



## A Healthy Buildings Guide to re-open retail stores: Restarting HVAC systems post COVID-19 shutdowns.

A comprehensive checklist by EcoEnergy Insights.

In recent months, most retail stores have been closed in line with efforts to combat the pandemic. This has made it imperative for retailers to ensure that their HVAC equipment is maintained properly during the closure and ready for occupancy when they reopen. Retail stores also need to be cleaned effectively during the closure period to reduce risk upon reopening.

Based on industry best practices for maintaining and operating heating, ventilation and air-conditioning (HVAC) equipment, including recommendations and guidelines from American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) for HVAC systems in the time of the COVID-19 pandemic and beyond, the following 'to do' list was created for retailers as they prepare to reopen their stores for business.

Purge

Equipment health checks

Prepare for start up

Run 'Normal' operations

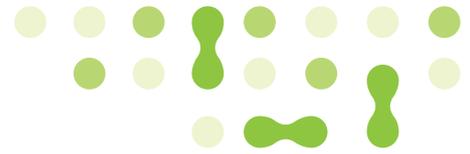
### Step 1: Purge

"Purging" involves removing contaminants inside the confined space by displacement with outside air to achieve acceptable contaminant levels relative to atmospheric levels. One of the best ways to achieve this is through "ventilation", which is the intentional introduction of outdoor air into a confined space by mechanical means to control indoor air quality.

Altered occupancy patterns during lockdown affect building heat load and indoor relative humidity levels, which can lead to conditions favoring mold growth. To prevent such situations, the building should be purged of stale air. At least one purge cycle is recommended after a complete shutdown.

Here is the list of actions we recommend:

1. Ventilate the building floors utilizing maximum outdoor air, preferably during night hours or in the early morning hours.



2. The purge operation is to be done once during a shutdown for approximately 3 hours in aggregate. Ventilation should be carried out with an interlock on outdoor air dew point condition to ensure the operation is not carried out when there is high humidity outdoors.
3. This operation is to be carried out by enabling the purge mode on Rooftop Units (RTUs) with predefined schedules. In absence of a purge mode, the following steps can be followed as an alternative:
  - a) Override the security system and set it to 'Occupied' for the purge period, if the RTUs are interlocked with the security system.
  - b) Create a 'Purge Schedule' for the purge period (preferably starting from 12 am) in the Master Schedule or RTU Schedule via the building automation system.
  - c) Create the 'Cooling Demand' by overriding the 'Occupied' set point to an appropriate value (say 70°F for example) for the purge period.
  - d) Enable the Damper Operation by:
    - i. Overriding the 'Economizer High Limit' to Outside Air Temperature (OAT) value +1°F, so that fresh air damper operation is forced, even at higher temperatures. The operating compressor will ensure the outdoor air is cooled down by the time it reaches the confined space.
    - ii. The Economizer Low Limit to continue as per normal operation.
    - iii. However, this purge mode is operated with the external dew point below 60°F. Internal conditions should not be allowed to cross the unoccupied temperature limit. In case the purge mode can't be executed or completed because of unfavorable conditions, the operator needs to revisit and conduct it at a more optimal condition.
4. Enable all variable volume terminal unit dampers based on availability.
5. Enable all ventilation (exhaust & supply) fans, if available.

On completion of this operation, we recommend the following reports be prepared:

1. A list of equipment not working as intended or which stopped during the processes due to safety interlock, to enable later verification, reprocessing, or maintenance.
2. A list of issues such as sensor faults, communication issues, or unhealthy compressors, for further checks. If needed, schedule for a technician's visit.

## **Step 2: Conduct cyclic equipment health checks**

In order to ensure that the HVAC equipment is in proper health during the shutdown period and ready for resuming operations, performance should be periodically reviewed. Equipment health can be periodically checked by operating in conditions similar to a full-load environment.

Here is the list of actions we recommend:

1. Each RTU should be operated for a small period of time at a suitable frequency (as an example, approximately 30 minutes every 2 weeks during the shutdown period).
2. Turning 'ON' all RTUs at the same time could lead to a spike in electricity demand, RTUs can be operated into a set of groups based on the site design (as an example, in groups of 3).



3. An example run of the 'Health Check' on a group containing 3 RTUs involves the following steps (this needs to be adapted as per the site design and operating conditions):
  - a. Set the RTUs to Occupied Mode
    - i. Override the security system to 'Occupied' for 2 to 3 hours if the RTU is interlocked with the security system.
    - ii. Override the RTU to Occupied Mode for 30 minutes.
  - b. Create Cooling demand
    - i. By overriding the Occupied set point to 3°F below the zone temperature.
    - ii. In case the zone temperature is maintained lower (i.e., nearer to heating set point), before reducing the cooling set point, reduce the heating set point as well. Maintain a minimum difference of 4 degrees between the cooling and heating set points.
  - c. Let the group of RTUs run in the above condition for 30 minutes.
  - d. After 30 minutes, check whether the supply air temperature has reduced to below 65°F. If a low supply air temperature is achieved, conclude the exercise for the group by releasing all overrides and reverting the RTUs back to the normal condition.
4. After a steady state condition during the health check is reached for the group (15 minutes into the health check), start the process on the remaining groups of RTUs, one group at a time.

On completion of this operation, we recommend the following reports be prepared:

1. List of issues which were remotely fixed.
2. List of issues such as sensor fault, communication issues, or unhealthy compressors, for further checks. If needed, schedule for a technician's visit.
3. List of sites that may have potential issues while re-opening, for further attention.

### **Step 3: Prepare for start up**

A day before the scheduled opening of the retail store or before pre-opening activities such as cleaning, the HVAC equipment should be operated in "Occupied Mode" for 24 hours. This will help the equipment purge any accumulated contamination so that the indoor environment is prepared for returning occupants.

Here is the list of actions we recommend:

1. Set the RTUs to Occupied Mode
  - a. Override the security system and set it to 'Occupied' from 12 am to 11:59 pm for the day before opening for operation, if RTUs are interlocked with security systems.
  - b. Create a 24-hour occupied schedule (12 am to 11:59 pm) in the building automation system.
2. Check the performance of mechanical assets for any deviations.
3. Ensure the economizer/fresh air dampers are set for maximum outdoor air ventilation, if conditions permit.



4. Identify any issues such as sensor fault, communication issues or an unhealthy compressor, for further checks. If needed, schedule for a technician's visit.

On completion of this operation, we recommend the following reports be prepared:

1. List of issues which were remotely fixed.
2. List of issues to be prioritized for dispatch.
3. List of sites that may have potential issues while re-opening, for further attention.

#### **Step 4: Run 'Normal' operations**

Following the startup preparation, the modes/schedules of HVAC equipment are to be returned to normal occupancy schedules. Retailers should prioritize providing maximum outdoor air ventilation and maintaining the sensors and dampers accordingly.

Here is the list of actions we recommend:

1. Update schedules to the normal / adjusted site occupied hours.
2. If supported by the Building Management Systems (BMS), update batch programs for planned schedules.

On completion of this operation, we recommend a report be prepared on the readiness with dispatch recommendations and other advisories.

Retailers can consider a specialized remote building service from EcoEnergy Insights to help restart and manage their retail stores remotely. EcoEnergy Insights' Restart Program provides building maintenance and management with the AI-enabled CORTIX™ building IoT platform and Command Center. The program can be launched quickly and easily support retailers as they reopen their stores. The program is flexible and can be applied to stores with BMS such as:

1. WebCTRL® Building Automation System by Automated Logic Corporation
2. Tridium's Niagara Framework®
3. Opus Building Automation System by Novar
4. Savvy® Energy Infosystem by Novar
5. Solutions by Nexrev
6. Trane Tracer® Controls

  Write to us at [info.ecoenergy@carrier.com](mailto:info.ecoenergy@carrier.com) and elevate your business now.

### **About EcoEnergy Insights**

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