INTERNATIONAL CODE COUNCIL®

National Environmental Health Association

ICC Pandemic Task Force

Consolidated Best Practices

September 2023

Background:

The Pandemic Task Force (PTF) is tasked with researching the effects of the COVID-19 pandemic on the built environment and developing a roadmap and proposing needed resources – including guidelines, recommended practices, publications and updates to the International Codes® (I-Codes®) – that are necessary to overcome the numerous challenges that may be faced during future pandemics and to construct and manage safe, sustainable and affordable occupancy of the built environment.

To accomplish this goal, the PTF broke the work into three phases:

1. **Phase I:** Research and identify documents pertaining to pandemics and the built environment.
2. **Phase II:** Develop best practices and guides to address the design and layout of new buildings and the adaptation of existing buildings and create a comprehensive package of public information materials.
3. **Phase III:** Conduct a comprehensive review of current code requirements as they relate to the prevention of the transmission of diseases and other serious health concerns. Any suggested revisions to current code requirements based on this assessment will be processed as proposed code changes to the I-Codes.

The PTF formed four working groups with the following areas of focus:

1. **Architectural/Structural**
2. **Fire Service**
3. **Mechanical/Electrical/Plumbing, and**
4. **Remote Operations**

During Phase I, the working groups populated an extensive repository of documents and publications relevant to the COVID-19 pandemic and conducted a systematic literature review of the gathered research material using a standardized review rubric. As the first deliverable, the intent of the research was to produce meaningful content for creating best practice guidelines for operation and management of the built environment during future pandemics.

During this time, research conducted by World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), and American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) had confirmed that airborne transmission of SARS-CoV-2 was significant and should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures. Ventilation and filtration provided by heating, ventilating, and air-conditioning systems reduces the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air. In general, disabling heating, ventilating, and air-conditioning systems is not a recommended measure to reduce the transmission of the virus. Unconditioned spaces can cause thermal stress to people that may be life threatening and may also lower resistance to infection. The WHO and the CDC both agree that indoor airborne transmission is significant, especially in poorly ventilated spaces, so ASHRAE's guidance focuses on reducing airborne exposure consistent with the current position of these public health organizations.

New technologies and/or solutions may be adopted by the Registered Design Professional (RDP) when listed for use by product Evaluation Services organization(s) or the Alternate Materials, Design, Methods of Construction and Equipment processes outlined in the I-Codes and approved by the Authority Having Jurisdiction (AHJ). The provisions of the I-Code are not intended to prevent the installation of any material or prohibit any design or method of construction not specifically prescribed by the codes. This guide is not intended to inhibit innovative ideas or technological advances but authorizes the approval of these solutions that can be demonstrated to offer at least equivalent performance that the code would specify.

As has been experienced over the last couple of years, pandemics can have significant consequences on human health and the economic well-being of not only countries but the world at large. With this understanding the International Code Council's Pandemic Task Force is proposing a Risk Assessment based holistic approach for the implementation of Best Practice Guidelines that is consistent with ASHRAE, WHO and CDC recommendations.

Risk management plays a vital role in goal achievement, providing stability and efficiency to proactively remove anticipated risks and obstacles to help advance the desired outcome. Risk can be anything that threatens or limits the desired outcome while obstacles are things that hinder or prevent progress. While the avoidance of risk altogether can be a deterrence to progress, reducing risk, in a logical and structured way, is important to help reduce the impacts of a pandemic, on a large scale and for individuals or organizations.

The CDC embraces intelligent risk management—obtaining risk data, applying analytics and producing actionable risk information to guide decision-making, (CDC Enterprise Risk Management webpage, https://www.cdc.gov/other/riskmanagement.html, accessed 24 May 2022). Establishing an actionable risk management tool provides a foundation for intelligent risk management and offers guidance to individuals, organizations and operators on how to best apply mitigation strategies to known risks. This type of tool also provides a common language and framework for multidisciplinary teams to evaluate and address the specific risks applicable to the team's environment and capabilities.

While having a foundational framework is important, the true value of a risk assessment tool is the flexibility to apply the fundamental principles within the tool to any number of possible situations. As seen in any emergency, no two situations are exactly alike. Having a tool that provides the foundation of data and the applicability of analytics provides the flexibility to apply this information to a multitude of situations providing an actionable decision-making guide. This flexibility is vital to be able to appropriately reduce risk within a pandemic situation in a way that will most benefit all those impacted.

Facility Emergency Risk Assessment Tool (FERAT)

The FERAT has been developed with the flexibility to apply the fundamental risk assessment principles to a number of possible emergency situations. This flexibility is vital to be able to appropriately reduce risk within an emergency in a way that will most benefit all those impacted.

The FERAT is a 5-step process to determine appropriate mitigation strategies which could be applied to a specific type of emergency in a specific facility type. The FERAT applies a dual matrix process to the type of emergency event correlated to the facility status. These two steps are then used to determine the applicable class of precaution applicable to the facility type. By determining all these correlated items, the FERAT provides a listing of mitigation strategies that can be applied.

A key aspect of the FERAT is the ability to rapidly apply the tool to a dynamic situation. As an example, a facility could use the FERAT to address the spread of an infectious disease, such as the recent COVID-19 pandemic. During this event, the facility could also experience a natural disaster such as a wildfire. Using the FERAT to address both events at the same time would allow the facility to properly monitor outdoor environmental conditions for impact to building systems and take necessary mitigation strategies to address emerging hazards. The ability to continually monitor the environment via the FERAT provides a facility the opportunity to rapidly respond to current events and determine the best strategies to mitigate risk.

For additional information on the FERAT see appendix page 14

Best Practices

The variations noted above are further evaluated within the best practices developed. Unless otherwise noted, the 2024 International Codes are the referenced code section used in this document. The following best practices topics are the culmination of the efforts from all working groups:

1. **Changes to Occupant Load Requirements.**

   The current pandemic has established "Physical Distancing" as a criterion to prevent airborne transmission of disease. Future occupant load requirements for pandemics in codes need to be researched and explored with clearly identified Pandemic Trigger Criteria and limits. During past pandemics, "Physical Distancing" has been implemented to prevent airborne transmitted disease.

   An amended Occupant Load (OL) table for pandemic use should be created for all occupancies considering the impact of air changes, air infiltration, size of ventilation system, natural ventilation, antimicrobial (UV) light, and touchless technology related requirements on occupant loads. These factors become critical for high density and higher risk occupancies. The table should include new, existing, and temporary buildings, as well as temporary changes of occupancy and use of existing buildings.

   There is an absolute need to establish a risk assessment process for each occupancy type considering impacts highlighted by each stakeholder. Recommendations of public health officials and the CDC play a critical role in pandemic related requirements with respect to occupant load and maximum density of people, including but not limited to screening processes, physical protective measures (masking), vaccinations, natural immunity, or other factors.

2. **Use of building and system materials to prevent the spread of disease.**

   There are steps that can be taken through the use of building materials to prevent the spread of airborne and contact transmitted diseases. For example, easily cleanable surfaces can be provided at high touch areas and antibacterial/antiviral materials for coating building surfaces used where possible. Additionally, in areas where the climate allows for natural ventilation, materials can be used that function well in unconditioned, open spaces subject to humidity, temperature extremes (hot or cold climates) and age of building (new vs. existing). Consideration needs to be given to increasing air flow in buildings not equipped to handle increased humidity, moisture, dust, frost or other climatic conditions that existing buildings were designed to keep out.

   Consideration needs to be given to the ability to sanitize and keep areas clean. The risk of transferring a virus, bacteria, or pathogen by physical contact with a contaminated surface depends on several factors. There are numerous sanitation methods available that should account for the category of the pathogen, occupancy/use group of the facility, type of surfaces, temperatures, humidity, time, the health of the facility users and other aspects. Airborne viral particles eventually fall onto surfaces, which, in order to minimize their ability to spread, should be disinfected or neutralized. This issue is relevant to all buildings, but increased care must be taken when a building's use is being altered to health care occupancy.

   Antiviral coatings on surfaces commonly used by the public in buildings prevent the spread of particles and inactivate transmission of a virus. These particles can extend to other surfaces, such as mobile phones, high touch public places, and surfaces of packaged materials and food.

   Common cleansers such as bleach or similar disinfecting chemicals have disadvantages since they can release irritant gases, are difficult to dispose safely, and must be used repeatedly. Certain disinfectants also trigger asthma and other chronic respiratory ailments. The U.S. Environmental Protection Agency (EPA) suggests using EPA-registered disinfectants (referenced by the CDC for routine cleaning and disinfection) to effectively reduce surface contamination. For these disinfectants, follow the label directions for safe and effective use. It is important to note that these disinfectants may not be a viable option for certain surfaces as they can be harmful to many electrical products and components. (EPA, 2021)

   Use of nanoparticles of silver, gold, copper, zinc oxide, titanium dioxide, and carbon-based nanotube and bionanoparticles such as chitosan are immensely effective for antiviral applications due to their increased contact with microbes by virtue of their small sizes (1–10 nm). However, antimicrobial coating technologies are still in their infancy and not readily available.

In all cases, the installation and use of antimicrobial or germicidal products shall comply with any applicable product safety standards and the manufacturer's instructions.

3. Maintain all required exiting in accordance with locally adopted codes and standards or as approved by the AHJ.

4. Ensure operational readiness of all fire protection and life safety systems.

A. Fire Alarm and Detection Systems

B. Automatic Sprinkler Systems

C. Automatic Fire-Extinguishing Systems for kitchen exhaust hoods

D. Fire Extinguishers

E. Other fire protection and life safety systems

5. Allow the use of other occupancies, that are equipped with fire alarm and fire sprinkler systems, to be used as temporary "I" occupancies.

A. During an emergency, declared by federal, state, or local authorities, other structures that are equipped with fire sprinkler and fire alarm systems may be used as a I-2 Occupancy when approved by the fire code official.

6. Allow sufficient quantities of alcohol-based hand rubs, both in storage and in use, to ensure proper hygiene.

A. Under the International Fire Code® (IFC) 5705.5,1.1, during an emergency, declared by federal, state, or local authorities, the maximum capacity of each dispenser shall be 1 gallon (4.5 L) when approved by the fire code official.

B. The IFC currently allows 240 gallons of a I-B liquid and 60 gallons of a I-A liquid per control area in a building with fire sprinklers. It is unlikely that a single facility would need more storage than is currently allowed.

7. Allow the use of tents and temporary membrane structures beyond 180 days when approved by the code official.

A. The usage period may be extended when approved by the fire code official.

8. Use of technology for touchless use.

The use of automatic door hardware, foot pulls on doors, touchless elevator controls, door sensors, occupancy sensors for lighting, and similar technologies are recommended. Where such technologies are implemented, compliance with the Americans with Disabilities Act (ADA) and the Code Council A117.1 accessibility standard must be maintained or for multifamily buildings compliance with the Fair Housing Act. (Other accessibility standards may apply outside the U.S.) Building public entrances and lighting systems also need to comply with the International Energy Conservation Code® (IECC) or other energy codes. This may impact what technologies can be implemented in a particular building.

Where touchless tech is not available, cleaning protocols need to be in place. Accessibility accommodation needs to be considered for every new procedure or technology. The cleaning and disinfection of mechanical and electrical equipment, fixtures, luminaires, and appliances should comply with NEMA GD 4-2020 COVID-19 Cleaning and Disinfecting Guidance for Electrical Equipment.

A. Cleaning refers to the physical removal of dirt and grime, and in the process, some portion of germs on a given surface.

B. Disinfecting refers to eliminating a high percentage of germs on a surface or rendering them incapable of reproducing.

Where Germicidal Irradiation Systems are used, they must comply with Section 1211.1 of the IBC. Where ultraviolet (UV) germicidal irradiation systems are provided they must be listed and labeled in accordance with UL 8802 and installed and maintained in accordance with their listing and the manufacturer's instruction. Germicidal Irradiation Luminaires must comply with Article 410, Part XVII of the NFPA 70, National Electrical Code. Luminaires intended to emit germicidal irradiation must be listed and identified as germicidal equipment. Luminaires must be installed in accordance with the manufacturer's instructions and equipment markings.

Existing codes, standards, and related regulations shall be explored when creating a process for acceptance of new technologies that provides needed safety for the structure and its occupants and visitors.

The risk assessment process criteria must be established and should be used as a guide by the building official, fire marshal, or RDP when tasked to make the decision for a facility.

9. Mechanical and electrical systems providing active or passive thermal comfort should be provided with adjustable operating modes as follows:

A. Naturally Ventilated Buildings (Passive)

1. Normal Operating Mode:
    - Thermal comfort standards based on Climate Zone
    - Building Operational Procedure Manual
2. Pandemic Operating Mode:
    - Environmental Risk Factors (airborne, water borne, insect borne, etc.)
    - Facility Emergency Risk Assessment Tool
        a. Ventilation methods and rates
        b. Ventilation Zones / Isolation Zones
        c. Existing vs New Buildings: Residential, Commercial, Mixed-Use
        d. Temporary Buildings

B. Buildings with Mechanical Systems (Active)

1. Normal Operating Mode:
    - Based on intended design occupancy type, density and current code guidelines for thermal comfort, indoor air quality and energy consumption for the relevant climate zone
2. Pandemic Operating Mode:
    - Re-assessed occupant density based on risk factors and physical distance criteria
    - Thermal comfort defined by the occupancy zone
    - Air ventilation based on risk assessment and capability of HVAC system
    - Residential Buildings https://www.ashrae.org/file%20library/technical%20resources/covid-19/guidance-for-residential-buildings.pdf
    - Isolate Occupancy Zones in Mixed-Use type buildings
        a. Establish air pressure difference between occupancy zones, and create Isolation Zones (e.g., anteroom) to isolate and prevent migration of air across different occupancy zones
        b. Stage occupancy schedule for mixed used tenants when air separation across zones is not possible based on HVAC system type and architecture
        c. Allow adequate time when switching occupancy schedules for full treatment of air volume in each zone based on CDC Table B.1 ACH and time required for airborne contaminant removal by efficiency.
    - Air flow patterns/distribution
    - Property Management Team: Education and Training
    - In-room-air-cleaners https://www.ashrae.org/file%20library/technical%20resources/covid-19/in-room-air-cleaner-guidance-for-

reducing-covid-19-in-air-in-your-space-or-room.pdf

- Mechanical Ventilation based on HVAC system types
  a. Constant Volume
  b. Variable Air Volume
  c. Ducted / Ductless
  d. RTU / ERV
  e. Type of filter (incl maintenance frequency)

3. Wildfire smoke mode
   - Environmental Risk Factors (PM 2.5, ozone, and other air pollutants in ambient air)
   - Building Manager – Education and Training
     a. Ventilation methods (filtration) and rates
     b. Ventilation Zones / Isolation Zones (e.g., anteroom)
     c. Maintain positive pressure indoors
     d. Portable air cleaner
     e. Existing vs New Buildings: Residential, Commercial, Mixed-Use

10. Mechanical Ventilation Systems should comply with Appendix D, Clean Air Delivery of the International Mechanical Code (IMC) for each occupancy zone. https://www.epa.gov/coronavirus/indoor-air-and-coronavirus-covid-19

A. Mechanical systems should be sized to accommodate a design airflow at a total static pressure drop which assumes the utilization of a supply air filter with a Minimum Efficiency Reporting Value of no less than 13.

B. In Group A, B, E, and I occupancies consideration should be given to the installation of an air quality sensor (e.g., carbon dioxide sensor). Each sensor installed in accordance with specifications as certified by the equipment manufacturer.

C. Pandemic air change rate recommendation (5 ACH Minimum).

D. Outside Air recommendation – Increase to as high as possible within system design based on environmental conditions.

Potential Best Practice – the ventilation rate, supported by air filtration and air disinfection, to ensure a healthy Indoor Air Quality (IAQ) has the potential of enhancing abatement of airborne viruses or diminishing adverse health effects, depending on the building, the intended use of the building, the number of occupants and the density of occupants. An adequate ventilation system requires a risk assessment (discussed in the next section) based on building construction, potential occupants (residential, industrial, office space, medical, etc.), potential ventilation rate for the intended use (high v. low ventilation rates), and design of the HVAC unit (air filtration, water retention).

11. Develop a risk assessment tool for ventilation systems

Potential Best Practice – a health-based response to any policy regarding a building design, construction, retrofit, modification, or maintenance requires a risk assessment – an assessment of the health risks to the occupants based on the building design, intended use, location, and occupants (vulnerable populations).

A risk assessment takes into account the building type, its use, the ventilation system, and the occupants to provide managers, maintenance, and designers insight into the potential risks from diseases that may occur. This includes respiratory diseases, diseases caused by excessive building humidity, or diseases caused by the building products used in its construction.

Risk assessments determine the healthiest air flow and air circulation rate. It can provide guidance on air filtration and it can assist with the humidity levels. Risk assessments can also identify health and safety risk factors for customers and employees (such as if retail kitchens do not allow for six feet of distancing, they can do higher air exchanges; or the addition of ceiling fans and outdoor air exchanges to increase air flow).

12. Mechanical control systems should:

A. Receive data from the carbon dioxide sensor in the occupied zone(s) at least once every five minutes.

B. Be calibrated to provide pre-established outdoor airflow rates or be equipped with the necessary instrumentation to measure the outdoor airflow.

C. Be capable of adjusting the outdoor airflow rate in response to an adjustable outdoor airflow setpoint.

D. Increase the amount of outdoor air provided to each occupiable zone until the carbon dioxide level in each occupiable zone falls below a maximum threshold as defined by the user.

13. HVAC system controls should:

A. Maintain temperature and humidity design setpoints.

B. Maintain equivalent clean air supply required for design occupancy whenever anyone is present in the space served by a system. When necessary to flush spaces between occupied periods, operate systems for a time required to achieve five air changes of equivalent clean air supply.

C. Limit reentry of contaminated air that may reenter the building from energy recovery devices, outdoor air intakes and other sources to acceptable levels.

D. HVAC systems should be commissioned to verify they are functioning as designed. For the recommended infection control measures to be effective, it is important that the HVAC system provide the intended flow of outdoor air, have properly installed filters and have controls that operate as intended.

Scientists investigating indoor environmental problems believe that there are multiple factors contributing to adverse indoor air quality. Poor air exchanges and air flow are among the foremost concerns. Other factors include imprecisely defined characteristics of HVAC systems, cumulative effects of exposure to low concentrations of multiple chemical pollutants, odors, elevated concentrations of particulate matter, microbiological contamination, and physical factors such as thermal comfort, lighting, and noise (Morey 1989, Molhave 1986, Burge 1989).

Design, maintenance, and operation of HVAC systems are critical to their proper functioning and provision of healthy and thermally comfortable indoor environments. Indoor environmental pollutants can arise from either indoor or outdoor sources (Levin 1989).

National Institute of Occupational Safety and Health (NIOSH) , the Occupational Safety and Health Administration (OSHA), and the American Conference of Governmental Industrial Hygienists (ACGIH®) have published regulatory standards or recommended limits for occupational exposures (NIOSH 1992, ACGIH 2001, ASHRAE 1999). With few exceptions, pollutant concentrations observed in indoor work environments fall well below these published occupational standards or recommended exposure limits. ASHRAE has published recommended building ventilation and thermal comfort guidelines (ASHRAE 1999, ASHRAE 1992).

Several potential viruses, diseases, respiratory infections and adverse health effects can be spread and/or triggered by poor indoor air quality in buildings. The spread of COVID-19, along with SARS and MERS, are most prominent, with influenza and other respiratory diseases in a shared room air system able to create a spreading event.

Air as a contagion medium is nebulous, widespread, and uncontained, making health-effective ventilation systems complicated. Buildings are designed for thermal comfort, odor control, initial investment cost and energy use. However, respiratory infections can be caused by pathogens emitted through the nose or mouth of an infected person and transported through ventilation systems to a susceptible host. The neglect of infection control in ventilation systems has led to the spread of respiratory diseases, despite evidence that healthy indoor environments can reduce pathogen counts and reduce the risk of spread (UC Berkeley, 2021; J. E. Janssen, The history of ventilation and temperature control: The first century of air conditioning. (ASHRAE Journal 41, 48 (1999)).

Investments in building construction recognizing the health impact ventilation systems have could greatly reduce the spread of respiratory diseases and other adverse health effects (CDC, 2019; REHVA et al., "Indoor climate and productivity in offices," REHVA Guidebook (2006). For existing buildings, for which risk-assessments are required to identify effective indoor air quality systems, there are numerous cost-effective solutions to enhance their ability to minimize the risk of infection transmission (UC Berkeley, 2021).

An effective ventilation system, with a properly designed and installed HVAC system that addresses air filtration and humidity (dew point), reduces the risk of dissemination of infectious aerosols in buildings (ASHRAE, 2021).

14. Carbon dioxide sensors should operate as follows:

A. The default detection threshold level for carbon dioxide measurement above which triggers an alert should be set to 1,100 parts per million (ppm). The end user can modify the detection threshold level based on specific operations and needs.

B. When carbon dioxide levels exceed the detection threshold level established above, the mechanical equipment should modify the outdoor airflow as noted above.

C. When the carbon dioxide concentration remains above the detection threshold level for a period of 30 minutes or more, the occupants in the zone should be alerted by approved audible and visual notification devices or through a building monitoring system.

15. Building Management System

Buildings with more than 100,000 square feet (9290 m²) of conditioned space should be equipped with a building management system and smart sensing technology, with the ability to proactively respond to assessed risks and operate building systems in at least four distinct operating modes as defined below. Modes should be password protected and issue a daily message to the facilities manager (or other high-level manager) that the system is in override.

A. Normal Operation:

   1. Temperature, humidity, and ventilation are satisfied in accordance with prevailing building code requirements.

B. Indoor Pollutant Mitigation:

   1. Threshold for the concentration of pollutants in the occupiable space are adjusted and the mechanical system responds by executing one or more of the following:
      - Increasing outdoor airflow rate
      - Overriding supply air filter bypass
      - Adjusting indoor temperature set points

C. Grid Demand Response:

   1. Building electrical systems are controlled to reduce power usage by executing one or more of the following:
      - Reducing lighting power
      - Adjusting indoor temperature set points
      - Shifting operational electrical loads
      - Discharging energy storage systems
      - Suspending charging of energy storage and electric vehicles

D. Other Building System / Responsive Mode:

   1. Building operating mode should be capable of optimizing the building performance to mitigate other internal and external conditions as established by the building design team.

16. HVAC Systems should be designed or modified to provide the following ventilation, filtration, and air cleaning. [a, b]

Suggested Minimum Standard	Reference
20 CFM/person (10 L/s/person) outside air ventilation rate for general non-clinical applications	Roadmap to good indoor ventilation (WHO)
MERV13 filter efficiency for general non-clinical applications	Guidance - ASHRAE Core Recommendations for Reducing Airborne Infectious Aerosol Exposure
800 ppm maximum CO2 concentration for general non-clinical applications	Guidance - Ventilation in Buildings-CDC
Introduce minimum clean air change rates	Guidance - Ventilation in Buildings-CDC

Footnotes: a. Verify applicable minimum requirements defined in codes and/or standards.

b. ASHRAE 241- 2023, Control of Infectious Aerosols, was released during the final stages of this guideline development. This standard was not reviewed by the Pandemic Task Force in time for the publication of this guideline. Where control of infectious aerosols is needed in the built environment, this standard can be a guiding principle in the consideration of circumstance within the scope of the document.

17. **Air distribution systems should be designed to reduce risk of transmission.**

Where directional airflow is not specifically required, or not recommended as the result of a risk assessment, promote mixing of space air without causing strong air currents that increase direct transmission from person to person.

18. **Plumbing water distribution system should be designed to facilitate flushing of all fixtures and piping following extended periods of reduced, or no water usage.**

- A comprehensive water management program (WMP) is recommended.
- Water heaters should be properly maintained and temperature set correctly.
- Water distribution systems should be flushed following approved methods.
- All decorative water features and piping should be flushed and cleaned.
- Pools and hot tubs/spas should be chemically treated for safe use.
- Safety equipment such as fire sprinkler systems, eyewash stations and emergency showers should be flushed and cleaned.

19. **During and/or following periods of reduced (or no) usage, the following steps should be taken prior to reoccupying buildings:**

- Maintain indoor humidity as low as possible, not exceeding 60 percent, as measured with a humidity meter. Building managers may consider continuous monitoring of indoor humidity using a digital hygrometer, ideally more than once daily, to minimize the need to access the building.
- Building should be assessed for mold and excess moisture after a prolonged shutdown and before occupants return.

a. After an assessment has confirmed that mold and moisture are not detected, or after remediation has been completed, a building HVAC system that has not been active during a prolonged shutdown should be operated for at least 48 to 72 hours before occupants return.

- After a building is reopened and occupied, routine checks of the HVAC system are recommended to ensure operating efficiency.
- If no routine HVAC operation and maintenance program is in place for the building, one should be developed and implemented.
- Flushing of the water system via a water management program - many waterborne pathogens could proliferate during the shutdown and flushing will be necessary prior to re-opening.

20. Use of IEBC during pandemic for buildings undergoing change of use.

The International Existing Building Code® (IEBC) may be useful during a pandemic. This code contains provisions for the conversion and change in use of existing spaces, with guidance specifically in Chapters 3 (Provisions for All Compliance Methods), 10 (Change of Occupancy) and 13 (Performance Compliance Methods). A framework is suggested that builds from IEBC minimum requirements for each occupancy and then considers hazards, risks and mitigating factors such as supplemental safety equipment, technologies, and operational requirements to reduce those risks and hazards to allow for interim use. Such guidance may be developed for the IEBC to assist building officials and design professionals in determining which types of existing buildings make the best candidates for temporary emergency use, and how to interpret and modify existing safety parameters for temporary use in these buildings.

This consideration may be the most important and can have the biggest impact as there are a huge volume of existing buildings being impacted today. New construction lags in making an impact when new issues are raised that must be addressed immediately. Planning for future pandemics is valuable in the IBC but should be done in concert with existing buildings. When considering existing buildings, the impact of any alterations as well as the change of occupancy should be considered. When discussing temporary use, 'temporary' no longer means 180 days; the COVID-19 pandemic lasted for years.

Minimum requirements need to be established for the safe temporary use of existing buildings during pandemics and emergencies. Some of the considerations include:

A. Safe Egress

B. Adequate Ventilation

C. Sanitation (adequate facilities)

D. Adequate Space

E. Structural soundness for the length of the change in use

F. Weather resistant

G. Scalable (recommendations for temporary facilities need to have an adjustment to take into consideration small modest temporary uses as well as large repurposing to allow the use to be scaled up or down, perhaps using a points system. For example, opening windows may be acceptable for a small temporary use, but modifying HVAC systems might be required for a large temporary repurposing.)

H. Similarity of temporary use to original design use

It is important to make sure the recommendation does not limit opportunities and create unintended consequences. When considering temporary use of an existing facility, consider everything including space, energy, and ventilation requirements. When considering medical facilities, recommendations by health officials should be included (e.g., HVAC, filters). For intensive care, there will be more stringent requirements. Provide recommendations for both existing and new buildings. Staffing is also an issue, the decision may not come down to if the building can be used, but rather if the building can be staffed. Tools need to be provided to allow regulators to grant relaxation to get the temporary use up and running. Consider changing retail to housing and changing retail to restaurant; adapt and reuse of the buildings.

Given the fact that communities adopt older or modified versions or don't adopt the latest code(s), it is suggested to use the titles or specific topics that are being suggested in lieu of chapter numbers. This element may be the most important and can have the biggest impact as there is a huge volume of existing buildings being impacted today. New construction lags in making an impact when new issues are raised that must be addressed instantaneously. It is suggested that in the discussion on the IEBC that we do not focus only on change of occupancy, but alterations should be considered for its impact. When discussing temporary use, we need to understand that temporary no longer means 180 days. The COVID-19 pandemic lasted for years. Measurable balance when changes are made to existing buildings should be taken into consideration. The most recent emergency issues of building maintenance for critical life safety failures haven't expanded to include the dramatic environmental catastrophes.

21. Continued use of emergency facilities to ensure that their use is safe for the public.

The 2024 International Building Code includes a Temporary Emergency Uses Appendix that provides guidance when emergencies exceed those the community has planned for. Response must be immediate, so there is not time for the typical plan review and inspection. Existing buildings may be used for occupancies other than they were intended, and temporary structures may need to be erected or brought in to address immediate needs. Recent examples were the housing needs due to mass evacuations during the west coast fires and how hard COVID-19 hit many community health care systems. This new appendix provides technical guidance on the use of temporary buildings and reuse of existing buildings in unanticipated emergency for the code user and the officials to maintain a minimum standard of public health and safety.

There are updated code provisions for minimum structural loads for temporary structures. In past code cycles, inappropriate references were attempted to be introduced to the International Building Code but failed due to lack of consensus within the industry. Following that failed attempt, committee members from the adopted structural loading standard ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures committed to work with building officials and industry stakeholders to develop provisions that align with the design basis for Chapter 16 and ASCE/SEI 7, as well as provide the appropriate level of risk and structural reliability to the public. In certain cases, temporary use factors are applied to the loads required by Chapter 16 and ASCE/SEI 7 for the case where buildings are used on a temporary basis.

22. Communities should determine suitability of existing structures for adaptation to temporary emergency uses.

Communities should create criteria to establish suitability of buildings before beginning the process of identifying local facilities that could be converted to emergency uses and that meet the base criteria. Occupancies especially relevant for discussion include R, I, E, M (reuse of big box stores), and A. Structural Risk Categories must be considered when reusing a facility for a use it was not designed for. Live load limits must also be evaluated carefully. Such temporary uses could include:

- Emergency Housing
- Medical/Medical storage
- Acute care
- Isolation units/quarantine areas
- Emergency operations and triage
- Vaccination centers
- Morgues

23. Enforcement of provisions triggered by a pandemic.

- Lastly, questions arise when discussing building safety during a pandemic such as:
- Who ensures safe building use? Building officials or property owners? Or both?
- How will this be achieved?
- What is needed for consistent code enforcement? (Or does it matter if temporary)?

- How should enforcement be addressed at national, state, and local levels?
- What is the role of the local health department?
- Code enforcement will be more consistent and effective if we educate stakeholders. Achieving compliance through a voluntary process rather than punitive process should be the goal at all levels.
- Every location has its unique issues in conjunction with city council and county commissioners. Some of the issues may necessitate new enforcement procedures.
- It is recommended that the measures are implemented correctly, or they could have an inverse impact on the well-being of the built environment and its occupants and visitors.

24. Energy Codes/Climate Change

Lastly, consider the use of sustainable/green materials and practices to mitigate adverse effects of climate change during the spread of viruses and transmissible diseases such as the rising carbon footprint, temperature and air quality. Consider opportunities to cleanse the air rather than increase ventilation.

25. Next phase - Incentivize good solutions.

The risk assessment criteria process, technology advancements, product innovations, subsequent certifications and listing for allowable uses, can help the RDP for designing the solution that brings benefit for a community safe solution.

Such criterion can help building, life safety and health officials to follow a consistent approach towards a safe, transparent, and consistent strategy to implement within a local community.
It can also:

- Recommend code changes that encourage the use of the building materials that prevent the spread of disease and touchless technologies to build in resistance to disease transmission for buildings needing retrofit.
- Encourage the creation of spaces that can be easily converted to pre-determined emergency uses if such an emergency arises.
- To stop airborne disease and improve health, we need a renewed focus on indoor air quality. Just as we disinfect and clean the water, we drink to reduce the risk of waterborne diseases such as Cholera, we need to disinfect and clean the air we breathe to reduce the spread of airborne pathogens including SARS-CoV-2, plus dust, molds, particulates and pollutant gasses.
- We need to find solutions that are energy efficient but that prioritize human life and health. COVID-19 evidence shows that touchpoints appear to be less important, but for other diseases, such as Influenza, reducing touchpoints is important, especially for public use and health care buildings.

In Summary

The ICC/NEHA Pandemic Taskforce Report provides a series of best practices designed to mitigate the health threats and risks from contagions for property owners, building managers and the code enforcement community. Occupants that live, work or visit buildings that embrace these practices will have less likelihood of contracting any airborne or waterborne diseases. These practices provide guidance for those who oversee the design, construction, maintenance and continued operation of buildings used by the general public.

Adoption and implementation of these practices will lessen the impact and the spread of future pandemics for occupants in buildings that embrace these practices.

Appendix - Facility Emergency Risk Assessment Tool

Step One

Using Table 1, identify the Emergency Impact/Status Activity Type (A-D).

Table 1 - Threat/Exposure.

Type A	**Disaster:** Includes but is not limited to: Natural Disasters: • Geological • Hydrological • Climatological • Environmental Human Caused Disaster: • Terrorism • Civil Disturbance • Utility Disruption • War • Technological Event
Type B	**Infectious Disease Spread Methodology:** Includes but is not limited to: Direct or Indirect Contact: • Physical • Airborne • Waterborne • Foodborne • Insect bites
Type C	**Displaced Population:** A type of threat/exposure that induces a population increase or decrease that results in a change in facility use as addressed in Table 2.
Type D	**Supply Chain Impact:** Is an interruption in the flow of process that involves any of the entities associated with the production, sales, and distribution of specific goods or services

Step Two

Using Table 2, identify the occupancy status of the facility.

Table 2 – Facility Use:

Status: Normal	**Status: Reduced**	**Status: Shut Down**	**Status: Surge/ Change of Use**
Facility is functioning at normal use capacity (at or less than maximum occupant load/ capacity)	Facility is functioning at reduced use below the normal occupancy capacity due to a threat or exposure	Facility is closed for use with minimal staff to manage facility remaining	Facility is in a surge capacity with greater than normal use or is in an alternate occupancy status
Examples such as: • Facilities at normal capacity as determined by building codes	Examples such as: • Restaurant with reduced seating capacity • Public school with reduced student capacity • Sports center with reduced attendance capacity	Examples such as: • Public School closed due to inclement weather • Business closed due to cyber attack • Nursing home evacuated due to hurricane	Examples such as: • Community shelter with demand greater than design capacity • Hospital at surge capacity • Convention center converted to care facility

Step Three

Match the Facility Use (Normal, Reduced, Shut Down, or Surge/Change of Use) from Step Two with the Emergency Impact/Status (A, B, C, D) from Step One using Table 3 to find the Class of Precautions (I, II, III, etc.). The activities are listed in Table 5A, 5B, or 5C – Minimum Recommended Mitigation Activities.

Table 3 – Class of Precautions:

The intersection of the facility uses and emergency impact/status in the table below;

	Emergency Impact/Status			
Facility Use	**TYPE A**	**TYPE B**	**TYPE C**	**TYPE D**
Normal	I	I	I	I
Reduced	II	III	IV	IV
Shut Down	V	VI	VII	VII
Surge/Change of Use	VIII	IX	X	X

Class of Precaution Definitions:

Class I: The facility is in normal operations during any threat or exposure.

Class II: The use of a facility is below the normal occupant loads during a Type A disaster threat or exposure.

Class III: The use of a facility is below the normal occupant loads during a Type B infectious disease threat or exposure.

Class IV: The use of a facility is below the normal occupant loads during either a Type C displaced population, or a Type D supply chain impact threat or exposure.

Class V: The facility is shut down during a Type A disaster threat or exposure.

Class VI: The facility is shut down during a Type B infectious disease threat or exposure.

Class VII: The facility is shut down during either a Type C displaced population or a Type D supply chain impact threat or exposure.

Class VIII: The facility is experiencing a surge of occupants or a change of use as the result of a Type A disaster threat or exposure.

Class IX: The facility is experiencing a surge of occupants or a change of use as the result of a Type B infectious disease threat or exposure.

Class X: The facility is experiencing a surge of occupants or a change of use as the result of either a Type C displaced population or a Type D supply chain impact threat or exposure.

Step Four

Using Table 4, identify the facility type

Table 4 – Facility Type:

Class of Precaution	Education/ Assembly[1]	Multi- Family Residential[2]	Factory/ Industrial[3]	Business/ Mercantile[4]	Institution[5]
I	Table 5A			Table 5A	Table 5A
II	Table 5A			Table 5A	Table 5C
III	Table 5A			Table 5A	Table 5C
IV	Table 5A			Table 5B	Table 5C
V	Table 5A			Table 5A	Table 5C
VI	Table 5A			Table 5A	N/A
VII	Table 5A			Table 5A	N/A
VIII	Table 5A			Table 5A	Table 5A
IX	Table 5A			Table 5A	Table 5A
X	Table 5A			Table 5A	Table 5C

Footnotes:

[1] The use of a facility for the education purposes through the 12th grade or for gathering of persons for purposes such as civic, social, or religious functions; recreation, food or drink consumption or awaiting transportation.

[2] The use of a facility for sleeping purposes when not categorized as an Institutional type.

[3] The use of a facility for assembling, disassembling, fabricating, manufacturing, processing or storage.

[4] The use of a facility for office, professional or service-type transactions including storage of records and accounts or for the display and sale of merchandise where the public has access.

[5] The use of a facility in which care or supervision is provided to persons who are or are incapable of self-preservation without physical assistance or in which persons are detained for penal or correctional purposes or in which the liberty of the occupants is restricted.

Table 5A – Minimum Recommended Mitigation Activities – General Recommendations [a, b]

Class of Precautions	Mitigation Activities
Class I	Maintain normal operations based on policy and procedures, applicable codes and standards and organizational goals
Class II	1. Consider all jurisdictional (local / state / federal) EMERGENCY response mandates to continue providing "reduced operations" facility (normal operations may be reduced by up to 90%) or as a "closed" facility (greater than 90% reduction; cessation of operations may be necessary to meet all mandates). 2. Evaluate structural integrity for occupancy and take necessary steps to avoid hazards. 3. Implement emergency management plans. 4. Implement security measures within facility. 5. Evaluate building systems and transition to safe modified operations. 6. Monitor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 7. Implement communication plan within facility for intended occupants and with appropriate jurisdictional response.
Class III	1. Consider all jurisdictional PANDEMIC response mandates and recommendations to function as a "reduced operations" facility (normal operations may be reduced by up to 90%). 2. Implement emergency management plans, as appropriate. 3. Implement appropriate security measures within facility. 4. Evaluate building systems and transition to safe modified operations (see section 9 of best practices document): a. Adjust outdoor ventilation rates. b. Evaluate air filtration practice and adapt based on Section 10 Best Practice Document **Mechanical Ventilation Systems should comply with Appendix D, Clean Air Delivery of the International Mechanical Code (IMC) for each occupancy zone.** c. Monitor CO2 concentration d. Monitor overall air quality for pathogens, if known e. Monitor water quality for pathogens. f. Monitor wastewater for detection of hazards. 7. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 8. Inform facility occupants of guidelines, as needed.
Class IV	1. Consider all jurisdictional response mandates and recommendations to function as a "reduced operations" facility (normal operations may be reduced by up to 90%). 2. Implement emergency management plans, as appropriate. 3. Implement appropriate security measures within facility. 4. Evaluate building systems and transition to safe modified operations (see section 9 of best practices document): a. Adjust building automation schedules, as appropriate. b. Adjust outdoor ventilation rates. c. Monitor CO2 concentration 5. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address emerging hazards).

Class V	1. Consider all jurisdictional (local / state / federal) EMERGENCY response mandates and recommendations. 2. Evaluate structural integrity for occupancy and take necessary steps to avoid hazards. 3. Implement security measures within facility. 4. Evaluate building systems and transition to safe modified operations. 5. Monitor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 6. Implement communication plan within facility for intended staff with appropriate jurisdictional response.
Class VI	1. Consider all jurisdictional PANDEMIC response mandates and recommendations. 2. Implement appropriate security measures within facility. 3. Evaluate building systems and transition to safe modified operations for critical staff (see section 9 of best practices document): d. Adjust outdoor ventilation rates. e. Monitor CO2 concentration f. Monitor overall air quality for pathogens, if known. g. Monitor water quality for pathogens. h. Monitor wastewater for detection of hazards. 4. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 5. Implement communication plan within facility for intended staff with appropriate jurisdictional response.
Class VII	1. Consider all jurisdictional response mandates and recommendations. 2. Implement appropriate security measures within facility. 3. Evaluate building systems and transition to safe modified operations (see section 9 of best practices document): a. Adjust building automation schedules, as appropriate. b. Adjust outdoor ventilation rates. c. Monitor CO2 concentration 4. Monitor outdoor environmental conditions for impact to facility and take necessary steps to address emerging hazards. 5. Implement facility specific communication plan for intended staff.

Class VIII	1. Consider all jurisdictional (local / state / federal) EMERGENCY response mandates to increase or change facility operations (modifying use and/or occupant loads). 2. Implement emergency management plans. 3. Implement security measures within facility. 4. Evaluate structural integrity for surge occupancy or change of use and take necessary steps to avoid hazards. 5. Evaluate structure for surge occupancy or change of use with respect to live loading for materials, supplies, equipment, and occupants, 6. Evaluate the facility for safety for the proposed surge occupancy or change of use. a. Sprinklers b. Fire Alarms c. Egress d. Accessibility 7. Evaluate and insure adequate capacity of systems and transition to safe modified operations: a. Adjust outdoor ventilation rates. b. Monitoring CO and CO2 concentration c. Provide adequate air quality/quantity. d. Provide adequate water quality/quantity. e. Provide adequate sanitation quality/quantity. f. Provide adequate power and lighting. 8. Develop and implement maintenance plan based on proposed use. 9. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 10. Implement communication plan within facility for intended occupants and with appropriate jurisdictional response. 11. For new temporary facilities see section 22 of best practice guideline.
Class IX	1. Consider all jurisdictional (local / state / federal) PANDEMIC response mandates to increase or change facility operations (modifying use and/or occupant loads). 2. Implement emergency management plans. 3. Implement security measures within facility. 4. Evaluate structure for surge occupancy or change of use with respect to live loading for materials, supplies, equipment, and occupants. 5. Evaluate the facility for safety for the proposed surge occupancy or change of use. a. Sprinklers b. Fire Alarms c. Egress d. Accessibility 6. Evaluate and insure adequate capacity of systems and transition to safe modified operations: a. Adjust outdoor ventilation rates. b. Evaluate air filtration practice and adapt based on Section 10 Best Practice Document. **Mechanical Ventilation Systems should consider compliance with Appendix D, Clean Air Delivery of the International Mechanical Code (IMC) for each occupancy zone.** c. Monitoring CO and CO2 concentration. d. Provide adequate air quality/quantity. e. Provide adequate water quality/quantity. f. Provide adequate sanitation quality/quantity. g. Provide adequate power and lighting. h. Monitor overall air quality for pathogens, if known i. Monitor water quality for pathogens. j. Monitor wastewater for detection of hazards. 7. Develop and implement maintenance plan based on proposed use. 8. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address potential additional hazards. 9. Implement communication plan within facility for intended occupants and with appropriate jurisdictional response. 10. For new temporary facilities see section 22 of best practice guideline.

Class X	1. Consider all jurisdictional (local / state / federal) INCIDENT response mandates to increase or change facility operations (modifying use and/or occupant loads). 2. Implement emergency management plans. 3. Implement security measures within facility. 4. Evaluate structure for surge occupancy or change of use with respect to live loading for materials, supplies, equipment, and occupants, 5. Evaluate the facility for safety for the proposed surge occupancy or change of use: a. Sprinklers b. Fire Alarms c. Egress d. Accessibility 6. Evaluate and insure adequate capacity of systems and transition to safe modified operations: a. Adjust outdoor ventilation rates. b. Monitoring CO and CO2 concentration. c. Provide adequate air quality/quantity. d. Provide adequate water quality/quantity. e. Provide adequate sanitation quality/quantity. f. Provide adequate power and lighting. 7. Develop and implement maintenance plan based on proposed use. 8. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address potential additional hazards. 9. Implement communication plan within facility for intended occupants and with appropriate jurisdictional response. 10. For new temporary facilities see section 22 of best practice guideline.

Table Footnotes:

a. For addition information to emergency response to natural disaster, see FEMA P-2055.

b. Communication plan may need to vary depending on Facility Type and Class of Precaution.

Table 5B – Minimum Recommended Mitigation Activities – Special Recommendations

Class of Precautions	Mitigation Activities
Class IV	1. Consider all jurisdictional response mandates and recommendations to function as a “reduced operations” facility (normal operations may be reduced by up to 90%). 2. Implement emergency management plans, as appropriate. 3. Implement appropriate security measures within facility. 4. Evaluate changes in commodity types and quantities and assure fire suppression system with local AHJ. 5. Evaluate egress to assure proper exiting, and consult with AHJ, where modifications are necessary. 6. Evaluate building systems and transition to safe modified operations (see section 9 of best practices document): a. Adjust building automation schedules, as appropriate. b. Adjust outdoor ventilation rates. c. Monitor CO2 concentration 7. Monitor outdoor environmental conditions for impact and take necessary steps to address emerging hazards.

Table 5C – Minimum Recommended Mitigation Activities – Institutional Facility [a, b]

Class of Precautions	Mitigation Activities
Class II	1. Coordinate with first responders to define defend in place strategies. 2. Consider all jurisdictional (local / state / federal) EMERGENCY response mandates to continue providing "reduced operations" facility (normal operations may be reduced by up to 90%) or as a "closed" facility (greater than 90% reduction; cessation of operations may be necessary to meet all mandates). 3. Evaluate structural integrity for occupancy and take necessary steps to avoid hazards. 4. Implement emergency management plans. 5. Implement defend in place strategies. 6. Implement security measures within facility. 7. Evaluate building systems and transition to safe modified operations. 8. Monitor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 9. Implement communication plan within facility for intended occupants and with appropriate jurisdictional response. 10. Full evacuation should only be considered as a last resort.
Class III	1. Coordinate with first responders to define defend in place strategies. 2. Consider all jurisdictional PANDEMIC response mandates and recommendations to function as a "reduced operations" facility (normal operations may be reduced by up to 90%). 3. Implement emergency management plans, as appropriate. 4. Implement service level prioritization strategies. 5. Implement defend in place strategies. 6. Implement appropriate security measures within facility. 7. Evaluate building systems and transition to safe modified operations (see section 9 of best practices document): a. Adjust outdoor ventilation rates. b. Evaluate air filtration practice and adapt based on Section 10 Best Practice Document. The **Mechanical Ventilation Systems should:** **i. Comply with ASHRAE/ASHE Standard 170, for health care facilities.** **ii. Consider compliance with Appendix D, Clean Air Delivery of the International Mechanical Code (IMC) for each occupancy zone, for all others.** c. Monitor CO2 concentration d. Monitor overall air quality for pathogens, if known, except for health care facilities. e. Monitor water quality for pathogens. f. Monitor wastewater for detection of hazards. 8. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 9. Inform facility occupants of guidelines, as needed. 10. Full evacuation should only be considered as a last resort.
Class IV	1. Coordinate with first responders to define defend in place strategies. 2. Consider all jurisdictional response mandates and recommendations to function as a "reduced operations" facility (normal operations may be reduced by up to 90%). 3. Implement emergency management plans, as appropriate. 4. Implement defend in place strategies. 5. Implement appropriate security measures within facility. 6. Evaluate building systems and transition to safe modified operations (see section 9 of best practices document): a. Adjust building automation schedules, as appropriate. b. Adjust outdoor ventilation rates. c. Monitor CO2 concentration 7. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address emerging hazard. 8. Full evacuation should only be considered as a last resort.

Class V	1. Coordinate with first responders to define defend in place strategies. 2. Consider all jurisdictional (local / state / federal) EMERGENCY response mandates and recommendations. 3. Evaluate structural integrity for occupancy and take necessary steps to avoid hazards. 4. Implement security measures within facility. 5. Implement evacuation plans. 6. Evaluate building systems and transition to safe modified operations. 7. Monitor environmental conditions for impact to building systems and take necessary steps to address emerging hazards. 8. Implement communication plan within facility for intended staff with appropriate jurisdictional response.
Class X	1. Consider all jurisdictional (local / state / federal) PANDEMIC response mandates to increase or change facility operations (modifying use and/or occupant loads). 2. Implement emergency management plans. 3. Implement security measures within facility. 4. Evaluate structure for surge occupancy or change of use with respect to live loading for materials, supplies, equipment, and occupants, 5. Evaluate the facility for safety for the proposed surge occupancy or change of use. a. Sprinklers b. Fire Alarms c. Egress d. Accessibility 6. Evaluate and insure adequate capacity of systems and transition to safe modified operations: a. Adjust outdoor ventilation rates. b. Evaluate air filtration practice and adapt based on Section 10 Best Practice Document. **Mechanical Ventilation Systems should comply:** **i. ASHRAE/ASHE Standard 170, Ventilation for Health Care Facilities, for patient care areas.** **ii. Appendix D Clean Air Delivery.** c. Monitoring CO and CO2 concentration d. Provide adequate air quality/quantity. e. Provide adequate water quality/quantity. f. Provide adequate sanitation quality/quantity. g. Provide adequate power and lighting. h. Monitor overall air quality for pathogens, if known i. Monitor water quality for pathogens. j. Monitor wastewater for detection of hazards. 7. Develop and implement maintenance plan base on proposed use. 8. Monitor outdoor environmental conditions for impact to building systems and take necessary steps to address potential additional hazards. 9. Implement communication plan within facility for intended occupants and with appropriate jurisdictional response. 10. For new temporary facilities see section 22 of best practice guideline.

Table Footnotes:

a. For addition information to emergency response to natural disaster, see FEMA P-2055.

b. Communication plan may need to vary depending on Facility Type and Class of Precaution.

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