters for vacuum cleaners.
 2. If carpet and woven upholstery are present, the cleaning methodology (based on manufacturer's recommendations), favoring hot water extraction if technically feasible.
 3. Protocols for cleaning, maintenance and handling of waste accumulated in equipment (e.g., used vacuum cleaner bags).
- g. Includes the following operational aspects:
 1. Use of cleaning and disinfection products, including dilutions (when needed) and ventilation requirements.
 2. On-site availability of current Safety Data Sheets (SDS) of cleaning and disinfection products, in languages spoken by the cleaning staff.
 3. Precautions to avoid slip hazards during and after floor cleaning.
 4. Safe disposal of waste, including soiled cleaning materials and PPE.
- h. Outlines a training program that meets the following:
 1. Training covers cross-contamination prevention via hand hygiene, PPE, cleaning cloth replacement, cloth handling techniques and carrying systems to separate clean tools from dirty ones.
 2. Training is delivered to all relevant personnel including building management, building operators and contracted cleaning staff, on an annual basis.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met in non-leased spaces.

4. Select Preferred Cleaning Products

Intent

Minimize potential health effects to occupants by selecting less hazardous products.

Feature Background

Summary: This feature requires the restriction of hazardous or harmful ingredients in cleaning, disinfection and sanitization products.

Issue: Commercial cleaning products may contain ingredients that may degrade the indoor air quality and are suspected to be hazardous to human health.⁷ Some products may emit substances that irritate the nose, eyes, throat and lungs and can cause or trigger asthma attacks.⁸ Moreover, the interactions between cleaning agents, microbes and public health are diverse and complex, and we are just beginning to better understand them.^{27,28}

Solutions: The provision of cleaning products that contain less hazardous ingredients may reduce the risk of respiratory and dermal symptoms.²⁹

Requirements

For All Spaces:

All cleaning, disinfection and sanitization products are specified in the cleaning plan and meet one of the following requirements:

- a. Products are labeled as 'low-hazard' or 'safer' by an ISO 14024-compliant (Type 1) Ecolabel, or by a third-party certification recognized by the local government where the project is located. Hazard criteria must be specific for the product classes within the scope of this feature.
- b. The Safety Data Sheet (SDS) of each product discloses ingredients per EU Regulation 2015/830 (CLP) or California State Bill No. 258 and no ingredients listed in Section 3 of the SDS are classified as Category 1, 1A or 1B for the following Globally Harmonized System (GHS) codes and corresponding hazard statements:
 1. H311 (toxic in contact with skin).
 2. H312 (harmful in contact with skin).
 3. H317 (may cause allergic skin reaction). Individual terpenes may be present up to a concentration of 0.5% in undiluted products
 4. H334 (may cause allergy or asthma symptoms or breathing difficulties if inhaled).
 5. H340 (may cause genetic defects).
 6. H350 (may cause cancer).
 7. H360 (may damage fertility or the unborn child).
 8. H372 (may cause damage to organs through prolonged or repeated exposure).

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met in non-leased spaces.

5. Reduce Respiratory Particle Exposure

Intent

Implement strategies to reduce human contact with respiratory particles.

Feature Background

Summary: This feature requires projects to implement design and policy strategies to minimize some instances of contact with contaminated respiratory particles.

Issue: Many viral diseases, including COVID-19²⁶² and influenza,²⁶³ are spread by oral or respiratory emissions of liquid particles emitted by an infected person when they cough, sneeze or even exhale.¹⁸² Factors that may affect exposure include the size distribution of the respiratory particles,²⁶³ humidity,^{264,265} air flow^{265,266} and air treatment.^{265,266} While the relative influence of these factors is variable, direct exposure to particles shed by an infected individual may increase a person's odds of acquiring certain diseases.^{262,267}

Solutions: Implementing design and policy strategies aimed at reducing exposure to some particles shed by infected individuals, like establishing physical distancing among people^{268,269} or providing barriers to prevent respiratory particles,²⁷⁰ may slow the spread of pathogens.²⁷¹

Requirements

For All Spaces:

The following requirements are implemented during periods when higher incidence of respiratory disease is likely:

- a. At least one of the following distancing strategies:
 1. Queuing marks to increase distance between people while waiting in line (e.g., in elevator lobbies, at check-out counters) and while using moving sidewalks and escalators, as applicable.
 2. Screens, protective furnishings or other engineering controls to reduce particle exchange at security check-ins, reception areas, check-out counters and other places with frequent interaction between occupants and a stationary worker.
 3. Self-service systems to control ingress or egress to the project (e.g., at reception desks or checkout counters).
- b. At least one of the following circulation strategies:
 1. One-way hallways and corridors.
 2. Separate entry and exit doors at pedestrian building entrances.
 3. Separate entry and exit for restrooms except single-user bathrooms.
- c. All of the following in any shared spaces (e.g., meeting rooms, workspaces, communal kitchens):
 1. Strategies to increase distance among occupants.
 2. Expectations and requirements for usage of face coverings or personal protective equipment.
 3. Clearly communicated rules for occupancy to reduce respiratory particle exposure and rationale for their use.

- d. At least one of the follow communication strategies to educate occupants about the practices implemented by the project to reduce respiratory particle exposure:
 1. Monthly communication (e.g., email, webcast) to all regular building occupants.
 2. Prominent signage (physical or digital) at all building entrances and in shared spaces.

Verification type: Professional Narrative

Certification notes: Interiors projects may count base building elevators, entries and exits towards feature requirements, even if outside of the project boundary.

Emergency Preparedness Programs

Emergency preparedness and resilience plans are critical to ensuring that organizations are equipped to immediately confront a crisis, as well as to recover successfully from it. Infectious disease epidemics have increased in the 21st century, involving fast global spread due to travel, trade and urbanization.^{30,31} For example, the COVID-19 pandemic infected 6 million people and spread to almost every continent within 5 months, impacting the social and economic livelihood of the global population on an incalculable scale.^{32,33} In addition, natural disaster emergencies kill around 90,000 people and affect close to 160 million people worldwide every year, with both an immediate and long-term impact on human lives and built spaces.³⁴

The U.S. Federal Emergency Management Agency estimates about 40-60% of small businesses permanently close following a disaster due to lack of a comprehensive disaster preparedness plan with proper mitigation strategies.³⁴ Emergency management plans can help organizations be better prepared to handle unforeseen events, minimize occupant confusion and improve coordination and safety during emergency situations.^{30,35-39} Robust emergency preparedness and response measures can also slow the spread of infectious disease and minimize secondary mortality.⁴⁰ Additionally, creating plans to support business continuity, remote work readiness and project re-entry after extended remote periods helps maintain business resilience and individual well-being during and after longer-lasting emergencies.^{41,42}

Finally, providing access to mental health services, such as psychological first aid, crisis counseling and bereavement counseling, is critical to supporting employee short-term recovery and long-term productivity, functioning and well-being.⁴³⁻⁴⁶ Stress is known to weaken the immune system and chronic stress is associated with increased risk of numerous adverse health consequences, such as depression, cardiovascular disease, diabetes and upper respiratory infection.^{47,48} Having access to health services, mental health support and restorative programming are important before, during and after any health crisis.

6. Develop Emergency Preparedness Plan

Intent

Enable organizations, families and individuals to prepare and respond to diverse emergency situations.

Feature Background

Summary: This feature requires projects to undertake a risk assessment, create an emergency management plan for natural, human-caused, technological and health-related emergencies and educate occupants on the plan to support emergency preparedness and response.

Issue: Natural disasters kill around 90,000 people and affect close to 160 million people worldwide every year, with both an immediate and long-term impact on human lives and built spaces.⁴⁹ Older adults, individuals with disabilities, pregnant women and children may have special needs during an emergency and are particularly vulnerable when disaster strikes.⁴⁹ The U.S. Federal Emergency Management Agency estimates about 40-60% of small businesses permanently close following a disaster due to lack of a comprehensive disaster preparedness plan with proper mitigation strategies.⁵⁰ Beyond natural disasters, infectious disease epidemics have increased in the 21st century, involving fast global spread due to travel, trade and urbanization.^{51,52} The COVID-19 pandemic spread to almost every continent and infected more than more than six million people worldwide within five months impacting the social and economic livelihood of the global population on an incalculable scale.^{53,54}

Solutions: An effective emergency management plan requires an understanding of local potential hazards, the needs of vulnerable groups, the responsibilities of the emergency response team and building response capabilities.⁵⁵ Emergency management plans, including risk assessments, occupant drills and enhanced emergency communications, can help organizations be better prepared to handle unforeseen events, minimize occupant confusion and improve coordination and safety during emergency situations.^{51,56-60} Robust emergency preparedness and response measures can also help to slow the spread of infectious disease and minimize secondary mortality.⁶¹

Requirements

For All Spaces:

The following requirements are met:

- a. A risk assessment is undertaken to address at minimum the following:
 1. Identify project assets (e.g., employees, facilities).
 2. Establish a pathway for vulnerable occupants or groups (e.g., older adults, people with disabilities, pregnant women, children) to confidentially identify their specific needs for an emergency.
 3. Evaluate potential impacts of relevant hazards and identify high-risk hazards.
 4. Determine emergency management planning priorities.
- b. An emergency management plan is in place outlining response in the case of emergency situations within the building or surrounding community, addressing at minimum the following hazards:
 1. Natural (e.g., flood, tsunami, wildfire, earthquake, heatwave).

2. Fire.
 3. Health (e.g., acute medical emergency, infectious disease pandemic).
 4. Technological (e.g., power loss, chemical spill, explosion).
 5. Human-caused (e.g., civil unrest, active shooter, terrorism).
- c. The emergency management plan meets the following requirements:
1. Incorporates annual (at minimum) inventory and maintenance of building emergency response resources (e.g., first aid kits, automated external defibrillators (AEDs), emergency notification system, personal protective equipment) and operations capabilities (e.g., backup power, remote management systems).
 2. Includes a list of specialized personnel that is updated annually (at minimum) and includes roles and contact information of the emergency response team.
 3. Plan is reviewed and updated (as needed) on an annual basis and is easily accessible to all regular building occupants.
- d. Regular building occupants are provided education and training on emergency preparedness and response, including the following:
1. Communications about the emergency management plan and related resources, including guidance by relevant local-, state-, regional- or global-level emergency response agencies (e.g., WHO, FEMA or equivalent), annually (at minimum), to employees during new employee onboarding and during an emergency event.
 2. Practice drills or other operations-based or discussion-based exercises conducted annually (at minimum) for each high-risk hazard identified in the risk assessment, and conducted every two years (at minimum) for other hazards covered under the emergency management plan.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met in the whole building.

7. Create Business Continuity Plan

Intent

Prepare organizations to operate, to the extent possible, under disruptive circumstances.

Feature Background

Summary: This feature requires projects to create a business continuity plan to facilitate resilience during and recovery after an emergency.

Issue: Globally, the frequency, size and cost of disasters is increasing due to climate change, population growth and rapid urbanization.⁶²⁻⁶⁴ In 2019, the global economic losses from disasters amounted to \$232 billion, and the 2020 COVID-19 pandemic caused the largest global recession in history.^{62,65} Small businesses may be particularly vulnerable as research shows that about 90% of smaller companies fail after emergencies unless they can resume business operations within five days.^{66,67} Emergencies such as biological events or active shooters may necessitate sheltering in the workplace, while longer-term emergencies may lead to extended workplace shutdowns.⁶⁸⁻⁷⁵ The latter can result in extensive layoffs, while employees who continue working may be forced to work in high-risk conditions or remotely in spaces not equipped to support productivity.⁷¹⁻⁷⁵

Most individuals who go through emergencies are likely to experience psychological distress, resulting in depression, anxiety, feelings of hopelessness, fatigue, irritability or anger.^{76,77} These impacts can be exacerbated by added stressors during emergencies such as social isolation, domestic abuse, economic hardship or loss of loved ones.^{76,77}

Solutions: Business continuity planning is critical to help manage business disruption, restore business operations, minimize risk to employees and mitigate financial loss when emergencies occur.^{59,60,78,79} Establishing organizational remote work readiness can help operations run smoothly and support employee well-being and productivity when an emergency makes remote work imperative.^{78,80}

Requirements

For All Spaces:

Projects implement a business continuity plan (BCP) that addresses at minimum the following:

- a. Determines critical business functions, processes, supporting resources and dependencies (e.g., email, internet connectivity, third-party suppliers or service providers, interdependent departments).
- b. Includes a list of the members, roles and responsibilities of the business continuity team and convenes the team twice annually (at minimum) to review, test and update (as needed) the plan.
- c. Implements a business impact analysis to evaluate the likely effects resulting from disruption of normal business functioning due to a disaster and identifies which critical business functions should be prioritized for recovery.
- d. Conducts a remote work readiness assessment, including at minimum the following:
 1. Evaluates which employees and/or positions (if any) are able to work remotely.
 2. Evaluates which employees and/or positions (if any) have the necessary support infrastructure to work productively in a remote situation.
 3. Evaluates whether organizational technology (e.g., company laptops, virtual private network (VPN)) is set up to support enterprise-wide remote work.
 4. Implements the strategies necessary to support remote work readiness as determined by the evaluation, including (as applicable) methods of communication to employees during remote work and provision for alternate work locations.
- e. Outlines strategies to support short- and long-term continuity in various disasters (e.g., blizzard, pandemic), restore and maintain business operations following disruption and re-mobilize to address recurring disasters.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met in the whole building.

8. Plan for Healthy Re-Entry

Intent

Ready spaces for re-occupancy following situations requiring them to be vacant, taking into account necessary adjustments to policies, operations and protocols to support safer and healthier re-entry.

Background

Summary: This feature requires projects to create and implement a re-entry plan that includes re-evaluation of existing policies, protocols and programs, risk inspections of building systems, frequent occupant communications, and flexible re-entry options to meet occupant needs.

Issue: In the U.S., the most frequent causes of evacuations each year are fires and floods; however, a wide range of other emergencies, from earthquakes and tornadoes to infectious disease outbreaks and explosions, can lead to mass evacuation and often may not allow for immediate re-entry.⁸¹⁻⁸³ During the COVID-19 pandemic, many businesses worldwide were forced to close by government mandates; 82% of Chinese, 69% of UK and 62% of U.S. employees were forced to work remotely during the crisis.^{74,84-86} Extended closures post-emergency closures can lead to significant economic losses: business shutdowns from COVID-19 led to global recessions, increased the U.S. unemployment rate in the U.S. to 14.7%, and an anticipated 5.2% loss in global GDP in 2020.^{71,73,87,88} However, reopening and re-entry after a natural disaster can pose safety risks given potential aftershocks or recurrences and infrastructural and systems damage.^{82,89,90} In particular, re-entry during or after infectious disease pandemics can significantly increase risk of exposure; studies of the 1918 flu pandemic found cities that lifted closures, quarantine rules and distancing measures too quickly saw more deaths and slower economic recovery.⁹¹ During the COVID-19 pandemic, in many countries lifting stay-at-home orders and reopening businesses led to surges in COVID-19 infections and deaths.⁹²⁻⁹⁵

Solutions: Careful consideration of re-entry timing and strategies is critical to supporting occupant health and safety in the aftermath of an emergency.⁹⁶⁻¹⁰⁵ Consulting with occupants on their re-entry needs and concerns, clearly communicating new roles, policies and protocols and offering flexible re-entry options will help mitigate occupant anxiety and support the inclusion, well-being and productivity of occupants.^{100,106,107} Assessing critical infrastructure systems and taking necessary actions to ensure those systems are functional after damage or extended shutdown is also crucial to facilitate safer and smoother re-entry.^{100,102,104} Finally, re-evaluating existing facilities management operations and workplace wellness policies to adapt to altered conditions post-emergency, and frequently communicating those changes to occupants, will help facilitate safer re-entry and create a healthier environment after re-entry.⁹⁶⁻¹⁰⁵

Requirements

For All Spaces:

Projects establish a plan for re-entry into the project after an emergency event, addressing at minimum the following:

- a. Consultation with regular building occupants prior to and just after re-entry to understand their needs and concerns related to re-entry.
- b. Applicable safety, compliance and risk inspections of water, mechanical, electrical, ventilation and life safety systems, including necessary actions to restart building and facility systems after prolonged shutdown and approval or clearance for safe re-entry.
- c. A list of roles for those who will be responsible for overseeing the re-entry plan. While roles and contact information should be made available to an organization's personnel, it is not necessary to include this information in the plan submitted for purposes of verifying this feature.

- d. Re-evaluation and adjustment (as needed) of human resources, workplace wellness and employee support policies and amenities (e.g., use of common areas and shared spaces like wellness rooms, food provision, physical activity programs) to support a safer and healthier re-entry.
- e. Policy to support phased re-entry (as needed) offering part-time options, work from home flexibility and/or flexible schedules for all employees (as feasible), particularly for parents and caregivers who may have specific dependencies (e.g., due to childcare closures or a sick family member) and vulnerable groups (e.g., people with disabilities or who may be particularly vulnerable to infectious disease).
- f. Re-evaluation and adjustment of facilities management policies and protocols to support a safer and healthier re-entry, including but not limited to:
 - 1. Crowd management and spacing and physical distancing of individuals.
 - 2. Heightened security measures (e.g., temperature screening, security personnel to monitor masking requirements).
 - 3. Access to personal protective equipment (PPE).
 - 4. Additional sanitization supplies and other cleaning or maintenance protocols.
- g. Contingency planning and re-closure measures should the same hazard that forced initial closure re-occur.
- h. Frequent communications through multiple methods (e.g., emails, signage, trainings) to all relevant stakeholders, including (as applicable) employees, occupants, residents, facilities management team, contractors and community members, on: the re-entry plan; new or altered policies; operations and procedures; relevant local-, state-, national- or global-level re-entry guidelines and how the project will address occupant health and safety concerns.
- i. Evaluation and incorporation of re-entry guidelines (as available) provided by a relevant local-, regional- or global-level emergency response agency (e.g., WHO, government emergency management agency or equivalent) into the plan, and adherence to instructions provided by that agency during re-entry.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met in the whole building. Note: Projects may apply requirements d) and e) to direct staff only.

9. Provide Emergency Resources

Intent

Provide resources, personnel and training to help organizations, families and individuals respond to diverse emergency situations.

Feature Background

Summary: This feature requires projects to offer resources like first aid kits and AEDs, coordinate with emergency response teams and provide emergency preparedness and response trainings.

Issue: It is estimated that sudden cardiac arrest (SCA) causes between 6.8 – 8.5 million deaths worldwide per year, with a global survival rate of less than 1%; in the United States, where SCA is a leading cause of death, about 10,000 SCA deaths per year occur in the workplace.^{108,109} An SCA victim's chances of survival lower by 7-

10% with every minute that passes without cardiopulmonary resuscitation (CPR) or defibrillation.¹¹⁰ Additionally, nearly 16,000 people worldwide die from preventable injuries each day, yet in most European countries, only 5-10% of the population is trained in first aid.^{111,112} While natural disasters kill an average of 90,000 people annually, nearly 60% of American adults have not practiced what to do in a disaster.^{49,113} Finally, anaphylaxis causes up to 1,500 deaths per year in the U.S., with studies showing a delay in administering epinephrine to be a significant risk factor associated with fatal outcomes from allergen exposure.¹¹⁴⁻¹¹⁶

Solutions: Rapid and effective emergency response requires coordination with local emergency responders and maintenance of emergency resources such as an emergency notification system, first aid kits and automated external defibrillators (AEDs).^{55,117} Supplementing those resources with occupant training on CPR, first aid, AED use and individual and family preparedness can increase individual response time and help improve survival rates; CPR and AED training alone can increase victim survival rates by nearly 40%.^{110,117} In food allergy emergencies, quick access to and immediate availability of epinephrine is essential.^{116,118}

Requirements

For All Spaces:

Promote Emergency Resources

Resources are in place that support emergency response, including at least three of the following:

- a. Information indicating emergency procedures (e.g., containment and response strategies for infectious disease outbreaks, evacuation during fire or earthquake, shelter-in-place during active shooter) available to all guests upon entrance to the building.
- b. Building emergency notification system with auditory and visual indicators of emergency (e.g., public address systems, flashing lights).
- c. At least one first aid kit per floor.
- d. AEDs accessible to any occupant within 3-4 minutes and adoption of routine maintenance and testing schedule. The locations of building AEDs are identified through posters, signs or other forms of communication other than on the AED itself.
- e. Undesignated epinephrine auto-injectors for food allergy emergencies.
- f. Rides subsidized by at least 50% to destination of need for emergency situations (e.g., urgent medical needs, personal or family emergency), including from home to work as needed (e.g., during public transit shutdown).

Verification type: Policy and/or Operations Schedule

Provide Emergency Training and Personnel

At least two of the following are in place:

- a. Emergency response team for medical emergencies, including at least one certified medical professional (e.g., Emergency Medical Technician, paramedic) or first responder (e.g., police, fire service, individuals certified in advanced first aid) present within the building during regular business hours.

- b. Security or crisis response team for human-caused disruptions (e.g., civil unrest, active shooter, terrorism).
- c. Annual availability to regular building occupants of a certified training course on CPR, first aid and AED usage.
- d. Trainings to promote individual and family emergency preparedness available to regular building occupants that address at least the following topics:
 - 1. Creating evacuation or sheltering plans.
 - 2. Building emergency kits, supplies and go-bags.
 - 3. Planning communications with family or primary contacts in case of emergency.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met in the whole building.

10. Bolster Emergency Resilience

Intent

Better enable individuals and communities to help maintain health and well-being, and organizations to maintain business function, during and after emergencies.

Background

Summary: This feature requires projects to facilitate resilience during and recovery after an emergency.

Issue: The estimated economic loss of natural disasters worldwide in 2019 was \$73 billion, while studies show an average of 14 million people worldwide are made homeless per year as a result of natural disasters.^{119,120} A wide variety of emergencies, from biological events, winter storms and tornadoes to active shooters or terrorist attacks, may necessitate sheltering in place.^{37,121} Alternatively, infectious disease pandemics can cause extended business shutdowns, while employees who continue working may be forced to work in high-risk conditions or in remote spaces not equipped to support productivity.^{122–126} Approximately one-third of U.S. adult workers were deemed “essential” during the COVID-19 pandemic and continued working; 31% of those were low-income and one-fourth were or lived with a healthcare worker and thus were at high risk of disease exposure.¹²⁶ Moreover, the United Nations Population Fund estimates that COVID-19 stay-at-home orders will lead to 2 million additional instances of intimate partner violence worldwide from 2020-2021.¹²⁷ Finally, studies show the capacity of hospital facilities decreases significantly in the aftermath of natural disasters, and the unprecedented spread and severity of the COVID-19 pandemic overwhelmed the capacity of U.S. hospitals, forcing them to ration resources and outsource healthcare workers.^{128–130}

Solutions: For emergencies that require sheltering on-site, a shelter-in-place plan is crucial to supporting occupant safety.^{68,70,131} Designating space for emergency public use can reduce the burden on medical facilities during critical events such as natural disasters and pandemics and help patients receive immediate care.^{132,133} Moreover, employer-funded employee relief assistance can help protect employees from unsafe domestic environments, help lower-income employees meet basic needs, reduce the risk of exposure during pandemics and support employee retention and well-being during and after emergencies.^{134–136}

Requirements

For All Spaces:

Projects implement at least one of the following:

- a. Designated outdoor or indoor space is made available to emergency responders, relief organizations or other equivalent institutions at no cost for alternative use in case of emergency (e.g., shelter during a natural disaster, treatment area during a pandemic).
- b. Employee assistance fund provided for emergency use by employees in at least two of the following critical scenarios:
 1. Sheltering from domestic violence or abuse.
 2. Quarantine due to infectious disease exposure.
 3. Damage to employee housing from a disaster.
- c. Shelter-in-place plan for emergencies in which occupants cannot leave the project (e.g., hurricane, chemical spill) that includes the following:
 1. A shelter-in-place kit with resources to help occupants shelter in place within the project for at least 24 hours (e.g., water, food supplies, blankets, flashlights, first aid kit).
 2. A pathway for occupants or groups who may be more vulnerable (e.g., older adults, people with disabilities, pregnant women, children) to confidentially identify specific needs they may have during a shelter-in-place emergency.
 3. Procedures for communicating to occupants the decision to evacuate or shelter-in-place during an emergency.
 4. A commitment to incorporate shelter-in-place guidelines provided by a relevant local-, regional- or global-level emergency response agency (e.g., WHO, FEMA or equivalent) into the plan, and to adhere to instructions provided by that agency during a shelter-in-place emergency.
 5. Annual (at minimum) occupant trainings on the shelter-in-place plan.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met in the whole building.

Health Service Resources

The COVID-19 pandemic has illustrated how the behaviors of one person can negatively impact others in severe ways. The strategies encompassed within this section focus on ways to foster individual actions that support health and safety for all in a space.

Unvaccinated individuals pose a risk to public health, and seasonal flu causes severe illness and death in high-risk populations, costing the U.S. \$10.4 billion in annual healthcare costs; the average hospitalized flu case in Canada costs \$11,092.^{137–140} Providing free on-site flu vaccines with education on good health habits can increase vaccination rates and reduces flu cases. Implementing support for influenza vaccine may also help support the infrastructure that will be needed when a vaccine is available for SARS-CoV-2, as well as promotes occupant health and reduces strain on community healthcare systems.

Moreover, studies estimate 20 million Americans and 37% of UK employees go to work sick because they lack sick leave or have only one-day sick leave, respectively, infecting colleagues as a result.^{141,142} Employees may also go into work when sick if their sick leave does not offer sufficient wage replacement.¹⁴¹ Providing timely access to health services can relieve both actual and perceived barriers to care.^{143,144} Additionally, studies show implementing paid sick leave reduces contagion in the workplace, improves employee productivity and reduces employee turnover.^{141,142,145} Overall, enhancing access to essential healthcare and paid sick leave can help improve the physical, social and mental health of individuals and communities.^{144,146}

Finally, exposure to tobacco smoke persists to detrimentally affect the health of both smokers and those exposed to secondhand smoke.¹⁴⁷ Secondhand smoke exposes nonsmokers to the same contaminants, increasing the number of people subject to health risks from smoking. The thirdhand smoke (residual chemicals left on indoor surfaces by tobacco smoke) clings to walls, furniture, clothes, bedding, carpets and other surfaces long after smoking has occurred,¹⁴⁸ Smoking can also increase comorbidities for influenza such as chronic obstructive pulmonary disease (COPD) and COVID-19.¹⁴⁹

11. Provide Sick Leave

Intent

Improve recovery from and reduce transmission of diseases by enabling and encouraging employees to stay home when sick.

Feature Background

Summary: This feature requires projects to provide access to paid sick leave.

Issue: Access to basic healthcare services is one of five key pillars that form the social determinants of health.¹⁵⁰ Access includes physical or geographic access, affordability and quality or acceptability of care, and access varies based on race, ethnicity, socioeconomic status, age, sex, disability status, sexual orientation, gender identity and location.^{5,154,64,65} While 94% of the world's countries mandate paid sick leave, the U.S. and Korea are the only OECD countries that do not, and 40% of American employees have no sick leave.^{155,156} Studies estimate 20 million Americans and 37% of UK employees go to work sick because they lack sick leave or have only one-day sick leave, respectively, potentially infecting colleagues as a result.^{157,158} Employees may also go into work when sick if their sick leave does not offer sufficient wage replacement.¹⁵⁷

Solutions: Studies show implementing paid sick leave reduces contagion in the workplace, improves employee productivity and reduces employee turnover.¹⁵⁷⁻¹⁶¹ Overall, enhancing access to paid sick leave can help improve the physical, social and mental health of individuals and communities.^{151,153}

Requirements

For All Spaces:

Provide Short-term Sick Leave

Employers provide a short-term sick leave policy for all eligible employees, distinct from paid time off and family leave, that includes the following:

- a. At least 10 days of sick leave are paid at 50% or higher of the employee’s full salary or wages, offered through a flat rate or annual accrual, during any 12-month period for any health condition.
- b. Statement that discourages employees from coming into work when they feel sick, and from doing work while on sick leave.
- c. Does not require a note from a medical professional or advance notice to gain approval for sick leave unless employee uses more than three consecutive days of sick leave.

Verification type: Policy and/or Operations Schedule

Provide Long-term Sick Leave

Employers provide a long-term sick leave policy for all eligible employees, distinct from paid time off and family leave, that includes at least one of the following:

- a. At least 12 weeks of sick leave (which may be unpaid) during any 12-month period for a chronic or serious health condition that involves inpatient care in a hospice or residential healthcare facility (e.g., stroke, infectious disease, surgery) or continuing treatment and/or supervision by a healthcare provider (e.g., diabetes, asthma, terminal cancer).
- b. One or more of the following to support all eligible employees recovering from serious health conditions:
 - 1. Part-time options.
 - 2. Work from home flexibility.
 - 3. Flexible schedules.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met for direct staff.

12. Provide Health Benefits

Intent

Support the overall health and well-being of individuals and their families by offering comprehensive health benefits, policies and services.

Background

Summary: This feature requires projects to provide access to essential and on-demand health services.

Issue: Access to basic healthcare services is one of five key pillars that form the social determinants of health.¹⁶² Access includes physical or geographic access, affordability and quality or acceptability of care, and access varies based on race, ethnicity, socioeconomic status, age, sex, disability status, sexual orientation, gender identity and location.¹⁶³

Solution: Basic essential healthcare services include medical, dental, vision, mental health, substance use, preventive screenings, disease management and biometric assessments.¹⁴⁴ Providing free on-site flu vaccines with education on good health habits can increase vaccination rates and reduces flu cases.¹⁶⁴ Providing timely access to health services can relieve both actual and perceived barriers to care.^{143,144} Studies demonstrate that

the overwhelming majority of employees seek one-on-one benefits consultation and flexible coverage options so they can opt into coverage that best meets their individual schedule and health needs.¹⁶⁵

Requirements

For All Spaces:

The following requirements are met:

- a. A health benefits plan is available to all eligible employees and their designated dependents (e.g., spouse, domestic partner, child, parent, parent-in-law, grandparent, grandchild, sibling) at no cost or subsidized that includes the following services:
 1. Medical care.
 2. Dental care.
 3. Vision care.
 4. Mental health and substance use services.
 5. Sexual and reproductive health services, including obstetrics and gynecology (OB-GYN) services and sexually transmitted infection (STI) testing and treatment.
 6. Medication/prescription coverage.
 7. Essential immunizations based on region.
 8. Preventive screenings and biometric assessments.
 9. Tobacco cessation programs.
 10. Infectious disease testing (e.g., tuberculosis, malaria, COVID-19) during a regional or global infectious disease outbreak, epidemic or pandemic as declared by a regional or global public health agency (e.g., WHO, disease control and prevention centers or equivalent institution).
- b. Confidential benefits consultations are available with clearly identified and qualified support staff (e.g., benefits counselor, human resources representative).

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met for direct staff.

13. Support Mental Health Recovery

Intent

Enable families and individuals to access mental health services and resources that provide support during and after emergencies.

Feature Background

Summary: This feature requires projects to offer supportive resources to facilitate recovery after an emergency.

Issue: Globally, the frequency, size and cost of disasters is increasing due to climate change, population growth and rapid urbanization.⁶²⁻⁶⁴ Most individuals who go through emergencies are likely to experience psychological distress, resulting in depression, anxiety, feelings of hopelessness, fatigue, irritability or

anger.^{76,77} These impacts can be exacerbated by added stressors during emergencies such as social isolation, domestic abuse, economic hardship or loss of loved ones.^{76,77}

Solutions: Providing access to mental health services, such as psychological first aid, crisis counseling and bereavement counseling, is critical to supporting employee short-term recovery and long-term productivity, functioning and well-being.^{76,77,99,166}

Requirements

For All Spaces:

Projects offer mental health services to support recovery from a traumatic event, to all employees at no cost or subsidized, either on-site, in-person within 400 m [0.25 mi] of the project boundary, or virtually, including at least three of the following:

- a. Crisis counseling or trauma-focused psychotherapy with qualified mental health professionals.
- b. Psychological first aid (PFA) training offered to all employees and/or required for manager-level employees.
- c. Bereavement counseling and materials on coping with grief, including resources for returning to work after a loss.
- d. Information on benefits coverage and how to access additional mental health services, made conveniently and confidentially accessible to employees.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met for direct staff.

14. Promote Flu Vaccines

Intent

Reduce incidence of seasonal influenza (flu) and promote flu vaccinations.

Feature Background

Summary: This feature requires projects to provide and encourage seasonal influenza (flu) immunizations.

Issue: Unvaccinated individuals pose a risk to public health, and seasonal flu causes severe illness and death in high-risk populations, costing the U.S. \$10.4 billion in annual healthcare costs; the average hospitalized flu case in Canada costs \$11,092.¹⁶⁷⁻¹⁷⁰

Solutions: Providing free on-site flu vaccines with education on good health habits can increase vaccination rates and reduces flu cases.¹⁶⁴ Flu vaccinations also reduce the quantity and duration of visits to intensive care units,¹⁷¹ freeing up medical capacity for other needs such as pandemics and natural disasters.

Requirements

For All Spaces:

The following requirements are met:

- a. Projects provide one of the following vaccine programs at no cost to regular building occupants:
 1. Annual on-site seasonal influenza (flu) vaccine starting at least one month prior to peak flu season in the project region.
 2. Health insurance coverage or voucher for flu vaccination, including paid time during the workday to receive immunization for seasonal influenza.
- b. Vaccine program is accompanied by a seasonal flu prevention campaign that covers the following:
 1. Alerts regular building occupants regarding the availability of on-site flu vaccine clinic, coverage or vouchers and encourages or incentivizes individuals to receive the vaccine.
 2. Educates regular building occupants on the health reasons to receive the vaccine and good hand hygiene and cough etiquette, and instructs them to stay home when experiencing flu-like symptoms.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements should be met for direct staff.

15. Promote a Smoke-Free Environment

Intent

Deter smoking, minimize occupant exposure to secondhand smoke and reduce smoke pollution through interventions that prevent the use, sale and advertisement of tobacco products.

Feature Background

Summary: This feature requires projects to ban indoor smoking and ban or restrict outdoor smoking within its boundaries, as well as restrict the sale and marketing of tobacco products.

Issue: Tobacco is responsible for an estimated six million deaths per year globally among direct users, and serves as the cause of death for up to half of its users.^{172,173} In addition to those deaths caused by direct use, an estimated 890,000 annual deaths can be attributed to non-user exposure to second-hand smoke.¹⁷² Exposure to tobacco smoke persists to detrimentally affect the health of both smokers and those exposed to secondhand smoke. Ingredients in cigarettes form over 7,000 compounds when burned, of which at least 69 are known to be carcinogenic.¹⁷⁴ As a result, the average life expectancy of a smoker is 10 years less than that of a nonsmoker.¹⁷⁵ Furthermore, secondhand smoke exposes nonsmokers to the same contaminants, increasing the number of people subject to health risks from smoking. The thirdhand smoke (residual chemicals left on indoor surfaces by tobacco smoke) clings to walls, furniture, clothes, bedding, carpets and other surfaces long after smoking has occurred. Emerging evidence suggests that there are serious health consequences associated with exposure to thirdhand tobacco smoke,¹⁷⁶ secondhand marijuana smoke and emissions from e-cigarettes.^{177,178} Health issues associated with tobacco smoke include asthma attacks, respiratory infections, coronary heart disease, stroke, lung cancer and sudden infant death syndrome.¹⁷⁹ Smoking can also increase comorbidities for influenza such as chronic obstructive pulmonary disease (COPD) and COVID-19.¹⁴⁹ Despite such severe influences on health, 80% of the global population lives in countries not protected by 100% smoke-free regulations.¹⁸⁰

Solutions: There is no safe and acceptable level of cigarette smoke exposure.¹⁸¹ Therefore, the only way to protect people from secondhand and thirdhand smoke is to implement a 100% smoke-free environment.¹⁸¹⁻

¹⁸³ In order to prevent intrusion of cigarette smoke from the outdoors, projects must also take steps to ensure that smoking is not allowed in the vicinity of building entrances, operable windows and building air intakes.¹⁸⁴ Another influencing factor on tobacco use is an individual's proximity to outlets where it is sold.¹⁸⁵ Restricting the sale of tobacco on-site is a key strategy for preventing or curbing use of tobacco products as well as providing support to those trying to quit.^{185,186}

Requirements

For All Spaces:

Prohibit Indoor Smoking

The following requirement is met:

- a. Smoking and the use of e-cigarettes is prohibited in interior spaces within the project boundary.

Verification type: Policy and/or Operations Schedule

Prohibit Outdoor Smoking

Smoking and the use of e-cigarettes is prohibited in the following areas, with signage present to clearly communicate the ban:

- a. Outdoors at ground level within 7.5 m [25 ft] (or the maximum extent allowable by local codes) of all entrances, operable windows and building air intakes. Signage is present to clearly communicate the ban. In outdoor areas within the project boundary that allow smoking (if any), signs are placed along walkways (not more than 30 m [100 ft] between signs) that describe the hazards of smoking.
- b. On decks, patios, balconies, rooftops and other occupiable outdoor areas above ground level.

Verification type: On-site Photographs, Letter of Assurance - Owner

Limit Tobacco Availability

The following requirements are met for projects where retail products are sold on a daily basis within the building site:

- a. Tobacco products (including e-cigarettes) are not marketed or promoted.
- b. Sale of tobacco products (including e-cigarettes) is prohibited within the building site.

Verification type: Letter of Assurance – Owner

Core notes: To earn this feature, the requirements should be met in the whole building.

Air and Water Quality Management

People spend approximately 90% of their time in enclosed spaces¹⁸⁷– in homes, offices, schools or other building environments. Depending on their specific properties, pathogens can enter our system through breaks in the skin or through our body's natural openings, such as our mouth, nose, and eyes.¹⁸⁸ Some pathogens can enter our bodies through our mouth and nose via the air we breathe, the food we ingest and the water we drink.

Air stagnation may concentrate airborne viruses. Research has shown that increased ventilation in a building can reduce the chance of influenza; a study published in 2019 found that providing even minimum levels of outdoor air ventilation reduced influenza transmission as much as having 50-60% of the people in a building vaccinated.¹⁸⁹ Some pathogens can also attach themselves onto smaller particles in the air such as dust. These small particles can stay in the air longer and travel farther distances than droplets, potentially affecting people within a wider spatial range.¹⁹⁰

Without proper maintenance and filtration, heating, ventilation and air conditioning systems can build up mold and particulates that can propagate respiratory diseases, especially after periods of inactivity.^{191,192} Inhalation exposure to indoor air pollutants can lead to a variety of negative short- and long-term health and well-being outcomes that can range in severity. Less severe symptoms of exposure can include headaches, dry throat, eye irritation or runny nose, while more severe health effects can include asthma attacks and carbon monoxide poisoning.¹⁹³⁻¹⁹⁵ Mold developed on cooling coils may shed particles into the building's indoor air and trigger asthma, headaches, allergies and other respiratory system disorders.¹⁹⁶⁻¹⁹⁹ In the U.S. alone, indoor pollution contributes to thousands of cancer deaths and hundreds of thousands of respiratory health issues annually.²⁰⁰ In addition to public health concerns, estimates by the U.S. EPA suggest that net avoidable costs associated with indoor air pollution amount to well over \$100 billion annually with 45% of those costs attributable to avoidable deaths from radon and environmental tobacco smoke, about 45% from lost productivity, and about 10% from avoidable respiratory diseases.²⁰⁰

Exposure to a range of contaminants in water can result in negative health impacts including the spread of infectious disease.²⁰¹ Water is typically treated with chlorine to keep it free of pathogens. However, if left stagnant after a period of vacancy, chlorine is likely to lose its disinfection power, creating opportunity for pathogens to contaminate the water. Additionally, *Legionella* bacteria is naturally present in waters at low concentrations, but it may colonize recirculated water systems such as hot water loops and cooling towers, especially where the water temperature is within 25 and 45 degrees C.²⁰² and can cause lung disease and even death if contaminated water aerosols are inhaled. Legionnaire's disease especially affects the immunocompromised, smokers and those over 50.²⁰²

Air and water quality monitoring, paired with operational strategies to improve the ventilation and filtration in a space, is critical to identifying and mitigating risks for occupants.

16. Assess Ventilation

Intent

Minimize indoor air quality issues through the provision of adequate ventilation.

Feature Background

Summary: This feature requires projects to assess their ability to bring in fresh air from the outside through mechanical and/or natural means in order to dilute human- and product-generated air pollutants.

Issue: Poorly ventilated spaces contribute to symptoms — such as headache, fatigue, dizziness, nausea, cough, sneezing, shortness of breath and eye, nose, throat and skin irritation — collectively called sick building syndrome (SBS).^{203,204} Poor ventilation is also linked to increased rates of absences in employees, higher operational costs for businesses and decreased productivity in students.^{205,206} One U.S.-based study reported

that the sick leave attributable to insufficient provision of fresh air in buildings is estimated to be 35% of total absenteeism.²⁰⁷ Therefore, the economic costs of SBS in under-ventilated buildings are significant and far exceed the energy-related cost savings.^{208–210}

Solutions: Many indoor and outdoor sources of air pollution emit particulate matter and volatile organic compounds (VOCs) that can cause discomfort and trigger asthma and eye, nose and throat irritation. In order to maintain healthy indoor environments for building users, it is necessary to provide sufficient ventilation required to maintain acceptable air quality.^{211,212} Increasing ventilation rates is also a recommended strategy to mitigate the transmission of COVID-19 and other airborne contagious diseases.^{213,214} In addition to proper HVAC system design, mechanically ventilated projects need to perform regular system maintenance as inadequate maintenance is associated with reduced ventilation performance and poorer indoor air quality and thermal conditions.²¹⁵

Requirements

For All Spaces:

A qualified engineer provides the project with an assessment of the following:

- a. The highest supply rate of outdoor air the current mechanical system can provide.
- b. Potential modifications to system controls to increase supply of outdoor air (e.g., ventilating for longer hours, changing the setpoint for demand-controlled ventilation systems).
- c. The extent to which the current mechanical system can operate without recirculating air.
- d. How and if any of the potential HVAC system modifications would affect the following:
 1. Energy consumption.
 2. The ability to manage thermal comfort conditions (e.g., higher ventilation leading to draft, recirculation elimination straining conditioning capacity).
 3. Maintenance processes.

Verification type: Professional Narrative

Core notes: To earn this feature, the requirements should be met in the whole building.

17. Assess and Maintain Air Treatment Systems

Intent

Mitigate risks from indoor contamination and pollution sources such as infectious disease particles and volatile organic compounds (VOCs).

Feature Background

Summary: This feature requires the projects to inventory air filters and other treatment devices to ensure proper maintenance.

Issue: Building materials, furnishings (e.g., carpets and furniture finishes), fabrics, cleaning products, personal care products, adhesives, solvents and air fresheners can all emit VOCs or semi-volatile organic compounds (SVOCs) into the indoor environment.^{216,217} VOCs include benzene, formaldehyde and other chemical

compounds, which at high concentrations can lead to irritation of the nose and pharynx and have been associated with leukemia and Nasopharyngeal cancer.^{218,219} Health effects can also include damage to the liver, kidneys and central nervous system.²²⁰ Additionally, particles exhaled by infected individuals that contain air-borne diseases such as COVID-19 can remain suspended several hours or longer and be recirculated to through the ducts of the building.^{214,221,222}

Solutions: Air can be treated to remove contaminants. Carbon filters remove VOCs and ozone from the passing air.^{223,224} HEPA or near-HEPA filters can help remove virus particles, since the virus often travels as part of larger particles.^{213,225} UVGI systems can also be effective, both when irradiating the upper portion of the room or when placed in the air ducts, so long as they are powerful and/or the air speed is slow enough to provide sufficient UV dose.^{213,226} For optimal performance, air filtration systems need to be maintained according to the manufacturer's instructions.

Requirements

For All Spaces:

System Inventory

Project provides an inventory of all filters and UVGI equipment currently used to treat the air in the following locations (if any):

- a. Ducts and air handling units.
- b. Fan coil units.
- c. Standalone air cleaning devices.

Verification type: Professional Narrative

Air Treatment Assessment

The following requirements are met:

- a. A qualified engineer provides the project with an assessment of the following
 1. The highest efficiency of media or other particle filters (particularly for recirculated air, if any) that can be installed with the current mechanical system.
 2. The capacity of the current mechanical system to utilize UVGI equipment.
- b. Project provides one of the following:
 1. Conditions under which project will install these treatment systems.
 2. A timeline for the installation of treatment systems.

Verification type: Professional Narrative

Device Maintenance

For devices identified in the System Inventory, the following requirement is met:

- a. Evidence that the filters and/or UV lamps have been replaced according to the manufacturer's recommendation is submitted annually through the WELL digital platform.

Verification type: On-going Maintenance Report

Core notes: To earn this feature, the requirements should be met in the whole building.

18. Develop Legionella Management Plan

Intent

Implement protocols to reduce risk of *Legionella* colonization.

Feature Background

Summary: This feature requires projects to manage recirculating hot water systems against *Legionella* colonization.

Issue: All water systems require some degree of validation to ensure that health targets are met under the operational conditions, for which sampling is an effective verification tool.²²⁷ *Legionella* bacteria is naturally present in waters at low concentrations, but it may colonize recirculated water systems and can cause lung disease and even death if contaminated water aerosols are inhaled.²²⁸ Legionnaire's disease affects especially the immunocompromised, smokers and those over age 50.²²⁸ Assets commonly vulnerable to *Legionella* infestation include domestic potable and hot water systems, cooling towers, humidifiers, misters, decorative fountains, spas and hot tubs.²²⁸

Solutions: Minimizing the risk of *Legionella* requires a thorough and quantitative risk assessment of buildings' water assets, identifying locations where control is required, and a well-documented maintenance and operations program.²¹³ Implementing a proper *Legionella* management plan should reduce the risk of exposure to pathogenic bacteria.

Requirements

For All Spaces:

Develop Legionella Plan

The project provides a *Legionella* management plan that meets the following requirements:

- a. Addresses hot water systems, cooling towers, decorative fountains and any other devices or spaces under control of the project where water is recirculated and aerosolized.
- b. Includes the items listed below:
 1. Determination of roles for *Legionella* management in the building, distinguishing those under project control from those that may be the responsibility of building management or other parties.
 2. Water system inventory and process flow diagrams of systems within the project boundary.
 3. Hazard analysis of water assets within the project boundary. If the project does not operate the building hot water supply system (e.g., boilers, heaters, pumps or hot water risers), then an explanation of the building-wide *Legionella* management policies (if any) and how they influence risk is included.

4. A list of monitoring actions for relevant variables (e.g., temperature or residual chlorine), performance limits associated with these variables and corrective actions when variables exceed such limits.
5. A list of critical control points (locations where actions to maintain relevant variables listed in (4) within performance limits are applied) within the project boundary.
6. Verification and validation procedures for evaluating the suitability and proper implementation of the management plan. A Legionella sampling schedule is included if projects have operational control over cooling towers and spas.
7. Protocols for documenting results of monitoring activities and corrective actions. If sampling for Legionella is planned, results are included.

Verification type: Technical Document - Legionella management plan

Implement Legionella Plan

The following requirement is met:

- a. Documentation of monitoring results, corrective actions and Legionella sample results as stated in the Legionella management plan are submitted annually through the WELL digital platform.

Verification type: On-going Maintenance Report

Core notes: To earn this feature, the requirements should be met in the whole building.

19. Monitor Air and Water Quality

Intent

Assess indoor air quality and water quality, which contribute to the health and well-being of building users.

Feature Background

Summary: This feature requires projects to monitor air quality and water quality levels at least once per year.

Issue: Exposure to air pollutants such as Volatile Organic Compounds (VOCs), ozone, particulate matter, carbon monoxide and others has been shown to increase the risk of respiratory and cardiovascular diseases in addition to causing thousands of cancer deaths annually.²²⁹ Inhaling pollutants present symptoms ranging from headaches, dry throat, eye irritation and runny nose that may later develop into extreme health outcomes such as asthma attacks and cancer.^{194,230,231} In addition, radon exposure is the second cause of lung cancer, after tobacco use.²³² Therefore, it is important to define indoor air quality levels that minimize risk to human health. All water systems require some degree of validation to ensure that health targets are met under their operational conditions, for which sampling is an effective verification tool.²²⁷

Solutions: The World Health Organization (WHO) and other regulatory bodies such as the U.S. Environmental Protection Agency (EPA) identify a list of “criteria” air pollutants and have established permissible levels for such criteria pollutants based on epidemiological studies that show the relationships between concentrations of these pollutants, duration of exposure and health risks. Achieving the goal of clean indoor air as defined by permissible levels requires the joined efforts of both professionals and building users in the implementation of adequate approaches. Indoor air quality can be properly managed through different features listed in the WELL

Air concept, including source control strategies, passive and active building design and operation strategies and human behavior interventions.^{233,234}

Basic management for water quality ensures that the water sourcing, treatment and delivery operates as designed. Turbidity, residual chlorine and pH monitoring help control basic chemical and microbiological water characteristics and, if trends are detected, may inform that actions may be needed to protect the quality of the water, such as changing a filter, checking the building's pipes for leaks or inquiring with local relevant governmental authorities.

Requirements

For All Spaces:

Monitor Air Parameters

The following pollutants are monitored in regularly occupied spaces (with a quantity and location of sampling points complying with the requirements outlined in the Performance Verification Guidebook) at intervals no longer than once per year, and results are submitted annually through the WELL digital platform:

- a. PM_{2.5} and/or PM₁₀.
- b. Total VOCs and/or Formaldehyde.
- c. Ozone.
- d. Carbon Monoxide.

Verification type: On-going Data Report

Assess Chemical and Biological Water Quality

The following drinking water parameters are sampled at intervals of no less than once per year and results are submitted annually through the WELL digital platform:

- a. Turbidity.
- b. pH.
- c. Residual (free) chlorine.
- d. Total coliforms, only if residual chlorine is below detection limits.

Verification type: On-going Data Report

Core notes: To earn this feature, the requirements should be met in non-leased spaces, provided this makes up at least 2.5% of total project area. Otherwise, the requirements should be met in a combination of non-leased and leased space that comprises at least 2.5% of total project area.

20. Manage Mold and Moisture

Intent

Limit the potential for bacteria and mold growth within buildings from water infiltration, condensation and internal leaks.

Feature Background

Summary: This feature requires projects to manage mold and moisture through inspections.

Issue: Excess moisture and dampness is a common problem in buildings, affecting about 20% of buildings in Europe, Canada and the U.S.²³⁵ When improperly managed, moisture creates conditions conducive to the growth of mold and other biological pests, which can increase the risk of developing respiratory infections and asthma for those within the building.²³⁵ It is estimated that one fifth of asthma cases in the U.S. are caused by excess moisture and dampness in buildings.²³⁶ Furthermore, moisture can damage the building itself by creating an environment hospitable to insects and other destructive pests, corroding metal components and degrading wood and porous building materials.²³⁷ These problems can arise when water unintentionally penetrates the building envelope or leaks from indoor uses of water, or when moisture-heavy air condenses on building materials.

Solutions: Inspections are needed to both verify that design and operations properly safeguards against mold growth, as well as informs the need for preventative maintenance.²³⁸

Requirements

For All Spaces:

Manage Moisture

The project implements a moisture management plan for building operations that contains the following:

- a. A schedule of periodic inspections for signs and potential sources of water damage or pooling, discoloration and mold on ceilings, walls, floors and HVAC equipment.
- b. A system or inspection protocol to periodically assess water pipe leaks.
- c. A system for occupants and tenants to notify building management about mold or water damage.

Verification type: Policy and/or Operations Schedule

Inspect for Leaks and Mold

The following requirement is met:

- a. Results of inspections for mold and leaks (including any mold test results) are submitted annually through the WELL digital platform.

Verification type: On-going Maintenance Report

Core notes: To earn this feature, the requirements should be met in the whole building.

Stakeholder Engagement and Communication

During emergencies, stakeholder engagement and communication is critical to instilling confidence, improving coordination and supporting actions that can help protect safety. Regular, clear communication about the emergency preparedness and response strategies being utilized by an owner or operator of a space to support people's health and safety, as well as how stakeholders can build awareness of what to do during an emergency event, provides critical information that supports the health and well-being of all occupants.

Through providing such communication, organizations can support occupant health literacy, which refers to a person's cognitive and social ability to access, interpret and understand basic health information, as well as the ability to act on that understanding to maintain health.^{239–242} Low health literacy is linked to lower use of preventive care (e.g., flu shots), poor management of chronic conditions (e.g., high blood pressure) and lower self-reported mental and physical health.^{243,244} Studies estimate that low health literacy costs the U.S. economy anywhere between \$70-240 billion each year.^{243,245}

Based on the effects of previous SARS outbreaks, COVID-19 is predicted to have lasting physical and mental health impacts.²⁴⁶ Providing individuals with access to health-promotion strategies, education and resources can help them to cultivate healthy habits and resilience in response to physical and mental health stressors.

Multi-modal programming, educational materials and communications can help promote health literacy and increase positive health outcomes.^{247,248} By supporting awareness of health and wellness programs and policies, projects can promote health literacy and encourage engagement with health resources, leading to both individual benefits - like increased participation in healthy behaviors and use of health services - and also employer benefits, providing an estimated 4:1 return on investment.^{243,249}

21. Promote Health and Wellness

Intent

Promote adherence to collective wellness and sustainability goals and a deeper occupant understanding of the features pursued by the project and of how building operations and policies impact health and well-being.

Feature Background

Summary: This feature requires project teams to establish a health-oriented project mission and to provide a guide to occupants that highlights the features pursued by the project, the relationship between health and buildings and available health resources and programs.

Issue: Health literacy refers to a person's cognitive and social ability to access, interpret and understand basic health information, as well as the ability to act on that understanding to maintain health.^{242,250–252} Health literacy is influenced by sociocultural factors such as age, socioeconomic status, mental health, cultural background, language and communication abilities, prior health experiences and how healthcare delivery and education systems deliver care, health information and health education.²⁵⁰ Low health literacy is linked to lower use of preventive care (e.g., flu shots), poor management of chronic conditions (e.g., high blood pressure) and lower self-reported mental and physical health.^{253,254} Studies estimate that low health literacy costs the U.S. economy anywhere between \$70-240 billion each year.^{245,253}

Solution: Establishing a health-centered mission and orienting stakeholders to how the project will adhere to that mission through features can help individuals remain engaged in the space and empower them to utilize all available health and wellness programs and policies.²⁵⁵ Multi-modal programming, educational materials and communications can help promote health literacy and increase positive health outcomes.^{256,257} By supporting awareness of health and wellness programs and policies, projects can promote health literacy and encourage engagement with health resources, leading to both individual benefits - like increased participation in healthy behaviors and use of health services - and also employer benefits, providing an estimated 4:1 return on investment.^{253,258}

Requirements

For All Spaces:

Promote Health-Oriented Mission

The project establishes a health-oriented mission that meets the following requirements:

- a. Outlines the project's objectives for health promotion.
- b. Connects supporting and improving occupant health to the organizational objectives or mission statement.

Verification type: Policy and/or Operations Schedule

Provide Feature Guide

A physical or digital feature guide is prominently displayed and/or made widely available to all occupants, meeting the following requirements:

- a. Describes the WELL Health-Safety Rating features achieved by the project.
- b. Explains how the features achieved by the project impact occupant health and well-being and support the project's health-oriented mission described in Promote Health-Oriented Mission.

Verification type: Policy and/or Operations Schedule

Provide Occupant Communication

The following requirement is met:

- a. Quarterly communications (e.g., emails, modules, trainings) are sent to regular building occupants, and onboarding communications are given to new employees, about health resources, programs, amenities and policies available to them addressed by the features achieved by the project.

Verification type: Policy and/or Operations Schedule

Core notes: To earn this feature, the requirements for Promote Health-Oriented Mission and Provide Feature Guide should be met in the whole building. The requirements for Provide Occupant Communication should be met for direct staff.

22. Share Food Inspection Information

Intent

Mitigate foodborne illness and increase consumer knowledge of food inspection results.

Feature Background

Summary: This feature requires restaurants and other food service areas to display letter grades or sanitary inspection reports.

Issue: Food quality is a public health necessity, with 68% of reported foodborne illness outbreaks in the U.S. originating from a food service setting.²⁵⁹

Solutions: Restaurant grading and public posting programs have been implemented in some communities, resulting in increased public awareness of restaurant cleanliness and quality, as well as incentivizing food establishments to uphold and maintain sanitary measures and hygiene practices. In New York City, for example, 88% of surveyed residents reported considering Health Department ratings in their dining decisions, underscoring the value of the rating systems in reassuring patrons regarding foods consumed away from home.²⁶⁰ Most importantly, implementation of a restaurant grading system has been shown to reduce the overall risk of foodborne disease. The Los Angeles restaurant hygiene grading and posting system, for example, was associated with an approximate 13% decrease in the number of foodborne-disease hospitalizations, further reinforcing the potential public health benefit of this intervention.²⁶¹

Requirements

All food service establishments within project boundary have at least one of the following prominently displayed on-premises and clearly visible to customers entering the establishment:

- a. Scoring or letter grading system issued by the local health department or other third-party inspection agency.
- b. Publicly available food hygiene or sanitary inspection report by the local health department or other third-party inspection agency.

Verification type: Letter of Assurance - Owner, Photographic evidence

Core notes: To earn this feature, the requirements should be met in the whole building.

Innovation

Innovation features address a novel concept or strategy aimed at addressing acute health and safety issues that are not already included within the WELL Health-Safety features.

The Innovation features provides guidelines on the requirements that must be met in order for an Innovation to be considered for approval. Projects should use Option 1 to submit new Innovation proposals. Options II-IV represent additional Innovation strategies pre-approved by IWBI.

Projects may receive up to three Innovation features.

23. Innovation I-III

Intent

Promote excellence in project design and continuous evolution of the WELL Health-Safety Rating.

Background

This feature provides projects several options to go beyond features of the WELL Health-Safety rating, including a pathway to propose new interventions that address health and well-being in novel ways and achieving relevant design-based features from the WELL Building Standard.

Requirements

For All Spaces:

Innovation Proposal

The project submits a proposal that meets the following requirements:

- a. Consistent with applicable laws and regulations and leading practices in building design and operations.
- b. Substantiated by existing scientific, medical and/or industry research.
- c. Positively impacts project occupants or the general public through one of the below:
 1. Goes above and beyond the current requirements of an existing WELL Health-Safety Rating feature.
 2. Relates to acute health and safety in a novel way that is not already addressed in a WELL Health-Safety Rating feature.

Verification type: *Technical Document*

WELL Accredited Professional (WELL AP)

At least one member of the project team:

- a. Has achieved the WELL AP credential.
- b. Maintains accreditation until project's initial rating is achieved.

Verification type: *Technical Document - proof of an active credential.*

Design for WELL Health-Safety

Project completes the requirements listed in one of the following WELL v2 or WELL v2 pilot features, and submits the corresponding verification method document(s):

- a. One of the following Air features:

WELL v2 feature	WELL v2 pilot feature
A01 Air Quality, Parts 1,2,3,4	A01 Fundamental Air Quality Parts 1, 2,3, 4
A06 Enhanced Ventilation Part 1, Option 1 or 3 – 2 points	A06 Enhanced Ventilation Part 1 - 2 points
A06 Enhanced Ventilation Part 1, Option 2	A06 Enhanced Ventilation Part 2 - 2 points
A06 Enhanced Ventilation Part 2, Option 1	A06 Enhanced Ventilation Part 3

A06 Enhanced Ventilation Part 2, Option 2	A06 Enhanced Ventilation Part 4 – 2 points
A07 Operable Windows Part 1	A07 Operable Windows Part 1
A08 Air Quality Monitoring and Awareness Part 1	A08 Air Quality Monitoring and Awareness Part 1
A11 Source Separation Part 1	A11 Source Separation Part 1
A12 Air Filtration Part 1	A12 Air Filtration Part 1
A13 Enhanced Supply Air	-
A14 Microbe and Mold Control Part 1	A14 Microbe and Mold Control Part 1

b. One of the following Water features:

<i>WELL v2 feature</i>	<i>WELL v2 pilot feature</i>
W01 Water Quality Indicators Part 1 and W02 Drinking Water Quality Parts 1, 2	W01 Fundamental Water Quality Parts 1, 2 and W02 Water Contaminants Parts 1, 2, 3, 4, 5, 6 (must do both to achieve 1 Innovation)
W07 Moisture Management Part 1	W07 Moisture Management Part 1
W07 Moisture Management Parts 2	W07 Moisture Management Parts 2, 3
W08 Hygiene Support Part 3	W08 Handwashing Part 1
W098 Onsite Non-Potable Water Reuse Part 1	W098 Onsite Non-Potable Water Reuse Part 1

c. The following Movement features:

<i>WELL v2 feature</i>	<i>WELL v2 pilot feature</i>
V03 Circulation Network Parts 1, 2, 3	V03 Movement Network and Circulation Parts 1, 2, 3
V04 Facilities for Active Occupants Parts 1, 2	V04 Active Commuter and Occupant Support Parts 1, 2

d. The following Thermal Comfort feature:

<i>WELL v2 feature</i>	<i>WELL v2 pilot feature</i>
T07 Humidity Control Part 1	T07 Humidity Control Part 1

e. The following Community feature:

<i>WELL v2 feature</i>	<i>WELL v2 pilot feature</i>
C13 Accessibility and Universal Design Part 1	C13 Accessibility and Universal Design Part 2

Verification type: Technical Document

Award Milestone

One of the following requirements are met:

- a. The project has an active WELL Precertification. This strategy may be used for one Innovation feature.
- b. The project has an active WELL Certification. This strategy may be used for all three Innovation features.

Verification type: Technical Document

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References

1. Van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med*. 2020;382(16):1564-1567. doi:10.1056/NEJMc2004973
2. Charles P. Gerba P, Sonia L.M. Fankem MMP, Stephanie A. Boone MP, Marlene Gaither MMR. Outbreak of Norovirus Illness in a College Summer Camp: Impact of Cleaning on Occurrence of Norovirus on Fomites | National Environmental Health Association: NEHA. *J Environ Health*. 2014;76.8:20-26.
3. Boone SA, Gerba CP. Significance of fomites in the spread of respiratory and enteric viral disease. *Appl Environ Microbiol*. 2007;73(6):1687-1696. doi:10.1128/AEM.02051-06
4. Barker J, Bloomfield SF. Survival of Salmonella in bathrooms and toilets in domestic homes following salmonellosis. *J Appl Microbiol*. 2000;89(1):137-144. doi:10.1046/j.1365-2672.2000.01091.x
5. Aiello AE, Coulborn RM, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk in the community setting: A meta-analysis. *Am J Public Health*. 2008;98(8):1372-1381. doi:10.2105/AJPH.2007.124610
6. Show Me the Science – When & How to Use Hand Sanitizer in Community Settings | Handwashing | CDC.
7. Garza JL, Cavallari JM, Wakai S, et al. Traditional and environmentally preferable cleaning product exposure and health symptoms in custodians. *Am J Ind Med*. 2015;58(9):988-995. doi:10.1002/ajim.22484
8. Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health. Protecting Workers Who Use Cleaning Chemicals. 2012.
9. Zock JP, Plana E, Jarvis D, et al. The use of household cleaning sprays and adult asthma: An international longitudinal study. *Am J Respir Crit Care Med*. 2007;176(8):735-741. doi:10.1164/rccm.200612-1793OC
10. Centers for Disease Control and Prevention. Show Me the Science – When & How to Use Hand Sanitizer in Community Settings | Handwashing.
11. Jumaa PA. Hand hygiene: Simple and complex. *Int J Infect Dis*. 2005;9(1):3-14. doi:10.1016/j.ijid.2004.05.005
12. Parkes LO, Hota SS. Sink-Related Outbreaks and Mitigation Strategies in Healthcare Facilities. *Curr Infect Dis Rep*. 2018;20(10). doi:10.1007/s11908-018-0648-3
13. Chattman M, Maxwell SL, Gerba CP. Occurrence of heterotrophic and coliform bacteria in liquid hand soaps from bulk refillable dispensers in public facilities. *J Environ Health*. 2011;73(7):26-29.
14. Schaffner DW, Jensen D, Gerba CP, Shumaker D, Arbogast JW. Influence of Soap Characteristics and Food Service Facility Type on the Degree of Bacterial Contamination of Open, Refillable Bulk Soaps. *J Food Prot*. 2018;81(2):218-225. doi:10.4315/0362-028X.JFP-17-251
15. Kotay SM, Donlan RM, Ganim C, Barry K, Christensen BE, Mathers AJ. Droplet- Rather than Aerosol-Mediated Dispersion Is the Primary Mechanism of Bacterial Transmission from Contaminated Hand-Washing Sink Traps. *Appl Environ Microbiol*. 2019;85(2). doi:10.1128/AEM.01997-18
16. Huang C, Ma W, Stack S. The hygienic efficacy of different hand-drying methods: A review of the evidence. *Mayo Clin Proc*. 2012;87(8):791-798. doi:10.1016/j.mayocp.2012.02.019
17. Lawson A, Vaganay-Miller M. The effectiveness of a poster intervention on hand hygiene practice and compliance when using public restrooms in a university setting. *Int J Environ Res Public Health*. 2019;16(24). doi:10.3390/ijerph16245036
18. Ford EW, Boyer BT, Menachemi N, Huerta TR. Increasing hand washing compliance with a simple visual cue. *Am J Public Health*. 2014;104(10):1851-1856. doi:10.2105/AJPH.2013.301477

19. Pellegrino R, Crandall PG, O'Bryan CA, Seo HS. A review of motivational models for improving hand hygiene among an increasingly diverse food service workforce. *Food Control*. 2015;50:446-456. doi:10.1016/j.foodcont.2014.09.015
20. Wu F, Takaro TK. Childhood asthma and environmental interventions. *Environ Health Perspect*. 2007;115(6):971-975. doi:10.1289/ehp.8989
21. Calderón MA, Linneberg A, Kleine-Tebbe J, et al. Respiratory allergy caused by house dust mites: What do we really know? *J Allergy Clin Immunol*. 2015;136(1):38-48. doi:10.1016/j.jaci.2014.10.012
22. Velazquez S, Griffiths W, Dietz L, et al. Protecting Workers Who Use Cleaning Chemicals. *Contact Dermatitis*. 2007;5(1):175-180. doi:10.1111/j.0105-1873.2004.00421.x
23. Behroozy A, Keegel TG. Wet-work exposure: A main risk factor for occupational hand dermatitis. *Saf Health Work*. 2014;5(4):175-180. doi:10.1016/j.shaw.2014.08.001
24. ASTM E1971-19. *Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings*. West Conshohocken, PA; 2019.
25. World Health Organization. *Cleaning and Disinfection of Environmental Surfaces in the Context of COVID-19*; 2020.
26. Gorman T, Dropkin J, Kamen J, et al. Controlling health hazards to hospital workers: A reference guide. *New Solut*. 2014;23(1_suppl):1-167. doi:10.2190/ns.23.suppl
27. Velazquez S, Griffiths W, Dietz L, et al. From one species to another: A review on the interaction between chemistry and microbiology in relation to cleaning in the built environment. *Indoor Air*. 2019;29(6):880-894. doi:10.1111/ina.12596
28. Zhong L, Su FC, Batterman S. Volatile organic compounds (VOCs) in conventional and high performance school buildings in the U.S. *Int J Environ Res Public Health*. 2017;14(1). doi:10.3390/ijerph14010100
29. Zock J-P, Plana E, Jarvis D, et al. The use of household cleaning sprays and adult asthma: an international longitudinal study. *Am J Respir Crit Care Med*. 2007;176(8):735-741. doi:10.1164/rccm.200612-1793OC
30. World Health Organization. *Managing Epidemics*; 2018.
31. World Health Organization. *WHO's Emergencies: Work in Prepare, Prevent, Detect and Respond*. World Health Organization; 2018.
32. World Health Organization. WHO Timeline - COVID-19. WHO Timeline - COVID-19. <https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19>. Published 2020.
33. World Health Organization. *Coronavirus Disease (COVID-19) Situation Report - 134*; 2020.
34. World Health Organization. Environmental health in emergencies : Vulnerable groups. Public Health Management of Chemical Incidents.
35. Lockwood NR. *Crisis Management in Today's Business Environment: HR's Strategic Role*; 2005.
36. Skryabina E, Reedy G, Amlôt R, Jaye P, Riley P. What is the value of health emergency preparedness exercises? A scoping review study. *Int J Disaster Risk Reduct*. 2017;21:274-283. doi:10.1016/j.ijdrr.2016.12.010
37. Occupational Safety and Health Administration. Evacuation Plans and Procedures eTool | Emergency Action Plan - Develop & Implement an Emergency Action Plan (EAP).
38. American Red Cross Ready Rating. SMB Prepared Playbook. 2015.

39. U.S. Small Business Administration. *Disaster Preparedness and Recovery Plan.*; 2019.
40. World Health Organization. *COVID-19 Strategy Update - 14 April 2020.*; 2020.
41. Business Continuity Plan | Ready.gov.
42. Goldman SB. *PANDEMIC MANUAL Planning and Responding to a Global Health Crisis for Facility Management Professionals.*; 2020.
43. Benedek DM, Fullerton C, Ursano RJ. First Responders: Mental Health Consequences of Natural and Human-Made Disasters for Public Health and Public Safety Workers. *Annu Rev Public Health.* 2007;28(1):55-68. doi:10.1146/annurev.publhealth.28.021406.144037
44. United Nations. *COVID-19 and the Need for Action on Mental Health.*; 2020.
45. World Health Organization. Mental health in emergencies. WHO Fact Sheets.
46. Society of Occupational Medicine. *Returning to the Workplace after the COVID-19 Lockdown.*; 2020.
47. Mental health: strengthening our response.
48. Stress Weakens the Immune System.
49. WHO. Environmental health in emergencies : Vulnerable groups. Public Health Management of Chemical Incidents.
50. Mike S. Make Your Business Resilient.
51. World Health Organization. *Managing Epidemics.*; 2018. <https://www.who.int/emergencies/diseases/managing-epidemics-interactive.pdf>. Accessed June 3, 2020.
52. World Health Organization. *WHO's Work in Emergencies: Prepare, Prevent, Detect and Respond - Annual Report 2018.* World Health Organization; 2018. <https://www.who.int/emergencies/who-work-in-emergencies/en/>. Accessed June 3, 2020.
53. WHO Timeline - COVID-19. <https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19>. Published 2020. Accessed June 3, 2020.
54. World Health Organization. *Coronavirus Disease (COVID-19) Situation Report - 134.*; 2020. https://www.who.int/docs/default-source/coronavirus/situation-reports/20200602-covid-19-sitrep-134.pdf?sfvrsn=cc95e5d5_2. Accessed June 3, 2020.
55. Occupational Health and Safety Administration. How to Plan for Workplace Emergencies and Evacuations. 2001.
56. Lockwood NR. *Crisis Management in Today's Business Environment: HR's Strategic Role.*; 2005. <https://www.shrm.org/hr-today/news/hr-magazine/Documents/1205RQuartpdf.pdf>. Accessed October 21, 2019.
57. Skryabina E, Reedy G, Amlôt R, Jaye P, Riley P. What is the value of health emergency preparedness exercises? A scoping review study. *Int J Disaster Risk Reduct.* 2017;21:274-283. doi:10.1016/j.ijdr.2016.12.010
58. Occupational Safety and Health Administration. Evacuation Plans and Procedures eTool | Emergency Action Plan - Develop & Implement an Emergency Action Plan (EAP). <https://www.osha.gov/SLTC/etools/evacuation/implementation.html>. Accessed June 3, 2020.
59. American Red Cross Ready Rating. SMB Prepared Playbook. 2015. <https://www.readyrating.org/Resource-Center/All-Resources/smb-prepared-playbook>. Accessed June 4, 2020.

60. U.S. Small Business Administration. *Disaster Preparedness and Recovery Plan.*; 2019. <https://www.sba.gov/sites/default/files/2019-08/2019 DPRP 3-2b-FINAL.pdf>. Accessed June 4, 2020.
61. World Health Organization. *COVID-19 Strategy Update - 14 April 2020.*; 2020. <https://www.who.int/publications-detail/covid-19-strategy-update---14-april-2020>. Accessed June 3, 2020.
62. *Weather, Climate & Catastrophe Insight.*; 2019. <http://catastropheinsight.aon.com>. Accessed June 4, 2020.
63. Coronese M, Lamperti F, Keller K, Chiaromonte F, Roventini A. Evidence for sharp increase in the economic damages of extreme natural disasters. *Proc Natl Acad Sci U S A.* 2019;116(43):21450-21455. doi:10.1073/pnas.1907826116
64. *Global Increase in Climate-Related Disasters.*; 2015. <https://www.adb.org/publications/global-increase-climate-related-disasters>. Accessed June 4, 2020.
65. International Monetary Fund. *World Economic Outlook, April 2020: The Great Lockdown.*; 2020. <https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020>. Accessed June 4, 2020.
66. Business Continuity Plan | Ready.gov. <https://www.ready.gov/business-continuity-plan>. Accessed June 4, 2020.
67. FEMA. *Make Your Business Resilient.*; 2015. https://www.fema.gov/media-library-data/1441212988001-1aa7fa978c5f999ed088dcaa815cb8cd/3a_BusinessInfographic-1.pdf.
68. Evacuation Plans and Procedures eTool | Emergency Action Plan - Shelter-in-Place | Occupational Safety and Health Administration. <https://www.osha.gov/SLTC/etools/evacuation/shelterinplace.html>. Accessed June 4, 2020.
69. CDC Emergency Preparedness and You | Learn How to Shelter in Place. <https://emergency.cdc.gov/shelterinplace.asp>. Accessed June 3, 2020.
70. Build A Kit | Ready.gov. <https://www.ready.gov/kit>. Accessed June 3, 2020.
71. Coronavirus Makes Work from Home the New Normal. <https://www.shrm.org/hr-today/news/all-things-work/pages/remote-work-has-become-the-new-normal.aspx>. Accessed June 4, 2020.
72. COVID-19: Making remote work productive and secure: PwC. <https://www.pwc.com/us/en/library/covid-19/making-remote-work-productive-secure.html>. Accessed June 4, 2020.
73. Kluch S, Hickman A. *4 Workplace Adjustments to Help Parents Working From Home.*; 2020. <https://www.gallup.com/workplace/300662/workplace-adjustments-help-parents-working-home.aspx>. Accessed June 4, 2020.
74. Willis Towers Watson. North American companies take steps to protect employees from coronavirus epidemic. 2020. <https://www.willistowerswatson.com/en-US/News/2020/03/north-american-companies-take-steps-to-protect-employees-from-coronavirus-epidemic>. Accessed June 4, 2020.
75. KFF. Taking Stock of Essential Workers | KFF. <https://www.kff.org/coronavirus-policy-watch/taking-stock-of-essential-workers/>. Published 2020. Accessed June 4, 2020.
76. World Health Organization. Mental health in emergencies. WHO Fact Sheets. <https://www.who.int/news-room/fact-sheets/detail/mental-health-in-emergencies>. Published 2019. Accessed June 3, 2020.
77. United Nations. *COVID-19 and the Need for Action on Mental Health.*; 2020. https://www.un.org/sites/un2.un.org/files/un_policy_brief_covid_and_mental_health_final.pdf. Accessed May 28, 2020.
78. Business Continuity Plan | Ready.gov. <https://www.ready.gov/business-continuity-plan>. Published 2020. Accessed May 29, 2020.

79. Emergency Management Agency F. *Continuity Guidance Circular - February 2018.*; 2018.
80. Goldman SB. *PANDEMIC MANUAL Planning and Responding to a Global Health Crisis for Facility Management Professionals.*; 2020. www.ifmafoundation.org. Accessed June 4, 2020.
81. Emergency Preparedness and Response | Getting Started - Evacuation & Shelter-in-Place. https://www.osha.gov/SLTC/emergencypreparedness/gettingstarted_evacuation.html. Accessed June 26, 2020.
82. *Planning Considerations: Evacuation and Shelter-in-Place - Guidance for State, Local, Tribal and Territorial Partners.*; 2019.
83. U.S. Fire Administration. *Operational Lessons Learned in Disaster Response.*; 2015.
84. Ciena. 68% of British Adults Will Work Remotely More Often After COVID-19. <https://www.ciena.com/about/newsroom/press-releases/68-percent-of-british-adults-will-work-remotely-more-often-after-covid-19.html>. Accessed June 26, 2020.
85. U.S. Workers Discovering Affinity for Remote Work. <https://news.gallup.com/poll/306695/workers-discovering-affinity-remote-work.aspx>. Accessed June 26, 2020.
86. Policy Responses to COVID-19. International Monetary Fund. <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#U>. Accessed June 26, 2020.
87. U.S. economy loses 20.5 million jobs, unemployment rate rises to 14.7% - Marketplace. <https://www.marketplace.org/2020/05/08/u-s-economy-loses-20-5-million-jobs-unemployment-rate-rises-to-14-7/>. Accessed June 26, 2020.
88. *Global Economic Prospects.*; 2020. <https://www.worldbank.org/en/publication/global-economic-prospects>. Accessed June 26, 2020.
89. Aftershock Forecast Overview. U.S. Geological Survey. <https://earthquake.usgs.gov/data/oaf/overview.php>. Accessed June 26, 2020.
90. Ferris E, Petz D, Stark C. *The Year of Recurring Disasters: A Review of Natural Disasters in 2012.*; 2013. <https://www.brookings.edu/research/the-year-of-recurring-disasters-a-review-of-natural-disasters-in-2012/>. Accessed June 26, 2020.
91. Markel H, Lipman HB, Navarro JA, et al. Nonpharmaceutical interventions implemented by US cities during the 1918-1919 influenza pandemic. *J Am Med Assoc.* 2007;298(6):644-654. doi:10.1001/jama.298.6.644
92. Live: WHO reports largest 24-hour increase in coronavirus cases | News | Al Jazeera. <https://www.aljazeera.com/news/2020/06/brazil-coronavirus-death-toll-nears-50000-live-updates-200620230549593.html>. Accessed June 26, 2020.
93. Wilson S. In the nation's biggest states, a spike in coronavirus comes with the economic reopening - The Washington Post. *The Washington Post.* https://www.washingtonpost.com/national/in-the-nations-biggest-states-a-spike-in-coronavirus-comes-with-the-economic-reopening/2020/06/21/e08457e4-af4f-11ea-b1e7-33e88fa24c71_story.html. Published June 21, 2020. Accessed June 26, 2020.
94. Chappell B, Stein R. U.S. Hits 2 Million Coronavirus Cases As Many States See A Surge Of Patients : Coronavirus Live Updates : NPR. NPR. <https://www.npr.org/sections/coronavirus-live-updates/2020/06/10/873473805/u-s-hits-2-million-coronavirus-cases-as-many-states-see-a-surge-of-patients>. Published June 10, 2020. Accessed June 26, 2020.
95. Bosman J, Smith M. Coronavirus Cases Spike Across Sun Belt as Economy Lurches into Motion - The New York Times. *The New York Times.* <https://www.nytimes.com/2020/06/14/us/coronavirus-united-states.html>. Published June 14, 2020. Accessed June 26, 2020.

96. CDC. COVID-19 Guidance: Businesses and Employers | CDC. https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html. Published 2020. Accessed June 8, 2020.
97. HMG. *Our Plan to Rebuild: The UK Government's COVID-19 Recovery Strategy*.; 2020.
98. PricewaterhouseCoopers. Returning to the workplace after COVID-19: What boards should be thinking about: PwC. <https://www.pwc.com/us/en/services/governance-insights-center/library/covid-19-returning-workplace-boards.html>. Published 2020. Accessed June 4, 2020.
99. Society of Occupational Medicine. *Returning to the Workplace after the COVID-19 Lockdown*.; 2020. https://www.som.org.uk/Returning_to_the_workplace_COVID-19_toolkit_FINAL.pdf. Accessed June 3, 2020.
100. *Recovery Readiness: A How-to Guide for Reopening Your Workplace | Cushman & Wakefield*.; 2020. <https://www.cushmanwakefield.com/en/insights/covid-19/recovery-readiness-a-how-to-guide-for-reopening-your-workplace>. Accessed June 9, 2020.
101. *GUIDANCE FOR CLEANING AND DISINFECTING*.; 2020. https://www.cdc.gov/coronavirus/2019-ncov/community/pdf/Reopening_America_Guidance.pdf. Accessed June 9, 2020.
102. *Getting Back to Work: Preparing Buildings for Re-Entry Amid COVID-19*.; 2020. <https://boma.informz.net/BOMA/data/images/Getting Back To Work Preparing Buildings for Re Entry.pdf>. Accessed June 9, 2020.
103. *Getting Your Workplace Ready for COVID-19*.; 2020. www.WHO.int. Accessed June 9, 2020.
104. *Re-Occupancy Assessment Tool V2.0*.; 2020. http://content.aia.org/sites/default/files/2020-06/STN20_344901_ReOccupancyAssessmentTool-V02_sm_v09.pdf. Accessed June 9, 2020.
105. *Guidance on Preparing Workplaces for COVID-19*.; 2020. <https://www.osha.gov/Publications/OSHA3990.pdf>. Accessed June 9, 2020.
106. JLL. COVID-19: Top 10 focus areas for workplace re-entry checklist. <https://www.us.jll.com/en/views/covid19-top-10-focus-areas-for-workplace-re-entry>. Published 2020. Accessed June 9, 2020.
107. Society of Occupational Medicine. *Returning to the Workplace after the COVID-19 Lockdown A Toolkit In Association With*.; 2020. https://www.som.org.uk/Returning_to_the_workplace_COVID-19_toolkit_FINAL.pdf. Accessed June 3, 2020.
108. Mehra R. Global public health problem of sudden cardiac death. *J Electrocardiol*. 2007;40(6 SUPPL. 1). doi:10.1016/j.jelectrocard.2007.06.023
109. Saving Sudden Cardiac Arrest Victims in the Workplace. <https://www.osha.gov/Publications/3185.html>. Accessed June 16, 2020.
110. Konig M. *Every Second Counts - AED Fact Sheet 2013 - Final*.; 2013. www.heart.org/policyfactsheets. Accessed June 16, 2020.
111. Krug EG, Sharma GK, Lozano R. The Global Burden of Injuries. *Am J Public Health*. 2000;90(4). <https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.90.4.523>. Accessed June 16, 2020.
112. *First Aid for a Safer Future - Focus on Europe*.; 2009.
113. Sixty Percent of Americans Not Practicing for Disaster: FEMA urges everyone to prepare by participating in National PrepareAthon! Day on April 30 | FEMA.gov. <https://www.fema.gov/news->

release/2015/04/28/sixty-percent-americans-not-practicing-disaster-fema-urges-everyone-prepare. Accessed June 16, 2020.

114. Hsieh F. Anaphylaxis. Cleveland Clinic Center for Continuing Education - Disease Management. <http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/allergy/anaphylaxis/>. Published December 2013. Accessed June 16, 2020.
115. Turner PJ, Jerschow E, Umasunthar T, Lin R, Campbell DE, Boyle RJ. Fatal Anaphylaxis: Mortality Rate and Risk Factors. *J Allergy Clin Immunol Pract*. 2017;5(5):1169-1178. doi:10.1016/j.jaip.2017.06.031
116. Boyce JA, Assa'ad A, Burks AW, et al. Guidelines for the diagnosis and management of food allergy in the United States: Report of the NIAID-sponsored expert panel. *J Allergy Clin Immunol*. 2010;126(6 SUPPL.):S1. doi:10.1016/j.jaci.2010.10.007
117. Berryman P, Lukes E, Mancini ME, Cazzell M, Kardong-Edgren S, Cason CL. Improving Workplace Safety Training Using a Self-Directed CPR-AED Learning Program. *AAOHN J*. 2009;57(4):159-167. doi:10.3928/08910162-20090401-02
118. Access to Epinephrine | Food Allergy Research & Education.
119. Cost of natural disaster losses worldwide 2000-2019 | Statista. <https://www.statista.com/statistics/612561/natural-disaster-losses-cost-worldwide-by-type-of-loss/>. Accessed June 25, 2020.
120. Anzellini V, Desai B, Fung V, et al. *Global Disaster Displacement Risk - A Baseline for Future Work | IDMC*; 2017. <https://www.internal-displacement.org/publications/global-disaster-displacement-risk-a-baseline-for-future-work>. Accessed June 25, 2020.
121. CDC Emergency Preparedness and You | Learn How to Shelter in Place.
122. Coronavirus Makes Work from Home the New Normal.
123. COVID-19: Making remote work productive and secure: PwC.
124. Kluch S, Hickman A. *4 Workplace Adjustments to Help Parents Working From Home.*; 2020.
125. Willis Towers Watson. North American companies take steps to protect employees from coronavirus epidemic. 2020.
126. Kaiser Family Foundation. Taking Stock of Essential Workers | KFF.
127. *Interim Technical Note Impact of the COVID-19 Pandemic on Family Planning and Ending Gender-Based Violence, Female Genital Mutilation and Child Marriage.*; 2020.
128. Mulyasari F, Inoue S, Prashar S, et al. Disaster Preparedness: Looking through the Lens of Hospitals in Japan. *Int J Disaster Risk Sci*. 2013;1375(2):89-100. doi:10.1007/s13753-013-0010-1
129. Lewnard JA, Liu VX, Jackson ML, et al. Incidence, clinical outcomes, and transmission dynamics of severe coronavirus disease 2019 in California and Washington: Prospective cohort study. *BMJ*. 2020;369(9). doi:10.1136/bmj.m1923
130. Khera R, Jain S, Lin Z, Ross JS, Krumholz H. *Evaluation of the Anticipated Burden of COVID-19 on Hospital-Based Healthcare Services Across the United States*. Cold Spring Harbor Laboratory Press; 2020. doi:10.1101/2020.04.01.20050492
131. Federal Emergency Management Agency. Every Business Should Have a Plan. 2014. https://www.fema.gov/media-library-data/1388786699366-f6593a40cee347ce4a8def70a28b748e/Business_quadfold_brochure_2012.pdf.

132. America Society of Civil Engineers. Alternate Care Sites Retrofitting Guidance. <https://www.usace.army.mil/Coronavirus/Alternate-Care-Sites/>. Published 2020. Accessed June 4, 2020.
133. CDC. Considerations for Alternate Care Sites | CDC. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/alternative-care-sites.html>. Published 2020. Accessed June 4, 2020.
134. Emergency Relief Funds Throw Employees a Lifeline During Pandemic. <https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/emergency-relief-funds-throw-employees-lifeline-during-pandemic.aspx>. Accessed June 4, 2020.
135. Employer-Assisted Housing: The Basics | National Housing Conference. <https://www.nhc.org/policy-guide/employer-assisted-housing-the-basics/>. Accessed June 4, 2020.
136. Stockham D, Clontz B. Emergency Assistance Funds (EAFs) for Employee Hardship and Disaster Relief: Legal, Tax and Design Considerations. 2015. <https://www.pgdc.com/pgdc/emergency-assistance-funds-eafs-employee-hardship-and-disaster-relief-legal-tax-and-design-cons>. Accessed June 9, 2020.
137. World Health Organization. Influenza (Seasonal).
138. Duncan IG, Taitel MS, Zhang J, Kirkham HS. Planning influenza vaccination programs: a cost benefit model. *Cost Eff Resour Alloc*. 2012;10(1):10. doi:10.1186/1478-7547-10-10
139. McKibbin WJ, Sidorenko AA. The Global Costs of an Influenza Pandemic. *Milken Inst Rev*. 2007:18-27.
140. Centers for Disease Control and Prevention. Make It Your Business To Fight The Flu: A Toolkit for Employers.
141. Scheil-Adlung X, Sandner L. *The Case for Paid Sick Leave.*; 2010.
142. Heymann J, Rho HJ, Schmitt J, Earle A. *Contagion Nation: A Comparison of Paid Sick Day Policies in 22 Countries.*; 2009. <http://www.issuelab.org/permalink/resource/2939>.
143. Jacobs B, Ir P, Bigdeli M, Annear PL, Van Damme W. Addressing access barriers to health services: An analytical framework for selecting appropriate interventions in low-income Asian countries. *Health Policy and Planning*. doi:10.1093/heapol/czr038
144. U.S. Department of Health and Human Services. Access to Health Services | Healthy People 2020.
145. *Estimating the Distributional Impacts of Alternative Policies to Provide Paid Sick Days in the United States Issue Brief-Worker Leave Analysis and Simulation Series 1.*; 2017.
146. Braveman P, Gottlieb L. The social determinants of health: It's time to consider the causes of the causes. *Public Health Rep*. 2014;129(SUPPL. 2):19-31. doi:10.1177/00333549141291s206
147. National Cancer Institute. Harms of Cigarette Smoking and Health Benefits of Quitting.
148. Matt GE, Quintana PJE, Destailats H, et al. Thirdhand tobacco smoke: Emerging evidence and arguments for a multidisciplinary research agenda. *Environ Health Perspect*. 2011;119(9):1218-1226. doi:10.1289/ehp.1103500
149. Jha P, Ramasundarahettige C, Landsman V, et al. 21st-century hazards of smoking and benefits of cessation in the United States. *N Engl J Med*. 2013;368(4):341-350. doi:10.1056/NEJMsa1211128
150. U.S. Department of Health and Human Services. Healthy People 2020: Social Determinants of Health. <https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health>. Accessed February 7, 2018.
151. Braveman P, Gottlieb L. The Social determinants of Health: It's Time to Consider the Causes of the Causes. 2014;129:19-31. doi:10.1177/00333549141291S206

152. Weissman J, Stern R, Fielding S, Epstein A. Delayed Access to Health Care: Risk Factors, Reasons, and Consequences. *Ann Intern Med.* 1991;114(4):325-331.
153. U.S. Department of Health and Human Services. Access to Health Services | Healthy People 2020. <https://www.healthypeople.gov/2020/topics-objectives/topic/Access-to-Health-Services>. Accessed February 4, 2018.
154. Gulliford M, Figueroa-Munoz J, Morgan M, et al. What does “access to health care” mean? *J Heal Serv Res Policy.* 2002;7(3):186-188. doi:10.1258/135581902760082517
155. Raub A, Chung P, Batra P, et al. *Paid Leave for Personal Illness: A Detailed Look at Approaches Across OECD Countries.*; 2018.
156. *Expanding Access to Paid Sick Leave.*; 2010.
157. Scheil-Adlung X, Sandner L. *The Case for Paid Sick Leave.*; 2010. <https://www.who.int/healthsystems/topics/financing/healthreport/SickleaveNo9FINAL.pdf>. Accessed June 5, 2020.
158. Heymann J, Rho HJ, Schmitt J, Earle A. *Contagion Nation: A Comparison of Paid Sick Day Policies in 22 Countries.*; 2009. www.cepr.net. Accessed June 5, 2020.
159. *Estimating the Distributional Impacts of Alternative Policies to Provide Paid Sick Days in the United States Issue Brief-Worker Leave Analysis and Simulation Series 1.*; 2017. <https://www.dol.gov/asp/evaluation>. Accessed June 5, 2020.
160. Scheil-Adlung X, Sandner L. Evidence on paid sick leave: Observations in times of crisis. *Intereconomics.* 2010;45(5):313-321. doi:10.1007/s10272-010-0351-6
161. Heymann J, Earle A, Hayes J. *The Work, Family, and Equity Index How Does the United States Measure Up? About the Project on Global Working Families.* www.mcgill.ca/ihsp. Accessed June 10, 2020.
162. U.S. Department of Health and Human Services. Healthy People 2020: Social Determinants of Health.
163. Gulliford M, Figueroa-Munoz J, Morgan M, et al. What does “access to health care” mean? *J Heal Serv Res Policy.* 2002;7(3):186-188. doi:10.1258/135581902760082517
164. Greenbaum E, Meinert E. Vaccinating Against the Flu: A Business Case. 2010;(September).
165. MetLife. Work Redefined: A New Age of Benefits. 2017. <https://benefittrends.metlife.com/us-perspectives/work-redefined-a-new-age-of-benefits/>.
166. Benedek DM, Fullerton C, Ursano RJ. First Responders: Mental Health Consequences of Natural and Human-Made Disasters for Public Health and Public Safety Workers. *Annu Rev Public Health.* 2007;28(1):55-68. doi:10.1146/annurev.publhealth.28.021406.144037
167. World Health Organization. Influenza (Seasonal). <http://www.who.int/mediacentre/factsheets/fs211/en/>. Published 2018. Accessed February 4, 2018.
168. Duncan IG, Taitel MS, Zhang J, Kirkham HS. Planning influenza vaccination programs: a cost benefit model. *Cost Eff Resour Alloc.* 2012;10(1):10. doi:10.1186/1478-7547-10-10
169. McKibbin WJ, Sidorenko AA. The Global Costs of an Influenza Pandemic. *Milken Inst Rev.* 2007.
170. Centers for Disease Control and Prevention. Make It Your Business To Fight The Flu: A Toolkit for Employers. https://www.cdc.gov/flu/pdf/business/toolkit_seasonal_flu_for_businesses_and_employers.pdf.
171. Arriola C, Garg S, Anderson EJ, et al. Influenza vaccination modifies disease severity among community-dwelling adults hospitalized with influenza. *Clin Infect Dis.* 2017;65(8):1289-1297. doi:10.1093/cid/cix468

172. World Health Organization. Tobacco. <http://www.who.int/mediacentre/factsheets/fs339/en/>. Published 2017. Accessed January 9, 2018.
173. World Health Organization. WHO global report on trends in prevalence of tobacco smoking 2015. *WHO Mag.* 2015;1-359. doi:978 92 4 156492 2
174. National Cancer Institute. Harms of Cigarette Smoking and Health Benefits of Quitting. <https://www.cancer.gov/about-cancer/causes-prevention/risk/tobacco/cessation-fact-sheet>.
175. Jha P, Ramasundarahettige C, Landsman V, et al. 21st-Century Hazards of Smoking and Benefits of Cessation in the United States. *N Engl J Med.* 2013;368(4):341-350. doi:10.1056/NEJMsa1211128
176. Matt GE, Quintana PJE, Destailats H, et al. Thirdhand tobacco smoke: Emerging evidence and arguments for a multidisciplinary research agenda. *Environ Health Perspect.* 2011;119(9):1218-1226. doi:10.1289/ehp.1103500
177. Wang X, Derakhshandeh R, Liu J, et al. One Minute of Marijuana Secondhand Smoke Exposure Substantially. *J Am Heart Assoc.* 2016;5(8):1-11. doi:10.1161/JAHA.116.003858
178. Mello S, Bigman CA, Sanders-Jackson A, Tan ASL. Perceived harm of secondhand electronic cigarette vapors and policy support to restrict public vaping: Results from a national survey of US adults. *Nicotine Tob Res.* 2016;18(5):686-693. doi:10.1093/ntr/ntv232
179. U.S. Department of Health and Human Services. *The Health Consequences of Smoking: 50 Years of Progress: A Report of the Surgeon General.* Rockville, MD; 2014. https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf.
180. World Health Organization. *WHO Report on the Global Tobacco Epidemic, 2017 - Monitoring Tobacco Use and Prevention Policies.* Geneva, Switzerland; 2017. <http://apps.who.int/iris/bitstream/handle/10665/255874/9789241512824-eng.pdf?sequence=1%0Ahttps://www.world-heart-federation.org/wp-content/uploads/2017/07/WHO-Report-on-the-global-tobacco-epidemic-2017-EMBARGOED.pdf%0Ahttp://apps.who.int/iris/bitstream/1>.
181. International Agency for Research on Cancer. *Evaluating the Effectiveness of Smoke-Free Policies.* Geneva, Switzerland; 2009. <https://www.iarc.fr/wp-content/uploads/2018/07/handbook13.pdf>.
182. Gan Q, Hammond SK, Jiang Y, Yang Y, Hu TW. Effectiveness of a smoke-free policy in lowering secondhand smoke concentrations in offices in China. *J Occup Environ Med.* 2008;50(5):570-575. doi:10.1097/JOM.0b013e3181638640
183. MacNaughton P, Adamkiewicz G, Arku RE, Vallarino J, Levy DE. The impact of a smoke-free policy on environmental tobacco smoke exposure in public housing developments. *Sci Total Environ.* 2016;557-558:676-680. doi:10.1016/j.scitotenv.2016.03.110
184. Kaufman P, Zhang B, Bondy SJ, Klepeis N, Ferrence R. Not just “a few wisps”: Real-time measurement of tobacco smoke at entrances to office buildings. *Tob Control.* 2011;20(3):212-218. doi:10.1136/tc.2010.041277
185. Reitzel LR, Cromley EK, Li Y, et al. The Effect of Tobacco Outlet Density and Proximity on Smoking Cessation. *Am J Public Health.* 2011;101(2):315-320. doi:10.2105/AJPH.2010.191676
186. Polinski J, Howell B, Gagnon M, Kymes S, Brennan T, Shrank W. Impact of CVS Pharmacy’s Discontinuance of Tobacco Sales on Cigarette Purchasing (2012-2014). *Am J Public Health.* 2017;107(4):556-562. doi:10.2105/AJPH.2016.303612
187. Klepeis NE, Nelson WC, Ott WR, et al. The National Human Activity Pattern Survey (NHAPS): A resource for assessing exposure to environmental pollutants. *J Expo Anal Environ Epidemiol.* 2001;11(3):231-252. doi:10.1038/sj.jea.7500165

188. The National Academies. How Infection Works, Entering the Human Host — The National Academies.
189. Smieszek T, Lazzari G, Salathé M. Assessing the Dynamics and Control of Droplet- and Aerosol-Transmitted Influenza Using an Indoor Positioning System. *Sci Rep.* 2019;9(1):2185-2185. doi:10.1038/s41598-019-38825-y
190. Centers for Disease Control and Prevention. *Lesson 1: Introduction to Epidemiology. In Principles of Epidemiology in Public Health Practice: An Introduction to Applied Epidemiology and Biostatistics.*; 2019.
191. Mendell MJ, Mirer AG, Cheung K, Tong M, Douwes J. Respiratory and allergic health effects of dampness, mold, and dampness-related agents: A review of the epidemiologic evidence. *Environ Health Perspect.* 2011;119(6):748-756. doi:10.1289/ehp.1002410
192. Bekö G, Clausen G, Weschler CJ. Is the use of particle air filtration justified? Costs and benefits of filtration with regard to health effects, building cleaning and occupant productivity. *Build Environ.* 2008;43(10):1647-1657. doi:10.1016/j.buildenv.2007.10.006
193. Joshi S. The sick building syndrome. *Indian J Occup Environ Med.* 2008;12(2):61-64. doi:10.4103/0019-5278.43262
194. Selgrade MK, Plopper CG, Gilmour MI, Conolly RB, Foos BSP. Assessing the health effects and risks associated with children's inhalation exposures - Asthma and allergy. *J Toxicol Environ Heal - Part A Curr Issues.* 2008;71(3):196-207. doi:10.1080/15287390701597897
195. U.S. Environmental Protection Agency. *Indoor Air Pollution: An Introduction for Health Professionals.*
196. Zock J-P, Jarvis D, Luczynska C, Sunyer J, Burney P, European Community Respiratory Health Survey. Housing characteristics, reported mold exposure, and asthma in the European Community Respiratory Health Survey. *J Allergy Clin Immunol.* 2002;110(2):285-292. [https://www.jacionline.org/article/S0091-6749\(02\)00092-1/pdf](https://www.jacionline.org/article/S0091-6749(02)00092-1/pdf).
197. Mendell MJ, Mirer AG, Cheung K, Tong M, Douwes J. Respiratory and allergic health effects of dampness, mold, and dampness-related agents: A review of the epidemiologic evidence. *Environ Health Perspect.* 2011;119(6):748-756. doi:10.1289/ehp.1002410
198. Fisk WJ, Eliseeva EA, Mendell MJ. Association of residential dampness and mold with respiratory tract infections and bronchitis: A meta-analysis. *Environ Heal A Glob Access Sci Source.* 2010;9(1):72. doi:10.1186/1476-069X-9-72
199. Jones R, Recer GM, Hwang SA, Lin S. Association between indoor mold and asthma among children in Buffalo, New York. *Indoor Air.* 2011;21(2):156-164. doi:10.1111/j.1600-0668.2010.00692.x
200. Jacobs DE, Kelly T, Sobolewski J. Linking public health, housing, and indoor environmental policy: Successes and challenges at local and federal agencies in the United States. *Environ Health Perspect.* 2007;115(6):976-982. doi:10.1289/ehp.8990
201. Nieuwenhuijsen MJ, Martinez D, Grellier J, et al. Chlorination disinfection by-products in drinking water and congenital anomalies: Review and meta-analyses. *Environ Health Perspect.* 2009;117(10):1486-1493. doi:10.1289/ehp.0900677
202. Centers for Disease Control and Prevention. Legionnaires Disease and Pontiac Fever | Legionella. US Centers for Disease Control & Prevention.
203. Wargocki P, Wyon DP, Sundell J, Clausen G, Fanger PO. The effects of outdoor air supply rate in an office on perceived air quality, sick building syndrome (SBS) symptoms and productivity. *Indoor Air.* 2000;10(4):222-236. <https://onlinelibrary.wiley.com/doi/epdf/10.1034/j.1600-0668.2000.010004222.x>.
204. Daisey JM, Angell WJ, Apte MG. Indoor air quality, ventilation and health symptoms in schools: An analysis

- of existing information. *Indoor Air*. 2003;13(1):53-64. doi:10.1034/j.1600-0668.2003.00153.x
205. Haverinen-Shaughnessy U, Moschandreas DJ, Shaughnessy RJ. Association between substandard classroom ventilation rates and students' academic achievement. *Indoor Air*. 2011;21(2):121-131. doi:10.1111/j.1600-0668.2010.00686.x
 206. Chan WR, Parthasarathy S, Fisk WJ, Mckone TE. Estimated effect of ventilation and filtration on chronic health risks in U.S. offices, schools, and retail stores. *Indoor Air*. 2016;26(2):331-343. doi:10.1111/ina.12189
 207. Milton DK, Glencross PM, Walters MD. Risk of sick leave associated with outdoor air supply rate, humidification, and occupant complaints. *Indoor Air*. 2000;10(4):212-221. https://buildequinox.com/files/iaq/milton_vent_sick_rates.pdf.
 208. Redlich CA, Sparer J, Cullen MR. Sick-building syndrome. *Lancet (London, England)*. 1997;349(9057):1013-1016. <https://www.ncbi.nlm.nih.gov/pubmed/9100639>.
 209. Fisk WJ. Estimates of improved productivity and health from better indoor environments. *Indoor Air*. 1997;7(3):158-172. doi:10.1111/j.1600-0668.1997.t01-1-00002.x
 210. Fisk WJ. How IEQ affects health, productivity. *ASHRAE*. 2002;44(5).
 211. Sundell J, Levin H, Nazaroff WW, et al. Ventilation rates and health: Multidisciplinary review of the scientific literature. *Indoor Air*. 2011;21(3):191-204. doi:10.1111/j.1600-0668.2010.00703.x
 212. Carrer P, Wargocki P, Fanetti A, et al. What does the scientific literature tell us about the ventilation-health relationship in public and residential buildings? *Build Environ*. 2015;94(P1):273-286. doi:10.1016/j.buildenv.2015.08.011
 213. The American Society of Heating Refrigerating and Air-Conditioning Engineers. ASHRAE Position Document on Infectious Aerosols. 2020.
 214. Federation of European Heating Ventilation and Air-Conditioning Associations. How to operate and use building services in order to prevent the spread of the coronavirus disease (COVID-19) virus (SARS-CoV-2) in workplaces. 2020.
 215. Hanssen SO. HVAC - The importance of clean intake section and dry air filter in cold climate. *Indoor Air, Suppl*. 2004;14(SUPPL. 7):195-201. doi:10.1111/j.1600-0668.2004.00288.x
 216. Salthammer T. Emissions of Volatile Organic Compounds from Products and Materials in Indoor Environments. *Handb Environ Chem*. 2004;4:37-71. doi:10.1007/b94830
 217. Wallace LA, Pellizzari E, Leaderer B, Zelon H, Sheldon L. Emissions of volatile organic compounds from building materials and consumer products. *Atmos Environ*. 1987;21(2):385-393. doi:10.1016/0004-6981(87)90017-5
 218. Nurmatov UB, Tagiyeva N, Semple S, Devereux G, Sheikh A. Volatile organic compounds and risk of asthma and allergy: A systematic review. *Eur Respir Rev*. 2015;24(135):92-101. doi:10.1183/09059180.00000714
 219. Nielsen GD, Larsen ST, Wolkoff P. Re-evaluation of the WHO (2010) formaldehyde indoor air quality guideline for cancer risk assessment. *Arch Toxicol*. 2017;91(1):35-61. doi:10.1007/s00204-016-1733-8
 220. U.S. Environmental Protection Agency. Volatile Organic Compounds' Impact on Indoor Air Quality. <https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality>.
 221. Stariolo DA. *COVID-19 in Air Suspensions.*; 2020. <https://arxiv.org/abs/2004.05699>. Accessed June 15, 2020.
 222. Dietz L, Horve PF, Coil DA, Fretz M, Eisen JA, Van Den Wymelenberg K. 2019 Novel Coronavirus (COVID-19) Pandemic: Built Environment Considerations To Reduce Transmission. Gilbert JA, ed. *mSystems*. 2020;5(2):e00245-20. doi:10.1128/mSystems.00245-20

223. Fisk WJ, Spears M, Sullivan DP, Mendell M. *Ozone Removal by Filters Containing Activated Carbon: A Pilot Study.*; 2009. <https://www.osti.gov/scitech/servlets/purl/1050670/>.
224. Sekine Y, Fukuda M, Takao Y, Ozano T, Sakuramoto H, Wang KW. Simultaneous removal of formaldehyde and benzene in indoor air with a combination of sorption- and decomposition-type air filters. *Environ Technol.* 2011;33(15-16):1983-1989. doi:10.1080/09593330.2011.562924
225. Liu Y, Ning Z, Chen Y, et al. Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals. *Nature.* 2020. doi:10.1038/s41586-020-2271-3
226. Yang Y, Zhang H, Nunayon SS, Chan V, Lai AC. Disinfection efficacy of ultraviolet germicidal irradiation on airborne bacteria in ventilation ducts. *Indoor Air.* 2018;28(6):806-817. doi:10.1111/ina.12504
227. World Health Organization. *Guidelines for Drinking-Water Quality.* Geneva, Switzerland: WHO Press; 1996. http://www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/.
228. Legionnaires Disease and Pontiac Fever | Legionella | CDC. US Centers for Disease Control & Prevention.
229. Franklin BA, Brook R, Arden Pope C. Air pollution and cardiovascular disease. *Curr Probl Cardiol.* 2015;40(5):207-238. doi:10.1016/j.cpcardiol.2015.01.003
230. Joshi S. The sick building syndrome. *Indian J Occup Environ Med.* 2008;12(2):61. doi:10.4103/0019-5278.43262
231. U.S. Environmental Protection Agency. *Indoor Air Pollution: An Introduction for Health Professionals.* <https://www.epa.gov/indoor-air-quality-iaq/indoor-air-pollution-introduction-health-professionals>.
232. World Health Organization. WHO Handbook on Indoor Radon: A Public Health Perspective. Presented at the: 2009. https://www.who.int/ionizing_radiation/env/9789241547673/en/.
233. Yang S, Goyette Pernot J, Hager Jörin C, Niculita-Hirzel H, Perret V, Licina D. Radon Investigation in 650 Energy Efficient Dwellings in Western Switzerland: Impact of Energy Renovation and Building Characteristics. *Atmosphere (Basel).* 2019;10(12):777. doi:10.3390/atmos10120777
234. Hadlich DE, Grimsrud DT. Radon in Institutional Buildings : The Impacts of Conservation Strategies. *Radon Institutional Build Impacts.* 1991;(1990).
235. Institute of Medicine (US) Committee on Damp Indoor Spaces and Health. Damp Indoor Spaces and Health - 5, Human Health Effects Associated with Damp Indoor Environments. *Heal San Fr.* 2004;(2):355. doi:10.17226/11011
236. Mudarri D, Fisk WJ. Public health and economic impact of dampness and mold. *Indoor Air.* 2007;17(3):226-235. doi:10.1111/j.1600-0668.2007.00474.x
237. U.S. Environmental Protection Agency. *Moisture Control Guidance for Building Design, Construction and Maintenance.* Washington, DC; 2013.
238. Hänninen OO. *WHO Guidelines for Indoor Air Quality: Dampness and Mold.* Copenhagen; 2011. doi:10.3920/978-90-8686-722-6_10
239. Sundhedsstyrelsen. *Health Literacy: A Prescription to End Confusion.* Washington, D.C.: National Academies Press; 2009. doi:10.17226/10883
240. Nutbeam D. The evolving concept of health literacy. *Soc Sci Med.* 2008;67(12):2072-2078. doi:10.1016/j.socscimed.2008.09.050
241. Peerson A, Saunders M. Health literacy revisited: What do we mean and why does it matter? *Health Promot Int.* 2009;24(3):285-296. doi:10.1093/heapro/dap014

242. Poureslami I, Nimmon L, Rootman I, Fitzgerald MJ. Priorities for Action: Recommendations from an international roundtable on health literacy and chronic disease management. *Health Promot Int.* 2017;32(4):743-754. doi:10.1093/heapro/daw003
243. World Health Organization. Health literacy: The solid facts. 2013.
244. National Institutes of Health. Improving Health Literacy Surgeon General's Workshop on Improving Health Literacy. 2006.
245. Vernon JA, Trujillo A, Rosenbaum S, Debuono B. Low Health Literacy: Implications for National Health Policy.
246. Shah K, Kamrai D, Mekala H, Mann B, Desai K, Patel RS. Focus on Mental Health During the Coronavirus (COVID-19) Pandemic: Applying Learnings from the Past Outbreaks. *Cureus.* 2020;12(3). doi:10.7759/cureus.7405
247. Schaller A, Dejonghe L, Alayli-Goebbels A, Biallas B, Froboese I. Promoting physical activity and health literacy: Study protocol for a longitudinal, mixed methods evaluation of a cross-provider workplace-related intervention in Germany (The AtRisk study). *BMC Public Health.* 2016;16(1):626. doi:10.1186/s12889-016-3284-6
248. Das S, Mia MN, Hanifi SMA, Hoque S, Bhuiya A. Health literacy in a community with low levels of education: findings from Chakaria, a rural area of Bangladesh. *BMC Public Health.* 2017;17(1):203. doi:10.1186/s12889-017-4097-y
249. Cho YI, Lee SYD, Arozullah AM, Crittenden KS. Effects of health literacy on health status and health service utilization amongst the elderly. *Soc Sci Med.* 2008;66(8):1809-1816. doi:10.1016/j.socscimed.2008.01.003
250. Sundhedsstyrelsen. *Health Literacy: A Prescription to End Confusion.* Washington, D.C.: National Academies Press; 2009. doi:10.17226/10883
251. Nutbeam D. The evolving concept of health literacy. *Off Provost.* 2008. doi:10.1016/j.socscimed.2008.09.050
252. Peerson A, Saunders M. Health literacy revisited: what do we mean and why does it matter? *Health Promot Int.* 2009;24(3):285-296. doi:10.1093/heapro/dap014
253. World Health Organization. Health literacy: The solid facts. 2013. http://www.euro.who.int/__data/assets/pdf_file/0008/190655/e96854.pdf.
254. National Institutes of Health. Improving Health Literacy Surgeon General's Workshop on Improving Health Literacy. 2006. https://www.ncbi.nlm.nih.gov/books/NBK44257/pdf/Bookshelf_NBK44257.pdf.
255. Centers for Disease Control and Prevention. *The CDC Worksite Health ScoreCard: An Assessment Tool for Employers to Prevent Heart Disease, Stroke, and Related Health Conditions.* Atlanta; 2014.
256. Schaller A, Dejonghe L, Alayli-Goebbels A, Biallas B, Froboese I. Promoting physical activity and health literacy: study protocol for a longitudinal, mixed methods evaluation of a cross-provider workplace-related intervention in Germany (The AtRisk study). *BMC Public Health.* 2016;16:626. doi:10.1186/s12889-016-3284-6
257. Das S, Mia MN, Hanifi SMA, Hoque S, Bhuiya A. Health literacy in a community with low levels of education: findings from Chakaria, a rural area of Bangladesh. *BMC Public Health.* 2017;17(1):203. doi:10.1186/s12889-017-4097-y
258. Cho YI, Lee S-YD, Arozullah AM, Crittenden KS. Effects of health literacy on health status and health service utilization amongst the elderly. *Soc Sci Med.* 2008;66(8):1809-1816. doi:10.1016/J.SOCSCIMED.2008.01.003
259. McKelvey W, Wong MR, Matis B. Letter Grading and Transparency Promote Restaurant Food Safety in New York City. *J Env Heal.* 2015;78(2):46-48. <https://www.ncbi.nlm.nih.gov/pubmed/26502567>.

260. Wong MR, McKelvey W, Ito K, Schiff C, Jacobson JB, Kass D. Impact of a letter-grade program on restaurant sanitary conditions and diner behavior in New York City. *Am J Public Heal.* 2015;105(3):e81-7. doi:10.2105/AJPH.2014.302404
261. Simon PA, Leslie P, Run G, et al. Impact of restaurant hygiene grade cards on foodborne-disease hospitalizations in Los Angeles County. *J Env Heal.* 2005;67(7):32-36, 56; quiz 59-60. <https://www.ncbi.nlm.nih.gov/pubmed/15794461>.
262. Chu DK, Akl EA, Duda S, et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *Lancet.* 2020;395(10242):1973-1987. doi:10.1016/S0140-6736(20)31142-9
263. Kutter JS, Spronken MI, Fraaij PL, Fouchier RA, Herfst S. Transmission routes of respiratory viruses among humans. *Curr Opin Virol.* 2018;28:142-151. doi:10.1016/j.coviro.2018.01.001
264. Yang W, Elankumaran S, Marr LC. Relationship between Humidity and Influenza A Viability in Droplets and Implications for Influenza's Seasonality. Park M-S, ed. *PLoS One.* 2012;7(10):e46789. doi:10.1371/journal.pone.0046789
265. Microbiomes of the Built Environment: A Research Agenda for Indoor Microbiology, Human Health, and Buildings | The National Academies Press. National Academies of Sciences, engineering, and Medicine. <https://www.nap.edu/catalog/23647/microbiomes-of-the-built-environment-a-research-agenda-for-indoor>. Published 2017. Accessed August 27, 2020.
266. Dai D, Prussin AJ, Marr LC, Vikesland PJ, Edwards MA, Pruden A. Factors Shaping the Human Exposome in the Built Environment: Opportunities for Engineering Control. *Environ Sci Technol.* 2017;51(14):7759-7774. doi:10.1021/acs.est.7b01097
267. van Beek J, de Graaf M, Al-Hello H, et al. Molecular surveillance of norovirus, 2005–16: an epidemiological analysis of data collected from the NoroNet network. *Lancet Infect Dis.* 2018;18(5):545-553. doi:10.1016/S1473-3099(18)30059-8
268. Valdez LD, MacRi PA, Braunstein LA. Intermittent social distancing strategy for epidemic control. *Phys Rev E - Stat Nonlinear, Soft Matter Phys.* 2012;85(3). doi:10.1103/PhysRevE.85.036108
269. Chaudhuri S, Basu S, Kabi P, Unni VR, Saha A. Modeling the role of respiratory droplets in Covid-19 type pandemics. *Phys Fluids.* 2020;32(6):63309. doi:10.1063/5.0015984
270. Verma S, Dhanak M, Frankenfield J. Visualizing the effectiveness of face masks in obstructing respiratory jets. *Phys Fluids.* 2020;32(6):061708. doi:10.1063/5.0016018
271. Ahmed F, Zviedrite N, Uzicanin A. Effectiveness of workplace social distancing measures in reducing influenza transmission: A systematic review. *BMC Public Health.* 2018;18(1). doi:10.1186/s12889-018-5446-1