Frequently Asked Questions: COVID-19 HVAC Resiliency Program

CARBON LIGHTHOUSE
PROFITABLE CLIMATE SOLUTIONS

What are the recommended defenses?

1. **Highly recommend measures.** These are in accordance with the CDC to defend against COVID-19 transmission.
    a. **Minimize the number of tenants** and **social distance** in buildings at all times.
    b. **Control density of people** in common areas (ex. phased shifts or offsetting lobby/elevator enter and exit times).
    c. **Increase cleaning procedures and frequency** (when it comes to cleaning, ensure disinfectant stays on the surface for at least a few minutes).
    d. **Require Personal Protective Equipment** (PPE) such as wearing masks and encourage responsible personal hygiene i.e., **washing hands** for at least 20 seconds.
        i. **Minimize interaction with high contact areas** by installing door foot handles, motion sensing faucets/soap/towel dispensers, and automated sanitizer dispensers.
    e. **Implement administrative controls** such as temperature checks prior to entry and develop visitor questionnaires.
    f. **Install engineered controls:** Where appropriate, install dividers and guards in areas of high density, including rearranging furniture to facilitate social distancing.

2. **Additional Carbon Lighthouse recommended measures for HVAC.** We have reviewed evidence that suggests these solutions, on top of the CDC Guidelines which are primary preventers, may be effective in reducing the risk of viral spread. The science is changing frequently, so we anticipate this resource to be a fluid document.
    a. **Clean air dilution.** Clean air is not limited to outside air. You can also use return air. We recommend 3-4 air changes per hour, or ACH.
        i. For added precaution, running the system post occupancy typically for 1-2 hours should be sufficient to entirely replace the air in the room.
    b. **In-Room/Upper-Room Ultraviolet Germicidal Irradiation (UVGI).** These are lights that use UV spectrum (mainly UV-C Energy at ~265nm) to deactivate viral particles. Because this measure can be very expensive in large spaces, we recommend implementing this measure in high density areas where you have less control over people coming in and out of the space such as bathrooms, lobbies and elevators. Our guidance is approximately 36W UV per 240 sqft of coverage. (See Section 3.2 of IES Committee Report CR-2-20)
    c. **Disable any existing Demand Controlled Ventilation (DCV) in zone.** This will allow a zone to continue to ventilate when there is no demand or occupancy.
        i. A good example of where this could be implemented is in bathrooms where exhaust typically would only turn on when there are people occupying it. Disabling DCV will ensure rooms are constantly being exhausted.
    d. **Disable Personal Fans.** There is some evidence that high velocity airflow can make droplets travel longer such as from one workstation to another socially distanced workstation.

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What are the recommended defenses? Cont.

3. Extra Insurance Measures. These are measures that are either still in active debate or may be unnecessary if using Carbon Lighthouse recommended measures. There is only circumstantial evidence of these measures being effective.

a. Upgrade from typical **MERV-8 filters to MERV 13-16 filters**. While MERV 13-16 filters are effective in trapping particles, they require heavy energy consumption. There are other significant factors that will prevent the virus from recirculating in ducts:
   i. Larger droplets are heavy and will fall to the ground almost immediately.
   ii. Particles produced closer to the floor level will not be entrained and captured by the return air grille unless they are first mixed into room air as if they were gases -- making them highly diluted in that case.

b. 100% Outdoor Air (OA). Not necessary for dilution. Bringing in 100% OA will result in higher energy usage and provide little additional benefit over clean air dilution. This measure is not practical for wildfire risk zones, peak cooling or heating seasons.
   i. Note that energy use will be even higher if HEPA filters are installed alongside an Outdoor Air practice.

c. Increase humidity to >40%. There is a general principle that maintaining humidity over 40% helps reduce spread of disease (all diseases, not just COVID-19).
   i. There is not strong evidence that temperature and humidity controls can reduce the spread of an infectious disease.
   ii. Additionally, increasing humidity would require additional costly hardware typically required in dry weather.

d. Portable free standing air filters for small confined spaces (bathrooms, conference rooms, small shared offices). Note that the CDC does not recommend spending time in small spaces in general.

e. Dry Hydrogen Peroxide Filtration. While these have a high upfront cost, DHP has shown to reduce microbial contamination in the air and on surfaces.

What is Carbon Lighthouse skeptical about?

1. **UVGI in-duct or central AHU**. This measure is expensive, and there isn't strong evidence that the virus can get sucked into ducts.
   a. In its typical use, UVGI is installed in AHU coils to clean mold or other bacteria off the coils, rather than the air passing through the AHU.
   b. Operators should work to prevent UV exposure to skin and especially the eyes.
2. **HEPA filters**. This may be considered overkill compared to MERV-16 filters, which should be sufficient in trapping particles.
   a. Additional pressure drops will result in higher energy spend from working the fans harder.
3. **24/7 HVAC operation.** This does not provide additional benefit above an appropriately scheduled operation and will be costly.

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What is Carbon Lighthouse skeptical about? Cont.

1. **Electrostatic Precipitation based filtration in-duct or central AHU**. This filter has been increasingly discussed in the marketplace, however, is unlikely to have an incremental benefit over MERV 13-16 filtration.
2. **Ozone Generators:** When used at concentrations that do not exceed public health standards, ozone applied to indoor air does not effectively remove viruses, bacteria, mold, or other biological pollutants.

Could I use Carbon Lighthouse to model how COVID-19 measures will work in my building?

1. Yes. We can help integrate COVID-19 mitigation measures and improvements to building controls to better manage air handling while balancing safety, comfort, and energy expenses.
2. We have sufficient consumption and controls data to quickly provide a proposal for integration and more immediate insights on energy impact

How will Carbon Lighthouse optimize systems as tenant needs shift, and occupancy varies?

1. Our service is already designed around normalizing for the natural changes in buildings over the life of the contract. We might measure & implement in a building that is 65% occupied, and two years later it becomes 95% occupied, and we normalize for that change and re-measure our savings, and potentially identify new opportunities for savings that were not previously available.
2. In an even simpler sense, our service already accommodates for low occupancy conditions every weekend plus holidays.
3. There are two parts to optimizing this:
    a. Understanding load, especially the occupancy component of the load. Having control systems that can react to that, potentially in much larger ways now.

Could COVID-19 mitigation measures be useful in the future, or will these be irrelevant after the pandemic?

1. The integration of COVID-19 mitigation measures into building operations and controls can help building owners better manage air handling while balancing safety, comfort, and energy expenses for years to come, far beyond the pandemic.
2. The key benefits of our COVID-19 HVAC Resiliency Program are avoiding overbuilt solutions that create unwarranted financial pressures — while modernizing your assets for maximum operational efficiency and resilience to future risks like viral outbreaks, extreme weather and fluctuating occupancy.