

## **ASHRAE Statement:**

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## **ASHRAE Recommendations for Building Owners for How to “Mothball” Their Buildings for an Undetermined Amount of Time and How to Operate the HVAC Systems During the Shutdown**

### **A: General Recommendations**

1. Notify relevant people of the need to shut down or partially occupy the building. Include exact dates and times the building will be shut down.
2. Backups and Data Protection – Backup all necessary computer data, e.g. building control systems and servers to local and/or cloud-based backup services and media.

If there are tenants that need to use the building during lockdown, they should refer to the Commercial Building Guide as the building may not be able to be shut down.

3. Check important remote or offsite access connections to the Building Management System and Building Automation System (BMS includes more than the HVAC controls in the BAS) to make sure they are functioning properly and can be logged into, if any. For example, remote observation via the security and access platforms, such as security cameras, locks, alarms and more can help monitor the building for emergencies remotely.
4. Operators should ensure that they have electronic copies of their building plans, past test and balance reports, operation and maintenance (O&M) manuals, systems manual and other pertinent information to operating the building.
5. If someone does visit the building to check, they could also be tasked with watering any of the plants.

### **B. Heating, Ventilating and Air-Conditioning**

1. In buildings equipped with a Building Automation Systems (BAS):
  - a. It is not recommended to completely shut off HVAC systems in a building that is being temporarily shut down or unoccupied for an undetermined amount of time during an emergency.
  - b. Operate or place the HVAC systems in the Unoccupied Mode using the BAS. For example, if the system is normally controlled to a 70°F heating with 40% RH and 75°F cooling setpoint at about 55% RH when the building is occupied, then having the limits in heating at set back to 65°F, 40% RH and cooling limits up to (80°F, 60% RH) is reasonable. If the limits are exceeded while in the Unoccupied Mode, the systems should be enabled and allowed to operate, with the OA dampers at minimum and exhaust fans off, until the space returns the Unoccupied Setpoint conditions. The intent is to maintain the building within a reasonable range of temperature and humidity conditions to help avoid developing poor indoor

conditions while reducing energy consumption during the shutdown.

- c. If occupants are going to be allowed to use the building on a partial or limited basis during a shutdown, it may be desirable to program an override into the BAS to allow the systems to be returned to normal Occupied modes of operations for temporary length of time, such as for two hours. After the override period expires, the system should automatically return to the Unoccupied setpoints.
  - d. Check if all the setbacks and setup modes are working.
2. A building without a BAS may require more set-up time to have the building be shuttered and may require more direct monitoring on site during the shutdown.
    - a. Recommend that the HVAC systems should not be completely shut down in any building where the building is being unoccupied for any length of time if the intent is to reoccupy the building in the future.
    - b. In addition, we do not recommend extreme setbacks for heating thermostat setpoints or extreme setup for cooling thermostat setpoints. The intent is to set the individual controls on the equipment to do the following—maintain a cooling space setpoint of 80°F and less than 60% RH in cooling and 65°F and minimum 40% RH in heating.
    - c. Any outside air dampers should be set to their minimum position. The exhaust fans other than those in restrooms should be turned off. If the OA dampers are closed, all exhaust fans shall be turned off.
    - d. Monitor the building regularly to ensure that no unexpected consequences are occurring such as condensation, moisture or fungal growth on HVAC system components or building surfaces and finishes.
  3. Boilers and distributed hot water:
    - a. If the building has more than one boiler, reduce the number of operating boilers to bare minimum needed. If the building is going to be offline for more than 60 days, dry storage is recommended via desiccants or inert gas blanketing. If using inert gas, follow OSHA safety protocols.
    - b. For boilers less than 300 hp, a heat source (light bulb) with a fan may be sufficient. Warm wet storage is acceptable; oxygen scavenger residuals in the boiler should be 500% of normal (i.e. if you normally run 20 to 40 ppm of sodium sulfite, maintain 100200 ppm during mothball period).
    - c. Maintain 400-600 ppm P-alkalinity during wet storage.
    - d. Boilers should fire and circulate once per week for minimum of 1 hour.
    - e. Cold wet storage is discouraged! Equipment could suffer significant corrosion damage.
    - f. If the boilers are offline, drain all deaerators, feed water tanks, surge/condensate receivers, superheaters and economizers. If you can't drain them, make sure they are fully flooded and oxygen scavenger levels are at 500% of normal.
    - g. If steam lines are idle, make sure all steam traps and condensate receivers are empty. Be prepared to dump condensate for several days upon restart due to flash rusting developing on the interior surfaces of the lines.

#### 4. Cooling towers, chillers and chilled water distribution piping:

- a. Many facilities have a water risk management plan such as an ANSI/ASHRAE Standard 188-2018, to provide guidance and protocols to minimize the risk of water borne pathogens, such as legionella pneumophila in their utility water systems. If you have a plan and it addresses shut down and restarts of this magnitude, follow it. If you do not have a plan:
  - i. Keeping systems running keeps the equipment in the best shape. Set the BAS to unoccupied temperature and humidity setbacks and monitor and adjust to preserve IAQ and building elements.
  - ii. With all mechanical systems, if you don't use it, nature takes it back. If you are taking chilled water systems down for an extended period of time, completely drain the cooling towers, chillers, heat exchangers and associated piping. Leaving the system with stagnant water can result in severe corrosion, biofouling and contribute to transmission of Legionnaires' disease. Be prepared for rust and biological incursions when bringing branch lines back into service. Do a complete system flush to restore design water parameters and clean strainers throughout. Consider adding side stream filtration at this time.
  - iii. Try to maintain circulation in main chilled water loops, the larger the loop the greater the importance.
  - iv. If operating at reduced capacities for extended duration, for HVAC hydronic loops, increase the frequency of testing and adjusting of biological control regimen by your water treatment provider.

#### C. Plumbing Systems:

1. Many facilities have a water risk management plan such as ANSI/ASHRAE Standard 188 to provide guidance and protocols to minimize the risk of waterborne pathogens such as legionella pneumophila in their utility water systems.
2. Regularly turn on the water and run the drinking fountains, lavatories, urinals, water closets and sinks. Do this once a week to avoid issues with stagnant water.
3. Make sure all plumbing P and U-traps are wet (filled with water) and check them routinely during the unoccupied times.
4. Water features should be shut down and properly drained. This should be part of the water risk management plan.
5. Distributed domestic hot water systems – If possible, keep distributed domestic hot water systems circulating, if possible. Keep water above 140°F to avoid microbial incursion. Do not let it drop below 120°F. If circulation must stop, try to circulate once every two weeks for two hours at temperature. If the hot water recirculating system goes down for extended duration, do a high temperature flush and pull the strainers before going back online.

#### D. Electrical Systems:

1. Unplug or disconnect non-essential appliances wherever possible. Unplug any and all appliances that don't need to stay powered on to avoid "Vampire or Phantom Appliances". These include but are not limited to:
  - a. Computers
  - b. Routers
  - c. Modems
  - d. Televisions
  - e. Printers
  - f. Chargers
  - g. Microwaves
  - h. Vending machines (remove food that may spoil before disconnecting vending machines that store food and perishables)
  - i. Things that turn on with a remote control
2. It is important to work with your IT department because some computers and monitors will need to remain powered on to facilitate remote desktop functions for remote working employees.

#### E. Special Systems:

1. Check on fire alarms and other equipment with battery backup power supplies. Consider having an electrical technician come and check that everything is working properly.
2. Check on the battery backup power supplies for IT and IOT devices, especially the ones that are mission critical. These items include but are not limited to servers, BAS, communication systems, lighting control systems and security systems.
3. If the building is equipped with an emergency or backup generator, arrange to have it tested regularly as required by codes, local jurisdictions and the manufacturer's recommendations.

## **ASHRAE Guidance on How to Re-Occupy a Building, Especially What Measures Should be Taken to Return the HVAC System to Normal Operation**

*The intent of this question is for when the work-remote orders are retracted, and the threat of exposure is greatly reduced. Those are listed below for many systems in the building. If you are restarting a building still at a high-level threat of exposure, please review the Occupancy Guides at [www.ashrae.org/Covid19](http://www.ashrae.org/Covid19).*

### **A. General Recommendations**

1. Prior to starting the building, operators may want to create a strategic plan that includes the following:
  - a. Create measures to make occupants feel safer
  - b. Ensure supply chain for critical items, such as filters, as confirmed for delivery
  - c. Review contractual agreements with tenants with regards to building support
  - d. Establish a communication protocol with tenants and include key contacts
  - e. Prepare and provide training for tenants on safety measures. It is important to note, that if you are opening when PPE requirements are still in place, the Occupancy Guides should be referenced as they deal with functioning buildings during the epidemic.
2. Notify relevant people - include exact dates and times that the building will be reopened.
3. Follow all local, state and federal executive orders, statutes, regulations, guidelines, restrictions and limitations on use, occupancy and separation until they have been officially relaxed or lifted.
4. Follow CDC advice regarding PPE
5. Follow OSHA Guidelines
6. Ensure that custodial scope includes proper cleaning procedures built from EPA and CDC guidance on approved products and methods:
  - a. Disinfect high-touch areas of HVAC and other building service systems (e.g. on/off switches, thermostats)
  - b. Disinfect interior of refrigerated devices, e.g. refrigerators, where the virus can potentially survive for long periods of time.
7. In buildings with operable windows, if the outside air temperature and humidity are moderate, open all windows for two hours minimum before the reoccupation.
8. Review programming to provide flushing two hours before and post occupancies. This includes operating the exhaust fans as well as opening the outside air dampers.
9. Run the system on minimum outside air when unoccupied.
10. Garage exhaust, if any, should run two hours before occupancy.
11. Install signage to encourage tenants to use a revolving door, if any, rather than opening swing doors in lobby area.

12. Review all procedures to consider the addition of “touchless” interactions where applicable. As an example, auto-flush valves are considered “touchless”.
13. Consider future renovations, to be included in the capital budget, to incorporate some of the strategies to mitigate transmission of viruses as indicated in the ASHRAE Position Document “Infectious Aerosols” as well as the Occupancy Guides.

## B. Heating, Ventilating and Air-Conditioning

### 1. General

- a. ASHRAE recommends that all building owners and service professionals follow the requirements of ASHRAE Standard 180-2018 which has tables to show the typical maintenance on equipment that has been in operation.
- b. Consider PPE when maintaining ventilation materials, including filters and condensate. Consult additional guidance before duct cleaning.
- c. Check if all the setbacks and setup modes are reversed back to normal.
- d. Open outside air intake dampers to their maximum, 100% preferred, four hours minimum, before the reoccupation. The maximum position the outside air dampers may be opened will depend on the time of year, local climate, the temperature and humidity of the outside air, and the capability of the HVAC equipment to condition the outside air so that the system is able to maintain acceptable indoor temperature and humidity. When operating in this “flush out” mode, monitor the system continuously to make sure that unexpected or unacceptable conditions inside do not develop. Upon completion of the flush, the damper positions should be corrected to provide design levels.
- e. Check to see that space temperature and relative humidity levels are being controlled to the acceptable setpoints.
- f. Check the status of any heat recovery wheels in the systems for leakage and cross-contamination. Consider deactivating these wheels until a service technician checks the operation and condition.

### 2. Airside Systems

- a. Check to see that the fans have turned on, and that air is moving in and out of the building.
- b. Check to make sure the dampers (outside and return) are working properly as this helps control the fresh air to the building. If the building increased its outside air (OA) during the epidemic, rebalancing the dampers may be required to achieve design air flows.
- c. Check overall building pressure to make sure it is positive. Do the same for any critical interior spaces.
- d. Check that the filters are still in acceptable condition. Facility staff should wear PPE, assuming the system may have been contaminated prior to shut down or upon restarting.
- e. Operator should consider increasing the level of filtration in the Air Handling Units (AHUs) for one or two replacement cycles upon opening the building. Make sure the air handling systems and fans can overcome the additional pressure drop of the new filters and still maintain air flow at acceptable levels. Refer to the Filtration Guidance [www.ashrae.org/covid19](http://www.ashrae.org/covid19). If higher filtration is not available, portable units in the high-

traffic areas may be used for a few months.

### 3. Cooling Systems

- a. Check the refrigerant pressures to make sure the system is adequately charged.
- b. Check the water quality in the systems and add chemicals as needed.
- c. Check coil leaving air temperatures to make sure the systems are providing dehumidification.
- d. Check the water levels and make-up water source for cooling towers to ensure they are available.
- e. Check pump operation and that water is flowing.

### 4. Heating Systems

- a. Check the fuel source to make sure it is on and available. Old fuel oil may need to be replaced.
- b. Confirm that the flues and make-up air paths are open prior to engaging boilers.
- c. Check that the coil actuators are controlling to temperature, or that heating elements are turned on at the disconnect.
- d. If the boiler system(s) were shut down, follow state boiler codes and the manufacturer's written instructions for starting up, and bring hot water and steam heating systems and plants back online.

### 5. Building Automation System

- a. Check that the devices and sensors are within an acceptable calibration for controlling space comfort and ventilation.
- b. Check that the alarms are set up and their communication path is correct (it is notifying the right person).
- c. Consider an update to the programming that would incorporate HVAC strategies to reduce virus transmission prior to future events. Automate the control sequences applied as "Epidemic Mode" operation that can be manually selected by the operator with one stroke.
  - i. Refer to Occupancy Guides for suggested HVAC strategies to employ when operating the building in an epidemic.

## C. Plumbing Systems

1. Many facilities have a water risk management plan such as an ASHRAE Standard 188-2018, Legionellosis: Risk Management for Building Water Systems, to provide guidance and protocols to minimize the risk of waterborne pathogens, such as legionella pneumophila in their utility water systems.
2. Turn on the water and run the drinking fountains, lavatories, urinals, water closets, and pantries to ensure water quality before usage.
3. Make sure all P and U-traps on plumbing drains are wet.

4. Distributed domestic hot water systems - if possible, keep these systems circulating. Keep water above 140°F to avoid microbial incursion. Do not let it drop below 120°F. If circulation was stopped, try to circulate once every two weeks for two hours at temperature. If the hot water recirculating system goes down for extended duration, do a high temperature flush and pull the strainers before going back online.
5. Maintenance should wear epidemic-level PPE when maintaining any of the sewage ejectors and lift stations until those systems are sterilized.

#### D. Electrical Systems

1. Plug in all appliances that were unplugged to avoid phantom electrical loads, including but not limited to:
  - a. Computers
  - b. Routers
  - c. Modems
  - d. Televisions
  - e. Printers
  - f. Chargers
  - g. Microwaves
  - h. Things that turn on with a remote control

#### E. Special Systems

1. Check on fire alarms and other equipment with battery backup power supplies. Consider having an electrical technician come and check that everything is working properly.
2. Have fire protection sprinkler systems, fire alarm systems, emergency lighting systems and other life-safety systems inspected by local authorities having jurisdiction (AHJs), if required by state and local statutes and ordinances, and by contract service professionals who routinely maintain these systems.
3. Check on the battery backup power supplies for Information Technology (IT) and Internet of Things (IOT) devices, especially the ones that are mission critical. That would include servers, building automation systems (BAS), communication systems, lighting control systems and security systems.
4. If the building is equipped with an emergency or backup generator, arrange to have it tested as required by codes, local jurisdictions and the manufacturer's recommendations.