Letting in some fresh air to combat the COVID-19 pandemic - by William Gati

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Last Fall, I taught a course at NYIT, School of Architecture in Environmental Design. I dedicated one lecture to the impact of the mechanical systems on indoor air quality. I stated that recirculated, unfiltered air could spread the virus to occupants in the space. Dr. Anthony Fauci, an expert in immunology, later confirmed my theory and closed down most public assembly spaces in New York City.

We can’t keep all public interior spaces closed indefinitely. As more people are allowed to go back to work, school, restaurants, shops, and interior areas, we need to protect their health and safety. What are some practical ways of achieving this, and at what cost?

The most effective way of introducing clean, non-contaminated air into interior spaces is by bringing

in fresh air. This is accomplished by adding a fresh air duct to the HVAC system. Some spaces have operable windows and doors, which should account for 4% of the actual floor area. For example, if you provide fresh air for a 1,000 s/f area, you need 40 s/f of operable windows and doors. Most interior spaces do not meet that requirement and require mechanical ventilation.

As per Greg Mortman, PE, of Automated Design Consultants, mechanical systems need to meet specific building code requirements for fresh air depending on the occupancy. For example, a restaurant requires .18 cubic feet per minute (cfm) of fresh air for every s/f of area. A 1,000 s/f restaurant will need 180 cfm of fresh air. Also, you need 7.5 cfm per person using the space. If you are allowed 70 people in the room, you need an additional 525 cfm. The total is now 705 cfm of fresh air for a 1,000 s/f space. A ton of air-conditioning will provide 250 cfm, so it should have four tons to serve adequately.

To add another layer of complication, NYC has introduced an energy code that requires Demand Control Ventilation (DCV). DCV monitors the level of carbon dioxide and varies the amount of fresh air based on the number of people in the space at any given time. The concept is to cut down the energy needed to temper the air if the occupancy is low. It is conceivable that an inadequate amount of fresh air is introduced into a given space at the beginning of an occupancy increase. Only when a sensor registers a surge in carbon dioxide does it trigger an increase in the fresh air.

Sometimes, energy conservation and good quality of fresh air may be at odds with each other. This leads to the cost of providing fresh air to buildings: it is costly to temper the air, and many owners and developers do not comply to the codes and requirements out of ignorance or intentionally want to save money at the cost of the health, safety, and welfare of their occupants. This is also very hard to regulate and enforce because of access to the units, control panels, and monitoring system. There is, however, an easy way to check compliance: with a portable carbon dioxide meter.

My theory is that whenever the carbon dioxide levels are dangerously high, there is not enough fresh air, and a greater chance of infected air. Most of us have a keen sense if the air in a space smells stuffy, moldy, or of low quality. Be aware that your comfort and safety is of your highest priority. Aside from keeping social distances, wearing face masks, washing hands, not touching your face, and cleaning all surfaces, I would like to introduce the following suggestion to keep people healthy indoors: introduce at least ten cfm per person of fresh air for each occupant using an indoor space and filter the air with a clean HEPA filter for each HVAC unit. ASHRAE recommends a MERV rating of 14 or higher. Regular replacement of filters is required to maintain the MERV rating.

Besides, many interior spaces use split systems and mini-split systems, which recirculate all the interior air and do not introduce any fresh air. This is a serious problem because the virus spreads easily in recirculated air from split systems. To combat this, you must use a fresh air duct to the old-style units or add a Dedicated Outdoor Air System (DOAS) to provide all the fresh air requirements. These units are designed to bring in only tempered fresh air that meets the ten cfm per person that I recommend. You can also incorporate a HEPA filter and/or an ultraviolet filter to your intake and supply lines to substantially reduce the chances of providing toxic air to your occupants.

In conclusion, developers, landlords, architects, engineers, and contractors need to comply with all the existing building code mandates regarding fresh air in public spaces to provide safe and healthy air for occupants to breathe while they are occupying these areas. Regulators, government agencies, and politicians need to be aware that proper use of filtering, fresh air intake, and replacement of old, inefficient units, cleaning up ductwork, and maintaining the mandatory fresh air requirements, can allow more people back inside safely and COVID-19 free.

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