LET'S CONNECT

COVID-19 UPDATE: June, 2020

OVERVIEW:

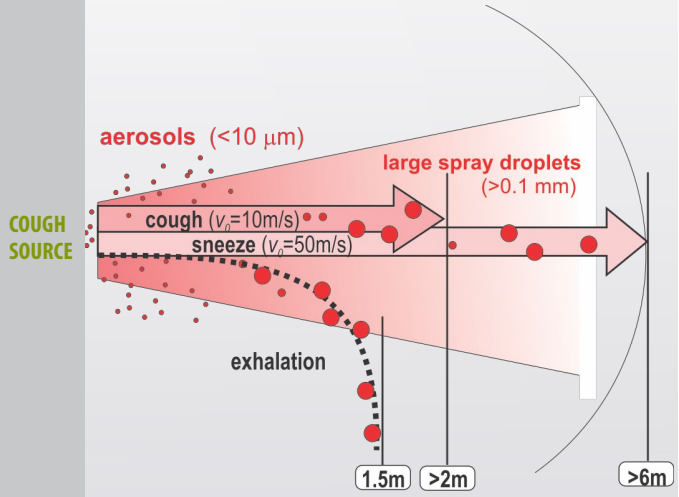
There is a lot of contradictory information floating around about COVID-19 and its impact on the built environment. The scientific understanding of the novel coronavirus is rapidly developing, and while many questions remain, decades of research on indoor air quality and viral transmission can help guide our understanding of managing risk in buildings.

WHAT WE KNOW:

- WHO and CDC state that evidence of transmission predominantly points to large droplet transmission at short range. However, many community spread events are difficult to explain though large droplet transmission exclusively. ASHRAE states that transmission through the air is sufficiently likely, therefore airborne exposure to the virus should be controlled.

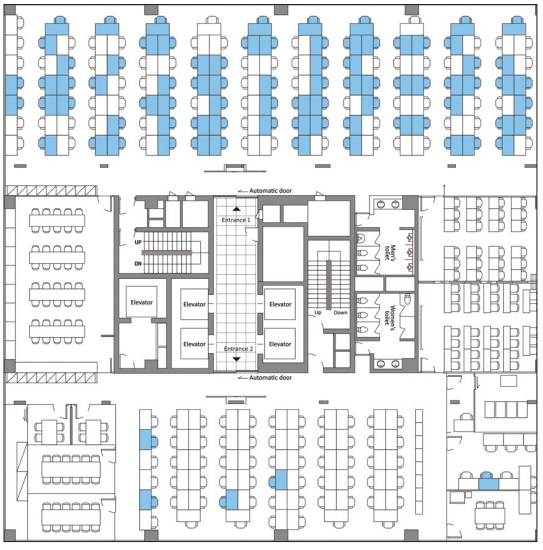
AIR DISTRIBUTION:

- Room air distribution may contribute to risk if it extends distance travelled by large droplets – avoid high-velocity discharge in breathing zone.
- Lower velocity mixing may be preferable to displacement.
- Personalized ventilation / exhaust are options in some cases.



Community spread by distance and type

- The virus has been shown to remain stable in airborne particles for longer than two hours and for days on surfaces. In order to get infected you need to get exposed to an infectious dose of the virus. If the infectious dose for COVID-19 is 1,000 viral particles, infection could occur through 1,000 viral particles in one breath or a rub of the eye, 100 viral particles each in 10 breaths, or 10 viral particles each in 100 breaths. As a result, the amount of exposure and duration of exposure both impact infection likelihood.
- We can't completely eliminate the risk of viral transmission in the built environment, and engineering controls cannot control all infection risk. Steps taken to adjust HVAC systems should be part of an overall strategy that includes wearing masks, configuring operations to allow for distancing and hand washing.
- This picture of a South Korean call center (at right) shows the seating locations of 94 infected employees (blue) on a floor of an office building with 811 employees. Only three employees seated on other floors were infected, and infections were mostly limited to employees seated in the same open office environment, despite the use of shared conference rooms, elevators and amenity spaces.



South Korean Call Center: COVID-19 spread on one floor

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WHAT WE DON'T KNOW:

- The amount of infectious dose that will cause an infection. In the example above, we used 1,000 viral particles as an easy number to demonstrate. Experts suggest that this number for COVID-19 could be as low as a few hundred to a few thousand particles. We don't have experimental evidence to demonstrate this exact level.
- The rate an infectious person sheds the virus. For example, a single breath releases 50 – 5,000 droplets, but the number of viral particles in those droplets is unknown. A person infected with influenza can release up to 33 infectious viral particles per minute.

WHAT ACTIONS YOUR FACILITY CAN TAKE

- Engineering controls are responsible for the ventilation, air distribution, filtration, disinfection (sometimes), and temperature and humidity control.
- Increasing ventilation air quantity can dilute the air in your building and reduce the amount of airborne viral particles. This may depend on the HVAC system type in your building – some systems aren't physically capable of delivering increased ventilation (DOAS, for example), and other systems may not be able to condition a greater quantity of ventilation air. Increased ventilation quantity will also increase energy costs.
- Simulations using the NIST FaTIMA tool (Fate and Transport of Indoor Microbiological Aerosols) performed by ASHRAE suggest that the increase from a MERV 8 filter to a MERV 13 filter without any changes to outside air reduces integrated exposure in a building by as much as 40% in a VAV system. Increasing to 100% outside air using a VAV system and a MERV 8 filter reduces integrated exposure by 44%, but with a significant energy cost increase. MERV 13 filters are able to be retrofitted in many commercial HVAC systems without significant upgrades and may be nearly as effective as increased total outside air. Improved filtration also has other significant health benefits such as reducing harmful particulate matter concentrations (PM 2.5).
- Germicidal UV Light systems are proven over a long record of application to disinfect the air exposed to it. These systems can be installed in HVAC equipment, or directly into spaces, but require more significant capital costs than MERV 13 filters. Other newer technologies such as bipolar ionization, pulsed xenon, vaporized hydrogen peroxide and photocatalytic oxidation, show varying degrees of promise at air disinfection, but have less scientific understanding.
- Air temperature and humidity impact infection risk. Several recent studies recommend 40%-60% relative humidity for infection risk. Studies on coronavirus suggest they are more resilient than some other infectious disease.

ABOUT EMANUELSON-PODAS

Emanuelson-Podas helps make amazing spaces happen. We're an MEP (mechanical, electrical and plumbing) engineering firm that works side-by-side with architects and other building professionals to develop design solutions that get air, power, light and water to the places that matter. A values-driven firm, our services include the full suite of MEP services as well as energy modeling and building commissioning.

SOURCES:

- ASHRAE Presentation: Managing COVID-19 and HVAC in Buildings for Emerging Economies
- https://www.cidrap.umn.edu/news-perspective/2020/05 indoor-spread-covid-19-can-be-lessened-experts-say
- https://www.sciencemediacentre.org/expert-reaction-to-questions-about-covid-19-and-viral-load/
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