Best Practices: Incorporating Public Health into HVAC Operations

Background

This document summarizes best practices research regarding HVAC operations in the wake of COVID-19. The information is aligned with and builds on the DCAS document: "Managing the Return to Office in the Age of COVID-19," which covers a broader set of topics. The best practices here are grouped into three categories: (1) System Evaluation, (2) HVAC: Ventilation Control, and (3) HVAC: Filtration Control.

For further information about building operations in the wake of COVID-19, DEM recommends that building operators consult the DCAS document, ASHRAE's Building Readiness[1] guidelines, and the preliminary risk assessment screening tool to help make risk-based decisions related to indoor occupancy.

1. Best Practices for General System Evaluation, including BMS/BAS

During system evaluation, building operators should verify that systems are operating in accordance with design conditions; have no deficiencies that can be repaired; and can be modified in accordance with available best practices.

- Gather and review building and system documentation (e.g. electrical drawings, sequences of operations, as-builts, etc.).
- Inspect systems, equipment, and controls to identify problems.
- Review the building's BAS and its features. Check system graphics or text-based reports to determine if points for temperature, relative humidity, CO_2, airflow, damper position, control valve position, motor speed and motor status are reporting reasonable values. Use testing instruments to verify any questionable BAS values by comparing BAS values to the testing instrument values. Start by verifying critical sensors, such as CO_2 or airflow measuring stations.
- Calibrate sensors if values are known to be inaccurate. Use the guidance in ASHRAE Guideline 11 and the testing equipment from FELL when checking calibration.
- Prepare a deficiency log and either issue work orders for in-house maintenance personnel and/or prepare purchase orders for qualified service providers to correct critical issues. Please note that installation of additional sensors may be required to implement enhanced ventilation sequence of operations for improved indoor conditions monitoring.

2. Best Practices for HVAC: Ventilation Control

Building operators are encouraged to increase their system's outdoor air ventilation, thus reducing recirculation of air, to help mitigate SARS-CoV-2 concentration.[1] In doing so, building operators should confirm that they are maintaining appropriate air temperature and relative humidity space conditions. In addition, building operators should monitor the impact of operational changes on their facility's energy consumption using **EnerTrac,** if available.

- Implement pre- and post-occupancy flushing periods; at present, 2 hours for each period has been suggested. This should be sufficient for most systems to meet minimum ventilation standards. If implemented, make sure to continue to maintain comfortable and safe air temperature and humidity space conditions.
- Lower demand-controlled ventilation (DCV) thresholds for maximum CO_2 concentration.
- Optimize the outside air damper operation by implementing a re-set strategy based on cooling/heating coil control valve position or space temperature/relative humidity.
- Maintain indoor relative humidity between 40% and 60%; within this range, the bioburden of infectious particles and infectivity of many viruses in the air decreases.
- Consider adjusting the space comfort setpoints to increase the system's ability to use more outside air.
- Implement energy-saving strategies, such as reducing the discharge pressure of the unit to serve the VAV box with the greatest air demand.

- Check that exhaust and relief systems are balanced appropriately to maintain pressure requirements; otherwise, increasing outside air, but keeping exhaust and relief air systems as designed, could reverse the intended pressure required for spaces such as commercial kitchens, bathrooms, process areas, and custodial areas.
- Consider keeping energy recovery systems operating where the supply and exhaust fan(s) are located correctly for pressure control at the exchanger. This statement applies if a system (1) is sized for an appropriate velocity and pressure drop; (2) has appropriate seals or purges that have been specified for the application; (3) was tested and balanced correctly during the construction phase; and (4) has been maintained according to manufacturer's requirements.
- Be aware that increasing ventilation will be more difficult on cold winter days, where there is risk of freezing AHU coils, particularly for air handlers that lack pre-heat systems.

3. Best Practices for HVAC: Filtration Control

Building operators are encouraged to improve their system's air filtration to help mitigate SARS-CoV-2 transmission.[1] Mechanical filter efficiency should be at least MERV 13 and preferably MERV 14 or higher. In addition, building operators should monitor the impact of operational changes on their facility's energy consumption using **EnerTrac,** if available.

- Determine the manufacturer's size, thickness, and MERV rating of your existing filters.
- For all filters inside the air handling equipment, inspect the filter frames to ensure that the filters fit tightly within the frames and seals exist around the perimeters of the frames to minimize any air leakage.
- If more efficient (higher MERV rating) filters are needed, verify that the HVAC system's capacity is sufficient to accommodate the filters without adversely affecting the system's ability to maintain indoor temperature, relative humidity, and space pressure relationships. For example, higher efficiency filters require greater air pressures to drive or force air through the filter.
- Determine fan RPM and brake horsepower needed to accommodate more efficient filters by using the fan laws and commercially available filter data (e.g. clean MERV 14 pressure drop at 0.3-inch w.g. and dirty at 1.0-inch w.g.).
- If the new MERV rated filter pressure drop is too great to operate within 95% of normal airflow, consider dropping to a lower MERV filter.
- If higher MERV level filters cannot be accommodated using the existing air handling equipment's fans and motors, consider using portable HEPA filter units in high-occupancy or high- bioburden spaces, such as building entries.
- Be mindful that higher MERV level filters generally require more frequent changing, with failure to do such diminishing efficacy and impairing HVAC operations.

DEM Assistance

- The Load Management Team is available to help agency staff conduct system evaluations and identify opportunities to improve efficiency while complying with public health recommendations.
  - For system evaluation assistance, please contact Estatio Gutierrez (esgutierrez@dcas.nyc.gov).
- For log-in access to **EnerTrac** or help adding a meter label for easier tracking, please contact Iffat Jahan (ijahan@dcas.nyc.gov).

[1] ASHRAE, "Building Readiness" *ASHRAE Website,* https://www.ashrae.org/technical-resources/building-readiness