Information in this document is provided as a service to the public. While every effort is made to provide accurate and reliable information, this is advisory, is provided for informational purposes only, and may represent only one person’s view. They are not intended and should not be relied upon as official statements of ASHRAE.
Acknowledgements

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General Information

Building Readiness Intent

The following Building Readiness information is meant to provide practical information and checklists for how your building should be operating and how to practically check its operation. Actual conditions at any specific building will vary, and the adjustments that should be made will depend on many factors such as local climate, complexity of systems involved and the use, occupancy and activities that occur in and around your building.

Building Readiness modes of operation for the building should include the following:

• Epidemic Operating Conditions in Place
  - Occupied
  - Unoccupied temporarily, and
  - Operation during building closure for indefinite periods
• Post Epidemic Conditions in Place
  - Re-starting the building

This document will provide some of the practical guidance on operating your building systems in these different modes. The suggested mode of operation during the Epidemic periods are detailed in the Buildings Guidance on the ASHRAE Covid-19 Website.

• Healthcare
• Residential
• Commercial
• Schools
• Transportation

In addition, this document will cover specific recommendations from the Building Guidelines such as:

• Increased ventilation
• Increased filtration
• Energy recovery ventilation systems operation considerations
General Information

Building Readiness Team

The Building Readiness Team could include professionals and licensed and certified individuals and companies that can perform the analysis, testing, design, construction, control programming, balancing, commissioning, maintenance and operation services required to make the adjustments and achieve the performance included in these recommendations. The following are the typical service providers that may be required:

- **Commissioning Provider (CxP)** – engage a CxP that has a recognized certification from ASHRAE (BCxP), ACG (CxA), BCA (CCP), NEBB (BSC and RCx), or others. They should also have completed several Retro-Commissioning or New Building Commissioning projects in the building type in question.

- **Test and Balance Company (TAB)** – engage a TAB that has recognized certification from Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB) or another certifying body. The TAB agent or service provider should have experience with the building type and systems being evaluated. These certifying bodies require a TAB company operator to have been trained and certified and requires the use of calibrated instruments.

- **Building Automation Systems (BAS) Company** – the Owner should engage the company currently providing service and support for the control system(s) that are installed in the building. If a new service provider is required, finding a local company that has experience working with and operating the building's existing control systems and preferably certified by the manufacturer to provide services for their equipment.

- **Contractors** – the Owner should engage, if necessary, the appropriate contractors to install or repair equipment or systems identified by the CxP, TAB, or BAS. This could include the following:
  - General Contractors (GC)
  - Mechanical Contractor (MC)
  - Electrical Contractor (EC)
  - Specialty contractors for fire alarm and smoke control systems and interfaces.

- **Architect and Engineer (AE)** – the Owner should engage a design team for any issues that might require permit drawings. It is preferred that the original Engineer or Architect of Record that was involved with the original construction or the latest renovation or addition to the facility be engaged if possible. Those professionals should be most familiar with the building’s current operation.

- **Owner’s Facility Staff** – the Owner should make sure that their facility staff are involved in the process. This allows for the information transfer on how systems might be altered to operate.
Epidemic Conditions in Place

Systems Evaluation:

The Owner should consider evaluating their building systems to check that it is operating in proper order, is capable of being modified to align with HVAC mitigation strategies, and to identify deficiencies that should be repaired. This could be viewed as tactical commissioning of the systems to determine risk areas for the building operating in epidemic conditions.

Systems evaluation should include the following steps:
1. Gather and review building and systems documentation, including but not limited to:
   a. Original design documents, specifically the original HVAC and Plumbing Water systems construction documents
   b. Record documents (as-built, marked up drawings and specifications received from the Contractor at the conclusion of construction)
   c. Original, approved equipment and system submittal documents
   d. Systems manuals
   e. Controls and Building Automation System (BAS) drawings and sequences of operation
   f. Equipment control wiring diagrams and troubleshooting guidelines
   g. Service contracts and maintenance logs
   h. BAS Trend reports and alerts and notifications reports
   i. Original Testing, Adjusting and Balancing (TAB) reports
   j. Original Commissioning Reports (if available)
Epidemic Conditions in Place

Systems Evaluation Continued:

2. Inspect equipment, systems and controls to determine where existing problems may exist. Start with components, then move to systems, finally move to the BAS and integrated, whole building operations.

For example:

a. Components
   i. Boilers
   ii. Chillers
   iii. Air Handling Units
   iv. Control Dampers
   v. Control Valves
   vi. Fan Coil Units
   vii. Grilles, registers and diffusers
   viii. Variable speed drives
   ix. Variable Air Volume terminal units,
   x. Water-to-water heat exchangers
   xi. Water-to-refrigerant heat exchangers
   xii. Water to air heat exchangers
   xiii. Steam-to-water heat exchangers

b. Systems
   i. Chilled water systems
   ii. Hot water systems
   iii. Condenser water systems
   iv. Air handling systems (Air handling equipment and air distribution networks: supply ducts, return ducts, exhaust ducts)
   v. Steam distribution systems
Epidemic Conditions in Place

Systems Evaluation Continued:

c. Building Automation Systems (BAS) and Integrated Systems
   i. Graphic user interfaces
   ii. Set Points (Temperature, Humidity, Airflow, CO2, etc)
   iii. Schedules (Occupied and Unoccupied)
   iv. Trend reports
   v. Alarm, alert and notification logs
   vi. Remote access capabilities
   vii. Life safety system interfaces and interlocks
   viii. Access control interfaces
   ix. Smoke control system interfaces
   x. Lighting control interfaces
   xi. Electronic security system interfaces

3. The investigators should be considering the HVAC mitigation strategies to reduce the potential bio-burden in the building that could be implemented on the systems.

4. Prepare a deficiency log and issue work orders to in-house maintenance personnel and purchase orders to qualified service providers to correct any critical issue identified in steps 1 and 2 that would prevent the system(s) from functioning in accordance with the systems’ original design intent or the building’s current use, occupancy and activity.

5. Prepare a report that identifies the HVAC mitigation strategies for the systems. This should include a brief work order description for the in-house maintenance personnel and qualified service providers. This should detail modifications or additions to components, systems and controls necessary so that the recommendations included in this document may be implemented.
Epidemic Conditions in Place

Increased Ventilation

The Building Guidance clearly encourages building operators to increase their systems outdoor air ventilation to reduce the recirculation air back to the space. The guidance indicates that this must be done as much as the system and or space conditions will allow.

The major concern is over the ability to maintain space conditions. Hot and humid climates could struggle to keep the space below acceptable temperature and relative humidity for comfort. Cold climates could struggle to keep the space above acceptable space temperature and relative humidity for comfort. It is important to note that research indicates that maintaining the space relative humidity between 40% and 60% decreases the bio-burden of infectious particles in the space and decreases the infectivity of many viruses in the air. The team should consider increasing the space comfort setpoints to increase the system’s ability to use more outside air.

The concern over the capability for a coil to provide additional capacity was evaluated using a typical cooling coil at various percent of outside air. This evaluation shows the additional required cooling capacity and gpm required[1] if the same exact coil experiences the different entering air conditions. The following shows the impact of increasing the percent of outside air:

<table>
<thead>
<tr>
<th>Percent OA</th>
<th>EAT DB / WB</th>
<th>CHW GPM</th>
<th>Coil Pressure Drop (Ft H2O)</th>
<th>Total Capacity (MBH)</th>
<th>Sensible Capacity (MBH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>77.64 / 66.64</td>
<td>73.66</td>
<td>5.04</td>
<td>443.49</td>
<td>282.78</td>
</tr>
<tr>
<td>30</td>
<td>78.95 / 68.55</td>
<td>83.4</td>
<td>6.32</td>
<td>510.68</td>
<td>297.83</td>
</tr>
<tr>
<td>40</td>
<td>80.26 / 70.39</td>
<td>94.27</td>
<td>7.90</td>
<td>582.09</td>
<td>312.93</td>
</tr>
<tr>
<td>50</td>
<td>81.56 / 72.15</td>
<td>104.17</td>
<td>9.49</td>
<td>651.46</td>
<td>327.99</td>
</tr>
<tr>
<td>60</td>
<td>82.86 / 73.84</td>
<td>114.6</td>
<td>11.3</td>
<td>720.81</td>
<td>343.1</td>
</tr>
<tr>
<td>70</td>
<td>84.15 / 75.47</td>
<td>125.87</td>
<td>13.43</td>
<td>790.57</td>
<td>358.15</td>
</tr>
<tr>
<td>80</td>
<td>85.44 / 77.03</td>
<td>135.5</td>
<td>15.37</td>
<td>857.15</td>
<td>373.26</td>
</tr>
<tr>
<td>90</td>
<td>86.72 / 78.54</td>
<td>149.73</td>
<td>18.48</td>
<td>929.1</td>
<td>388.3</td>
</tr>
</tbody>
</table>

The unit was selected to be 10,000 cfm with a constant 44°F chilled water supply with a 12°F chilled water rise to make a consistent coil leaving air temperature of 52°F dry-bulb and 51.5°F wet-bulb. This assumes a return air condition of 78°F and 60% RH from the space. The coil was locked in at an 8-row coil with 126 fins per foot that is 20.45 square feet of coil face area.
Epidemic Conditions in Place

Increased Ventilation Continued:
The assessment team determining how much more a coil can handle can see that increasing from 20% outside air to 90% outside air doubles the required chilled water, triples the coil pressure drop and requires just over twice the amount of cooling source from the chiller.

There are other options to increase the outside air in an AHU as much as the building automation system (BAS) will allow based on space conditions. There are two different approaches to modify a system to optimize the outside air without ignoring space comfort in hot and humid climates that is a twist on the dynamic supply air temperature reset strategy. This is assuming a typical variable air volume AHU serving multiple VAV boxes or as a single zone VAV unit. The outside air damper and return dampers could be linked or separate, but they work in opposite directions in any option presented.

Option 1: Increased OA based on Cooling Coil
If the cooling coil control valve is less than 90% AND the discharge air temperature (or space temperatures) are satisfied, OPEN the OAD [CLOSE the RAD] 3% every 15 minutes.

If the cooling coil control valve is greater than 90% OR the discharge air temperature (or space temperatures) is exceeded by 1 degree F, CLOSE the OAD [OPEN the RAD] 6% every 5 minutes.

Option 2: Increased OA based on Space Conditions
This option assumes that a coil leaving air temperature controls the CHW valve to maintain a constant setpoint.

If the space temperatures are satisfied and the relative humidity is less than 55%, OPEN the OAD [CLOSE the RAD] 3% every 15 minutes.

If the space temperatures are exceeded by 1 degree F OR the relative humidity is greater than 60%, CLOSE the OAD [OPEN the RAD] 6% every 5 minutes.

These options require different sensors to be installed in the unit to work properly. Either sequence would allow the unit to increase the outside air ventilation as much as possible without exceeding the space comfort conditions. It is also important to note that demand controlled ventilation, static pressure reset strategies and the typical supply air temperature reset strategies should be disabled.
Epidemic Conditions in Place

Upgrading & Improving Filtration:

Building owners are encouraged to improve the efficiency of the filters serving their HVAC systems within the guidance provided for most of the building types listed on the ASHRAE COVID-19 Preparedness Resources website. Mechanical filters are the most common types of filters found in HVAC systems. According to the ASHRAE Position Document on Filtration and Air Cleaning, the term used to describe mechanical filter efficiency is MERV. MERV is an acronym for Minimum Efficiency Reporting Value. The MERV rating of a mechanical filter is determined by filter manufacturers in accordance with ASHRAE Standard 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size. Standard 52.2, table 12-1 lists filter MERV rating parameters for MERV 1 through MERV 16. The higher the MERV number the better the ability of a filter to remove particles from the air ranging in sizes from 0.3 micron diameter up to 10 microns in diameter at standard airflow conditions and face velocities specified in the test standard. A more detailed discussion of the various air filtration and disinfection technologies available may be found on the ASHRAE COVID-19 Preparedness Resources main page under the Filtration/Disinfection tab.

ASHRAE recommends that mechanical filter efficiency be at least MERV 13 and preferable MERV 14 or better to help mitigate the transmission of infectious aerosols. Many existing HVAC systems were designed and installed to operate using MERV 6 to MERV 8 filters. While MERV 13 and greater filters are better at removing particles in the 0.3 micron to 1 micron diameter size (the size of many virus particles) the higher efficiency does not come without a penalty. Higher efficiency filters require greater air pressures to drive or force air through the filter. Care must be taken when increasing the filter efficiency in an HVAC system to verify that the capacity of the HVAC system is sufficient to accommodate the better filters without adversely affecting the system’s ability to maintain the owner’s required indoor temperature and humidity conditions and space pressure relationships.
Epidemic Conditions in Place

Practical Approach to Increase MERV in an AHU:

The following are practical steps an owner can take to evaluate the maximum MERV rating and HVAC system can accommodate while maintaining acceptable system performance:

1. Consider retaining the services of a qualified design professional, a certified commissioning provider (CxP) or a certified testing, adjusting and balancing (TAB) service provider especially for larger, more complex HVAC systems or for systems serving critical buildings or spaces within buildings.

2. If available, gather the documents described above under the System Evaluation section of this document. One of the most valuable documents to have on hand for analyzing filter upgrades would be the original TAB report if the building configuration, use and occupancy has not changed drastically since the building was originally occupied.

3. Determine the manufacturer, size and thickness and MERV rating of the existing filters. For example, 20 inches by 20 inches square, 1-inch thick, MERV 8. Obtain the filter’s operating characteristics from the manufacturer or the manufacturer’s website.

4. Inspect the filter frames inside the air handling equipment where the filters are installed to determine the filters fit tight within the frames and seals around the perimeter of the frame to minimize any air leakage around the filters (often called bypass air). For most filter frames, it would be wise to add silicone sealant on the upstream and downstream side of the frame as it meets with the AHU wall.

5. With the existing filters installed in the system, have the TAB agent perform and document a complete static pressure and temperature profile of the unit prior to any filter upgrades. This should be done per ASHRAE Standard 111-2008 (RA 2017) - Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation and Air-Conditioning Systems guidance (read only version coming soon). If the existing filters are dirty, have the TAB agent develop the profile with dirty filters installed, then change to clean filters of the same type as existing and develop a second profile. The profile should also document fan and motor RPM and power supply voltage and amp draw at each condition (old dirty filters, old filter type clean and new filter upgrade).
Epidemic Conditions in Place

Practical Approach to Increase MERV in an AHU Continued:

6. Obtain the airflow pressure drop of the proposed increased filter efficiency (MERV 13 or higher) and determine the appropriate “dirty filter” setpoint for the new filters. Have the TAB firm insert materials, such as cardboard pieces, to block the existing filters to achieve the upgraded filter dirty setpoint.

7. Have the TAB company develop the unit profile. The profile should also document fan and motor RPM and power supply voltage and amp draw.

8. The team should determine if this is an acceptable temporary operating point for the AHU.
   a. The TAB agent should be able to calculate the changes in airflow caused by the change in filters and determine the percentage reduction in airflow. If the unit’s airflow does not drop by more than 5% from the original TAB report airflow, unit discharge temperatures do not drop too low to potentially cause coil freezing or suction pressure issues in DX equipment, then the filter upgrade may not require any further adjustments to the unit.
   b. If airflow drops to low and causes problems, then have the TAB agent evaluate the fan drive to determine if the fan motor speed may be increased for direct drive fans using variable speed drives or that a sheave change can be made to belt driven fans to get the fan back to its pre-filter change airflow without overloading motor and drive maximum amp ratings.
   c. If the new filter MERV rated filter pressure drop is too great to allow the unit to operate within 95% of the pre-filter change airflow, consider dropping to a lower MERV filter and repeat the process.

9. Once the appropriate new filter MERV level is determined, obtain a set of filters that can be inserted into this unit's filter frame. Change out the existing filters to the new filters and have the TAB agent develop unit profiles with the new filters installed. The TAB agent should be able to calculate the changes in airflow caused by the change in filters and determine the percentage reduction in airflow. If the unit’s airflow does not drop by more than 5% from the original TAB report airflow, unit discharge temperatures do not drop too low to potentially cause coil freezing or suction pressure issues in DX equipment then the filter upgrade may not require any further adjustments to the unit.

10. If it is still desired to upgrade the system to MERV filtration, consider retaining a licensed design professional to size and select new fans and motors and/or new air handler to perform to pre-filter change performance criteria with the new filter upgrade pressure drop increase. Have the engineer consider increased static pressure loads on the unit with both clean and dirty filters.

11. If an increase in filter MERV level can be accommodated using the existing air handling equipment fans and motors, consider using portable HEPA filter units in high occupancy or high bioburden (such as the building entry) spaces.
Calculation Approach to Increase MERV in an AHU:

The following provides a simple example of how this process might work in the field [2] using the fan laws:

• AHU is equipped with MERV 8 filters.
• Following ASHRAE recommendations, the filter system will be upgraded to MERV 14.
• Commercially available filter data, yields the following information:
  - MERV 8 clean at 0.25 in w.g. and considered dirty at 0.5 in w.g.
  - MERV 14 clean at 0.3 in wg and considered dirty at 1.0 in. w.g.
• The proposed AHU is 23,000 cfm with a supply fan array using variable frequency drives (VFD) controlled to duct static setpoint.
• The analysis will be on a per fan basis.
Epidemic Conditions in Place

Calculation Approach to Increase MERV in an AHU Continued:

<table>
<thead>
<tr>
<th>Filter Level</th>
<th>Supply Airflow CFM</th>
<th>Fan RPM</th>
<th>Static Pressure Fan (in. w.g.)</th>
<th>Fan Brake Horsepower</th>
<th>Fan Motor Nameplate Horsepower</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERV 8</td>
<td>23,000</td>
<td>2,216</td>
<td>5.3 Dirty</td>
<td>5.36</td>
<td>7.5</td>
</tr>
<tr>
<td>MERV 14</td>
<td>23,000</td>
<td>2,395</td>
<td>5.8 Dirty</td>
<td>6.7</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Discussion on the findings of the Calculated Approach:

1. Assuming the unit is under a constant discharge duct pressure control, a static pressure profile of the unit should show a nearly constant pressure in the supply plenum and a gradually increasing negative pressure in the mixing box, filter array and coils on the inlet side of the fan.
2. Energy saving strategies such as reducing the discharge pressure of the unit to serve the VAV box with the greatest air demand should and could still be employed and continued.
3. There is commercially available software that evaluates the costs of material and labor for filter change out intervals. Good testing instrumentation should be available to trend and chart (and it desired record) filter pressure drops.
4. This is only an example. There are potential issues in maintaining airflow at design by increasing fan speeds.
   a. Fan speed cannot be upgraded because of the limits of that fan construction class is an example. In this case, manufacturers data indicate that the fan maximum rpm is 3125. Check with the fan manufacturer.
   b. It is possible that there will be insufficient motor horsepower in the unit. A motor change with its associated electrical system upgrade costs may be required. In motor change case, the owner may choose to operate the system at a reduced air flow. Reduced airflow in this example would be approximately 22,200 cfm.
   c. Filter bypass is a potential problem. If possible, conduct a light test to determine if there are any major cracks needing closure.
   d. Cabinet negative pressure leakage is also a potential problem. Check with the manufacturer as they will be following AHRI standards.
Epidemic Conditions in Place

Energy Savings Considerations:

The health, safety and welfare of building occupants and maintenance personnel should always come first. This means that facility operators and maintenance personnel should focus on verifying that systems are functioning properly and maintenance routines are kept as scheduled where possible during the event or crisis. However, for buildings that are experiencing temporary reduced occupancies and closures, the HVAC systems should be operated in their unoccupied modes using relaxed temperature and humidity set points to help reduce energy consumption and cost.

You might want to also consider checking your systems control strategies optimization. The typical building strategies are outlined in **ASHRAE Guideline 36-2018 - High-Performance Sequences of Operation for HVAC Systems** (read only version coming soon). While this document does not cover all of the systems, it does give some general guidance to recommended control strategies.

When buildings are scheduled for re-occupancy, guidance for re-starting systems is included in this document and on the **ASHRAE Covid-19 Website**.
Epidemic Conditions in Place Maintenance Checks

For equipment within a building that is not identified within this response, we recommend referring to the following documents for additional guidance:

Epidemic Conditions in Place
Maintenance Checks

General Recommendations:

- Notify Tenants of exact dates and times the building will be setback.
- Check remote or offsite access connections to the Computerized Maintenance Management System (CMMS), Building Management System (BMS), and Building Automation System (BAS) to make sure they are functioning properly and can be logged into, if any.
- Assign personnel rotation for weekly onsite rounds, provide a schedule for the rounds and trades.
- Set up a log for tracking all adjustments and trends to identify deviations from the program.
- Verify all the modes modified are working daily.
Epidemic Conditions in Place
Maintenance Checks

Heating, Ventilating & Air-Conditioning

Where semi-annual / annual scheduled maintenance on the equipment can be performed safely, do not defer this maintenance cycle. Where worker safety could be at risk, consider deferment of semi-annual / annual maintenance on the equipment up to 60 days.

The following are recommended as minimum verification/checks to be performed:

Boilers (Monthly):
- For systems with Steam Boilers, develop a schedule that provides minimum supervision on-site.
- Perform chemical testing of system water. Verify water treatment target levels are being maintained.
- For systems using fuel oil
- Check fuel pump for proper operation.
- Inspect fuel filter; clean and verify proper operation.
- For systems using natural gas
- Check gas pressure, gas valve operation, and combustion fan operation.
- Check for evidence of leakage of fuel supply, heat transfer fluid, and flue gas.
- Verify proper operation of safety devices per manufacturer’s recommendations.

Chillers (Monthly):
- Perform chemical testing of system water. Verify water treatment target levels are being maintained.
- Check control system and devices for evidence of improper operation.
- Check variable-frequency drives for proper operation.
Epidemic Conditions in Place

Maintenance Checks

Heating, Ventilating & Air-Conditioning Continued:

**Air Cooled Chillers:**
- Check refrigerant system for evidence of leaks
- Check/clean fan blades and fan housing
- Check/clean for fin damage
- Check for proper fluid flow and for fluid leaks

**Water Cooled:**
- Check refrigerant system for evidence of leaks
- Check for proper fluid flow and for fluid leaks
- Check compressor oil level and/or pressure on refrigerant systems having oil level and/or pressure measurement means

**Cooling Towers and Evaporative-Cooled Devices (Monthly):**
- Perform chemical testing of system water. Verify water treatment target levels are being maintained.
- Check chemical injector device for proper operation
- Check conductivity and other sensors for proper readings
- Check water system ultraviolet lamp, replace bulbs as needed (if applicable)
- Check control system and devices for evidence of improper operation
- Check variable-frequency drive for proper operation
- Check for proper fluid flow and for fluid leaks
- Check for proper damper operation
- Inspect pumps and associated electrical components for leaks and normal operation
Epidemic Conditions in Place

Maintenance Checks

Heating, Ventilating & Air-Conditioning Continued:

Steam Distribution Systems (Monthly):
- Perform chemical testing of system condensate and feed water
- Check piping for leaks
- Check steam traps and condensate return units for proper operation
- Check safety devices per manufacturer’s recommendations

HVAC Water Distribution Systems (Monthly):
- Perform chemical testing of system water. Verify water treatment target levels are being maintained.
- Check for proper fluid flow and for fluid leaks. If necessary, vent air from system high points and verify backflow preventers and pressure regulating valves on makeup water lines are functioning properly.
- Check expansion tanks and bladder type compression tanks have not become waterlogged

Pumps:
- Inspect pumps and associated electrical components for proper operation
- Check variable-frequency drive for proper operation
- Check control system and devices for evidence of improper operation

Air Handling Units (Monthly):
- Check for particulate accumulation on filters, replace filter as needed
- Check ultraviolet lamp, ultraviolet lamp, replace bulbs as needed (If applicable)
- Check P-trap
- Check control system and devices for evidence of improper operation
- Check variable-frequency drive for proper operation
Epidemic Conditions in Place
Maintenance Checks

Heating, Ventilating & Air-Conditioning Continued:

Roof Top Units (Monthly):
- Check for particulate accumulation on outside air intake screens and filters, replace filter as needed
- Check ultraviolet lamp, replace bulbs as needed (if applicable)
- Check P-trap
- Check control system and devices for evidence of improper operation
- Check variable-frequency drive for proper operation
- Check refrigerant system for leaks
- Check for evidence of leaks on gas heat section heat-exchanger surfaces
- Check variable-frequency drives. For fans with belt drives, inspect belts and adjust, as necessary

Water-Source Heat Pumps:
- Check for particulate accumulation on filters, replace filter as needed
- Check P-trap
- Check control system and devices for evidence of improper operation
Epidemic Conditions in Place

Maintenance Checks

Plumbing Systems

Follow recommended operations as outlined in the Building’s Legionella Management Plan. In absence of this plan, the following are minimum recommendations.

- Water features and fountains - shutdown per manufacturer's instructions and drain.

**Plumbing Rounds (Weekly):**
- Flush piping systems through drinking fountains, lavatories, urinals, water closets and sinks to prevent stagnation
- Verify wet floor sinks and drains remain wet
- Check for proper fluid flow and for fluid leaks
- Inspect booster pumps system for proper operation
- Inspect Domestic Hot Water heater for production of hot water at 140°F
- Inspect pumps and associated electrical components for proper operation
- Check the recirculation system for proper flow and for fluid leaks
- Inspection of secondary disinfection system for proper operation (if applicable)
Epidemic Conditions in Place Maintenance Checks

Electrical Systems:

☐ Disconnect all non-essential appliances wherever possible from power outlets. Coordinate with building tenants or departments.
☐ Turn off lights, keep the emergency and egress lighting energized.

Special Systems:

❑ Inspect fire alarm master panels and other life safety equipment with battery backup power supplies are functioning. (Weekly)
❑ Inspect the battery backup power supplies for IT and IOT devices and mission critical systems. (Weekly by IT personnel)
❑ Run emergency or backup generators, test transfer of power, per manufacturer’s recommendations. (Monthly)
Shut Down a Building Temporarily

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.
   
a. If there are tenants that need to use the building during lockdown, they should refer to the Commercial Building Guide on www.ashrae.org/COVID19 site under the “Buildings” section, 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 operate the building.

5. If someone does visit the building to check, they could also be tasked with watering any of the plants.
Shut Down a Building Temporarily

Heating, Ventilating & 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 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 re-occupy 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.
   i. If the OA dampers are closed, all exhaust fans shall be turned off.
   d. Monitoring 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.
Shut Down a Building Temporarily

Heating, Ventilating & Air-Conditioning Continued:

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 enough. 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 100-200 ppm during mothball period).
   c. Maintain 400-600 ppm P-alkalinity during wet storage.
   d. Boilers should fire and circulate once per week for a 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 cannot 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, Legionellosis: Risk Management for Building Water Systems, 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 do not use it, nature takes it back. If you are taking chilled water systems down for an extended period, 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 currently.
      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.
Shut Down a Building Temporarily

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 these systems circulating. 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.
Shut Down a Building Temporarily

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 including but are not limited to:
- Computers
- Routers
- Modems
- Televisions
- Printers
- Chargers
- Microwaves
- Vending machines (remove food that may spoil before disconnecting vending machines that store food and perishables)
- 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.
Shut Down a Building Temporarily

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.
A Systems Manual should already be in place for normal operations which is a system-focused composite document that includes the design and construction documentation, facility guide and operation manual, maintenance information, training information, commissioning process records and additional information of use to the Owner during occupancy and operations. If there is not an existing Systems Manual, refer to ASHRAE Guideline 1.4-2019: Preparing Systems Manuals for Facilities (read only version coming soon) for guidance to build that document.

While the Systems Manual should include all modes of operation, it is unlikely that it would include a mode for Epidemic Conditions in Place. During an Epidemic, the Systems Manual should be updated to include special operations and considerations such as:

1. Indicate which systems will remain online without alterations.
2. Indicate which systems will remain online with alterations.
   a. Detail special provisions
   b. Detail revised sequences of operations
   c. Include any BAS checks to make sure the proper mode is engaged
3. Indicate which systems will be de-energized
   a. If these include water systems, indicate how those will get water flow occasionally to avoid growth issues
4. Outline daily activities and documentation that might be different than the normal facilities checks. Include updated data logs and forms as needed.

Just as a normal Systems Manual might be used in the training of the operations and facility staff and occupants before and during normal operations, the updated Systems Manual that includes the Epidemic Conditions in Place Mode should also be used to train operations and facility staff and occupants. This training should be done prior to switching to Epidemic Conditions in Place Mode for the facility and during the event.
Post-Epidemic Conditions in Place

Re-starting a Building

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 Commercial Building Guide on www.ashrae.org/COVID19 site under the “Buildings” section.
Post-Epidemic Conditions in Place

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
Post-Epidemic Conditions in Place

General recommendations continued:

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 the 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. Engage a qualified Commissioning Provider (CxP), TAB firm, and/or BAS contractor to verify sensor calibration for demand-based ventilation instrumentation, airflow measurement instrumentation and temperature control instrumentation.

14. Engage a mechanical service company, if not already under contract, to inspect and assess the operational capabilities of all mechanical refrigeration equipment (i.e. chillers and DX cooling equipment), water heaters, steam boilers, pumps and associated specialties (i.e. expansion tanks, deaerators, traps, PRVs, mixing stations, etc.).

15. 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 at www.ashrae.org/covid19.
Post-Epidemic Conditions in Place

Heating Ventilating & Air Conditioning:

1. ASHRAE recommends that all building owners and service professionals follow the requirements of ASHRAE Standard 180-2018 “Standard Practice for the Inspection and Maintenance of Commercial HVAC Systems” which has tables to show the typical maintenance on equipment that has been in operation.
2. Consider PPE when maintaining ventilation materials, including filters and condensate. Consult additional guidance before duct cleaning.
3. Confirm occupancy schedule with building tenants and review programmed operation schedule in BAS and/or HVAC components (i.e. unitary controls). Modify as needed to fit the current occupancy schedules and ventilation requirements.
4. Check if all the setbacks and setup modes are reversed back to normal.
5. 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.
6. Operate the HVAC systems in Occupied mode for at least 24 hours after completing the previous steps. Trend temperature control and ventilation parameters through the BAS. If this capability is not available, request a qualified Commissioning Provider or TAB firm install monitoring equipment or measure systems to verify proper temperature and ventilation control. Be advised that equipment may be operating below design capacity, but sequencing and temperature control should function correctly.
7. Check to see that space temperature and relative humidity levels are being controlled to the acceptable setpoints.
8. Verify Occupied / Unoccupied sequencing after measurement and verification of Occupied parameters is complete.
9. 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.
10. Consult with the CxP, BAS contractor, TAB firm or Design firm to identify any areas of concern or anomalies in the monitored or measured data and compile a list of issues to be addressed to meet minimum occupancy ventilation requirements and occupant comfort / operational temperature setpoints.
Post-Epidemic Conditions in Place

Airside Systems:

1. Check to see that the fans have turned on, and that air is moving in and out of the building.

2. 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.

3. Check overall building pressure to make sure it is positive. Do the same for any critical interior spaces.

4. 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.

5. Operators 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.

If higher filtration is not available, portable units in the high-traffic areas may be used for a few months.
Post-Epidemic Conditions in Place

Cooling systems:

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

Heating System:

1. Check the fuel source to make sure it is on and available. Old fuel oil may need to be replaced.
2. Confirm that the flues and make-up air paths are open prior to engaging boilers.
3. Check that the coil actuators are controlling to temperature, or that heating elements are turned on at the disconnect.
4. 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.
Post-Epidemic Conditions in Place

Building Automation System:

1. Check that the devices and sensors are within an acceptable calibration for controlling space comfort and ventilation.

2. Check that the alarms are set up and their communication path is correct (it is notifying the right person).

3. 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” operations that can be manually selected by the operator with one stroke.
   - Refer to Occupancy Guides for suggested HVAC strategies to employ when operating the building in an epidemic.
Post-Epidemic Conditions in Place

Plumbing Systems:

1. Many facilities have a water risk management plan such as 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. 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.
Post-Epidemic Conditions in Place

**Electrical Systems:**

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
Post-Epidemic Conditions in Place

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.
For equipment within a building that is not identified within this response, we recommend referring to the following standards for additional guidance:


Post-Epidemic Conditions in Place Maintenance Checks

General Recommendations:

❑ Notify Tenants of exact dates and times the building will be setback.

❑ Check remote or offsite access connections to the Computerized Maintenance Management System (CMMS), Building Management System (BMS) and Building Automation System (BAS) to make sure they are functioning properly and can be logged into, if any.

❑ Assign personnel rotation for weekly onsite rounds, provide a schedule for the rounds and trades.

❑ Set up a log for tracking all adjustments and trends to identify deviations from the program.

❑ Verify all the modes modified are working daily.
Post-Epidemic Conditions in Place

Maintenance Checks

Heating, Ventilating & Air-Conditioning
Where semi-annual / annual scheduled maintenance on the equipment can be performed safely, do not defer this maintenance cycle. Where worker safety could be at risk, consider deferment of semi-annual / annual maintenance on the equipment up to 60 days.

The following are recommended as minimum verification/checks to be performed:

Boilers (Monthly):
- For systems with Steam Boilers, develop a schedule that provides minimum supervision on-site.
- Perform chemical testing of system water. Verify water treatment target levels are being maintained.
- For systems using fuel oil
  - Check fuel pump for proper operation.
  - Inspect fuel filter; clean and verify proper operation.
- For systems using natural gas
  - Check gas pressure, gas valve operation, and combustion fan operation.
  - Check for evidence of leakage of fuel supply, heat transfer fluid, and flue gas.
  - Verify proper operation of safety devices per manufacturer’s recommendations.
Post-Epidemic Conditions in Place Maintenance Checks

Heating, Ventilating & Air-Conditioning Continued

Chillers (Monthly):
- Perform chemical testing of system water. Verify water treatment target levels are being maintained.
- Check control system and devices for evidence of improper operation
- Check variable-frequency drives for proper operation

Air Cooled Chillers:
- Check refrigerant system for evidence of leaks
- Check/clean fan blades and fan housing. Check/clean for fin damage
- Check for proper fluid flow and for fluid leaks

Water Cooled:
- Check refrigerant system for evidence of leaks
- Check for proper fluid flow and for fluid leaks
- Check compressor oil level and/or pressure on refrigerant systems having oil level and/or pressure measurement means
Post-Epidemic Conditions in Place
Maintenance Checks

Heating, Ventilating & Air-Conditioning Continued:

Cooling Towers and Evaporative-Cooled Devices (Monthly):

- Perform chemical testing of system water. Verify water treatment target levels are being maintained.
- Check chemical injector device for proper operation
- Check conductivity and other sensors for proper readings
- Check water system ultraviolet lamp, replace bulbs as needed (if applicable)
- Check control system and devices for evidence of improper operation
- Check variable-frequency drive for proper operation
- Check for proper fluid flow and for fluid leaks
- Check for proper damper operation
- Inspect pumps and associated electrical components for leaks and normal operation
Post-Epidemic Conditions in Place

Maintenance Checks

Heating, Ventilating & Air-Conditioning Continued:

Steam Distribution Systems (Monthly):
- Perform chemical testing of system condensate and feed water
- Check piping for leaks
- Check steam traps and condensate return units for proper operation
- Check safety devices per manufacturer’s recommendations

HVAC Water Distribution Systems (Monthly):
- Perform chemical testing of system water. Verify water treatment target levels are being maintained
- Check for proper fluid flow and for fluid leaks. If necessary, vent air from system high points and verify backflow preventers and pressure regulating valves on makeup water lines are functioning properly
- Check expansion tanks and bladder type compression tanks have not become waterlogged

Pumps:
- Inspect pumps and associated electrical components for proper operation
- Check variable-frequency drive for proper operation
- Check control system and devices for evidence of improper operation
Post-Epidemic Conditions in Place Maintenance Checks
Heating, Ventilating & Air-Conditioning Continued:

**Air Handling Units (Monthly):**
- Check for particulate accumulation on filters, replace filter as needed
- Check ultraviolet lamp, ultraviolet lamp, replace bulbs as needed (if applicable)
- Check P-trap
- Check control system and devices for evidence of improper operation
- Check variable-frequency drive for proper operation

**Roof Top Units (Monthly):**
- Check for particulate accumulation on outside air take screens and filters. Replace filter as needed
- Check ultraviolet lamp, ultraviolet lamp, replace bulbs as needed (if applicable)
- Check P-trap
- Check control system and devices for evidence of improper operation
- Check variable-frequency drive for proper operation
- Check refrigerant system for leaks
- Check for evidence of leaks on gas heat section heat-exchanger surfaces
- Check variable-frequency drives. For fans with belt drives, inspect belts and adjust, as necessary

**Water-Source Heat Pumps**
- Check for particulate accumulation on filters, replace filter as needed
- Check P-trap
- Check control system and devices for evidence of improper operation
Post-Epidemic Conditions in Place Maintenance Checks

Plumbing Systems:

Follow recommended operations as outlined in the Building’s Legionella Management Plan. In absence of this plan, the following are minimum recommendations.

- Water features and fountains - shutdown per manufacturer's instructions and drain.

**Plumbing Rounds (Weekly):**
- Flush piping systems through drinking fountains, lavatories, urinals, water closets and sinks to prevent stagnation
- Verify wet floor sinks and drains remain wet
- Check for proper fluid flow and for fluid leaks
- Inspect booster pumps system for proper operation
- Inspect Domestic Hot Water heater for production of hot water at 140°F
- Inspect pumps and associated electrical components for proper operation
- Check the recirculation system for proper flow and for fluid leaks
- Inspection of secondary disinfection system for proper operation (if applicable)
Post-Epidemic Conditions in Place Maintenance Checks

**Electrical Systems:**

- Disconnect all non-essential appliances wherever possible from power outlets. Coordinate with building tenants or departments.
- Turn off lights, keep the emergency and egress lighting energized.

**Special Systems:**

- Inspect fire alarm master panels and other life safety equipment with battery backup power supplies are functioning (Weekly)
- Inspect the battery backup power supplies for IT and IOT devices and mission critical systems (Weekly by IT personnel)
- Run emergency or backup generators, test transfer of power, per manufacturer’s recommendations (Monthly)
As stated above in the Epidemic Conditions in Place, a Systems Manual should be revised to include this new mode of operation for the facility. During an epidemic, there might be altered sequences of operations, as well as data logging information and operations for record keeping. When the epidemic is over and occupants begin to return to the workplace in a more normal capacity, systems will likely be returned to, or near, previous operations.

When returning systems to normal operations, operations staff should review the Occupied and Unoccupied Modes in normal operation to ensure that the document is current. There should be documentation kept of the change over, any anomalies encountered, as well as operational data recorded moving forward, when switching between modes.

The post-change over review should be performed so that any updates that need to be made can be made and put into action.
References

[1] Cooling coil selections provided by Trane Orlando.

Information in this document is provided as a service to the public. While every effort is made to provide accurate and reliable information, this is advisory, is provided for informational purposes only, and may represent only one person’s view. They are not intended and should not be relied upon as official statements of ASHRAE.