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# Kitchen Dedicated Outdoor Air Systems



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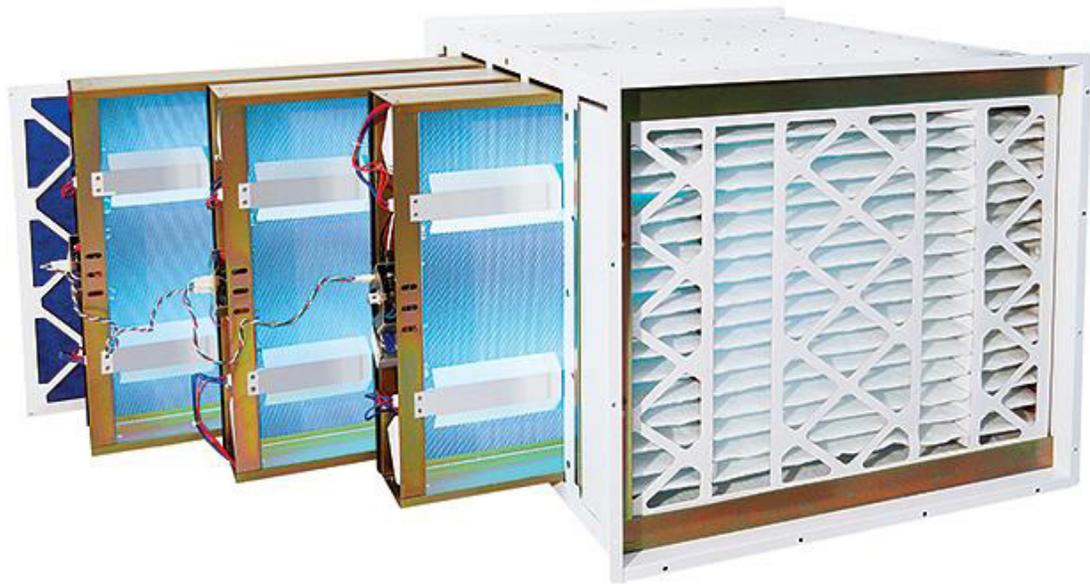
With the ongoing reopening of restaurants and other businesses, many people are rightfully concerned about how to minimize the spread of COVID-19 in enclosed spaces. According to a recent segment on CBS News, proper ventilation of a dining room can drastically reduce the spread of airborne particulates that can carry the virus. Ventilation in the design context happens when fresh outdoor air is introduced to an interior space while the same amount of stale air is exhausted. This helps to maintain healthy CO2 levels in a space as well as to remove the airborne particulates that accumulate in the air.



eat.com / Michelle and  
Chris Gerard

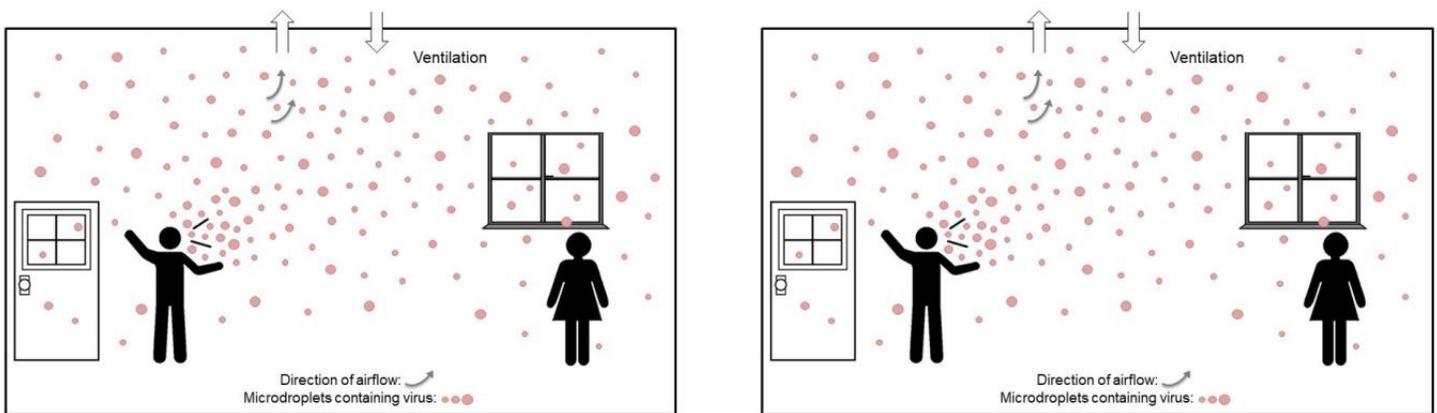
Current research has begun to suggest that COVID-19 is significantly more contagious in indoor environments. COVID-19 is spread more easily in enclosed spaces such as a restaurant because it forces close social interaction, close contact with surfaces and objects that can carry the virus, and forces people within the space to all inhale and exhale the same air. Our current understanding of the virus SARS-CoV-2 which causes the disease COVID-19 is that it is transmitted through aerosolized droplets which are expelled mainly through breathing, sneezing and coughing, though it is also found to spread through other bodily secretions. Thus far there has been no evidence to suggest that COVID-19 can be directly contracted from touching a contaminated surface, but SARS-CoV-2 on a surface can become airborne just through the flow of air, contact with the surface, and if it is on skin, thermal plumes from body heat can carry it off of the skin.

A recent scientific article suggests several ways in which the spread of COVID-19 can be reduced. While no method is 100% effective, a number of preventative measures can greatly reduce the spread of COVID-19 and other diseases. The first, perhaps most obvious method is to introduce a high-quality filtration system. This has been shown to be effective, though studies of filtration systems in hospitals show that it is possible for contaminated airflows to slip around gaps surrounding the filters. Duct-mounted UV light systems can also greatly reduce the occurrence of viruses in system's air supply, though it is recommended to only be used in critical environments to prevent development of UV-resistant viruses. Bipolar ionization filters have also shown a positive impact to reduce the spread of COVID-19. It is also suggested that the humidity of a space be kept between 40-60% relative humidity as a higher level of moisture in the air helps to slow the spread of aerosolized droplets in a space.



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The most effective method found in reducing the spread of airborne viruses was introduction of a steady supply of outdoor air to a space. It is suggested that the easiest way to achieve this is through natural airflow, i.e. open windows directly within the space. However, this can provide complications of its own. If the air surrounding the space is polluted, contains allergens, etc., then having free exchange of this air can actually reduce the air quality in a space. Also, in peak summer months, the air being exchanged can be very hot and humid and in winter months, very cold and dry. Introducing significant amounts of this air into the space can make maintaining a comfortable temperature and humidity in the space very difficult or impossible. The best, most controllable method, especially in a restaurant setting, is through mechanical ventilation.

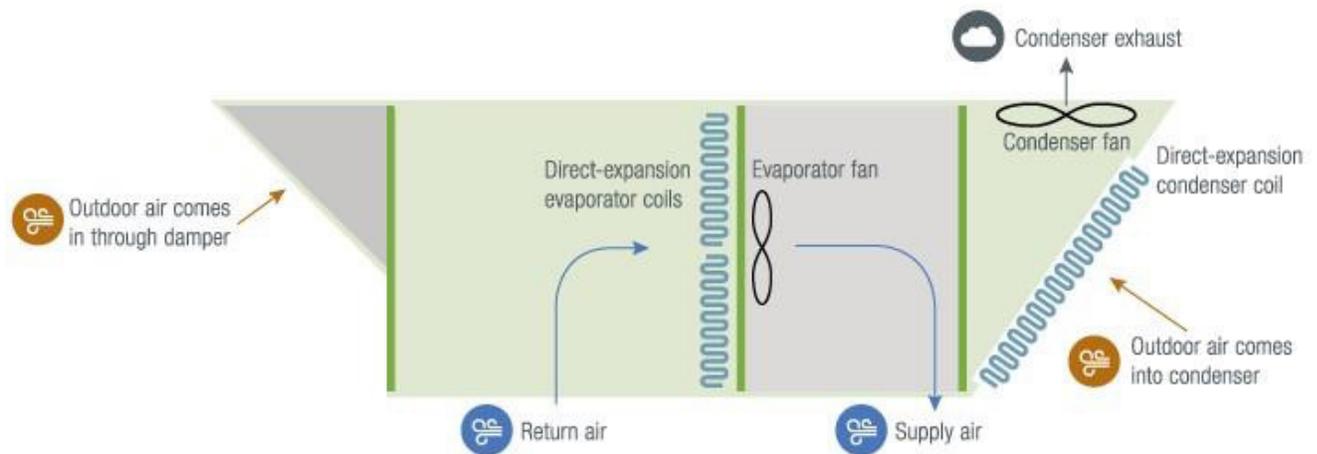


Morawska et al.; Clinical Infectious Diseases 2020

Traditional restaurant design utilizes mechanical ventilation in three main ways: through kitchen exhaust, through subsequent makeup air either to the kitchen area or directly to the hood, and through ventilation in the dining area, either by natural or mechanical means. Typically, the ventilation in the dining area is provided through the HVAC unit serving the area, most often a packaged rooftop unit. This provides a simple way of introducing outside air/ventilation to a space.

However, there is a rising trend in restaurant design to combine the makeup and the ventilation air into one system known as a Dedicated Outdoor Air System, or DOAS. The way this works is that, instead of having a dedicated makeup air unit introducing outside air to the hood, the DOAS provides fully conditioned makeup air to the kitchen and dining areas. In many cases, the required makeup air for a commercial kitchen exhaust hood tends to be higher than the ventilation requirement of that restaurant. As such, the amount of outside air being provided to the dining area can be increased, thus providing greater dilution of contaminants like viruses and bacteria. And because DOAS units are typically on for the majority of the day, they provide a constant supply of fresh outdoor air to the restaurant. A DOAS unit also filters the incoming outdoor air to reduce allergens and pollutants that can be found in outdoor air.

Introducing a DOAS to a restaurant has many benefits in addition to helping reduce the spread of viruses. Because it fully cools outdoor air, it helps to dehumidify the air in the summer, allowing greater comfort in the space. Because it also heats outdoor air, the space will remain comfortable in the winter as well. In this way, the system can take care of all the HVAC needs of the space as makeup air for the hoods in the kitchen, the ventilation air for the dining room, as well as providing the heating and cooling required in the space. DOAS units also typically come with a fully modulating scroll compressor which allows it to run at partial loads, which allows for a significant energy savings. Some utilities even offer customers rebates for operating units with modulating compressors as they greatly reduce the strain on the electrical grid due to cycling on and off far less.



Source: E Source; adapted from National Renewable Energy Laboratory

With a goal of reducing the spread of COVID-19 and other viruses, increased outdoor airflow facilitated by the use of a DOAS unit helps to cycle in non-contaminated air while pulling the contaminated air out of a space. The dehumidification during the cooling process helps to maintain a proper humidity in the space, further contributing to indoor air quality. Bringing a steady supply of outdoor air into a space is considered to be the most effective way to reduce transmission of viruses, and a DOAS unit is a great way to do just that. As more restaurants and other spaces continue to be designed with indoor air quality and virus transmission reduction in mind, our public spaces will become safer and we can see a real reduction in the spread of airborne diseases.

Ryan Soames Engineering is a full-service MEP design and consulting firm with offices in New York, New Jersey, and Miami. We have many years of restaurant design experience, from walk-up food court restaurants to multi-floor upscale dining spaces and everything in between. We work hard to take the needs of each client and their restaurant into consideration when designing systems for their restaurant. As the COVID-19 pandemic continues, we are utilizing numerous methods as mentioned in this article to improve the air quality and safety of many spaces, from full ground-up design jobs to simple modifications to existing systems. Our engineers are staying up to date with the latest scientific articles and studies related to COVID-19 to ensure our designs are reducing the spread of COVID-19 and other airborne diseases to the greatest possible extent. Whether it's the simple installation of a humidification system or a full-fledged COVID-19 reducing design, Ryan Soames Engineering has you covered.



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