HVAC SOLUTIONS
For Reducing Airborne Pathogens
- New Construction

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Most North Americans spend approximately 90% of their time indoors, whether they are at school, at work, or out shopping, so indoor air quality (IAQ) can have a significant effect on the health of the population.

The quality of the air delivered by an HVAC system is commonly measured by its ventilation effectiveness, which is the ability of the system to remove internally generated airborne pollutants from a space. Generally, the HVAC system removes pollutants through the introduction of fresh, clean air and removal of polluted air. Ventilation Effectiveness, the quantity, is a function of Room Air Distribution airflow patterns and is measured as: Concentration of contaminants in Return / Concentration of contaminants in Occupied Zone.

Ventilation and filtration provided by heating, ventilating, and air-conditioning (HVAC) systems can reduce the airborne concentration of SARS-CoV-2 (the virus that causes COVID-19) and thus the risk of transmission through the air.¹

From improved filtration to alternative supply air methodologies, changes to your HVAC system can reduce the probability of exposure to airborne pathogens within workplaces, schools, and other high occupancy areas.

Particle size & suspension time comparison

<table>
<thead>
<tr>
<th>Particulate</th>
<th>Diameter</th>
<th>Suspension Time</th>
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<tbody>
<tr>
<td>COVID-19 Virus</td>
<td>&lt;1 µm</td>
<td>Can remain suspended for hours</td>
</tr>
<tr>
<td>Bacteria &amp; Aerosols</td>
<td>&lt;5 µm</td>
<td>Can remain suspended for hours</td>
</tr>
<tr>
<td>Pollen &amp; Droplets</td>
<td>5-100 µm</td>
<td>Can remain suspended for minutes</td>
</tr>
<tr>
<td>Human Hair</td>
<td>20-180 µm</td>
<td>Suspended for seconds</td>
</tr>
</tbody>
</table>

¹https://www.ashrae.org/technical-resources/resources

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For larger scale remodels, renovations, or new construction consider Underfloor Air Distribution or Displacement Ventilation.

**IMPROVED OCCUPANT WELLNESS**

Stratified Air Systems deliver air directly into the breathing zone pushing contaminants up and out of the space. The results are improved indoor air quality, and less contaminants and airborne pathogens in the occupied zone. Research studies have found that stratified air system ventilation effectiveness can be twice as high as mixing systems. [Price Engineer's HVAC Handbook, Ch4 Table 4.1]

**INCREASED FLEXIBILITY**

Underfloor service and air delivery can cut reconfiguration costs and time significantly through easily accessed power and data cabling and non-ducted air devices. This will reduce long term costs as businesses adjust to meet continually evolving office requirements for occupant density and furniture layouts. 2,9

**Underfloor Air Distribution (UFAD)** is an alternative to traditional overhead air distribution that delivers air from a pressurized air plenum beneath a raised access floor, relying on the natural buoyancy of air to remove heat and contaminants.

Displacement Ventilation operates on the same principles as UFAD supplying air directly into the occupied zone and creating stratification. Typically diffusers are ducted from the ceiling to a low level supply diffuser. In some cases ceiling diffusers can be used to free up wall or floor space.

**Displacement Chilled Beam Cabinet**
- Displacement air flow pattern
- Minimized ductwork cost
- Reduced energy costs from hydronic system

**Corner Displacement Unit**

**DISPERSION OF AIR:**
- Mixing conditions the entire room with temperature and contaminants mixed uniformly throughout.
- Displacement conditions only the occupied zone. The air is not mixed in this system, but instead air motion is driven by the heat sources pushing contaminants upwards out of the breathing zone.

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8 Alspach, Peter, P.E., & Moellenberndt, Anne Marie, P.E., Copyright ASHRAE. (2014). Impatient Optimism. Posted at: https://www.hpbmagazine.org/


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**DISPLACEMENT SUPPLY, FILTERED RETURN, AND ROOM FILTRATION**

Displacement ventilation provides low velocity air at higher temperatures to create a comfortable environment. This type of approach to air delivery relies on natural convection to move the air throughout the space making it energy efficient. The air is supplied at low level and pushes contaminants and particles upwards out of the breathing zone resulting in improved air quality\(^2,3,4,5,6\) instead of recycling contaminants back into the space. Enhanced filtration of the return air is provided by the MERV13 filters on the series fan powered terminal unit.

### Option 1
**Ceiling Displacement**

Displacement Flow Ceiling Diffuser (DFCD)

A ceiling model DFC displacement diffuser can be installed in a typical ceiling grid and paired with overhead ductwork and terminal units.

- Fits into standard T-bar ceiling grid
- 2’ x 2’ and 2’ x 4’ sizes available
- Low pressure drop minimizes impact on system
- Quiet air delivery
- Comfortable, occupant driven airflow

### Option 2
**Ceiling Displacement with Fan Mixing Box**

A fan mixing box with a MERV 13 filter is paired with ceiling mounted displacement diffusers (DFC) to provide enhanced filtration of the recirculated air. The FDC mixes return air to provide 62°F supply air temperature.

- Fan mixing box replaces VAV terminal
- MERV13 filter option
- 400 - 1,500 cfm
- ECM motors

### Option 3
**Low Level Displacement with Fan Mixing Box**

1 Way Corner Displacement Diffuser (DFC1)

Ductwork can be routed from the ceiling or walls and connected to the corner Displacement Corner Cabinet. This low level supply provides improved ventilation effectiveness, quiet air delivery, and comfortable airflow for occupants.

- Improved ventilation effectiveness
- Low level supply
- Non-intrusive exposed duct
- Duct cover options
  - Solid
  - Perforated
- Various sizes available
- Quiet air delivery
- Comfortable, occupant driven airflow
- Up to 850 cfm

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Designers of new and existing facilities could go beyond the minimum requirements of published standards to be even better prepared to control the dissemination of infectious aerosols. The following modifications to building HVAC system operation should be considered for non-healthcare buildings:

- Increase outdoor air ventilation (disable demand-controlled ventilation and open outdoor air dampers to 100% as indoor and outdoor conditions permit).
- Improve central air and other HVAC filtration to MERV-13 (ASHRAE 2017b) or the highest level achievable.
- Add portable room air cleaners with HEPA or high-MERV filters with due consideration to the clean air delivery rate (AHAM 2015).


New construction overhead mixing systems can utilize targeted filtration to address specific zones that may have higher occupant activity or filtration requirements. Filtration at specific diffusers effectively reduces the concentration of airborne contaminants, thereby reducing the probability of exposure to airborne germs, viruses, and bacteria. Portable in-room filtration is the quickest way to improve air quality and our commercial grade units are easily positioned where they’re needed most.

**Option 1**
Portable Air Purification

The Price Room Air Purifier (RAP) improves indoor air quality with air filtration wherever and whenever you need it. The RAP is designed to continuously cycle air through a HEPA filter, eliminating unwanted dust particles, germs and contaminants.

- Plugs into standard outlet with 115V power cord
- Energy efficient and quiet EC motor
- Adjustable fan speed
- Locking casters allow ease of mobility
- Prefilter & HEPA filter
- 150-600 cfm
- Optional UV lights and bipolar ionization

**Option 2**
Recessed Diffusers with Integrated Ceiling-Access Filters

Filtered Diffuser Module (FDM)
Diffusers with ceiling-access filters have a 6” plenum box and are installed on top of the t-bar ceiling grid, replacing existing diffusers. These diffusers have integrated MERV 13 or 15 filters that require access to the ceiling plenum for periodic replacement. Filters are slid in or out of this diffuser through a hinged access door on the side of the unit. This diffuser style is available in any of the Price, T-bar ceiling diffuser models.

**Option 3**
Overhead Air Purifier (OAP)

The goal of the Overhead Air Purifier (OAP) is to filter room air through consistent air changes. The fan powered unit draws air directly from the space, through a MERV rated filter, and discharges the clean air directly back into the space. The OAP is designed to be installed directly above any space and does not require modification to existing ductwork or other HVAC equipment.

The OAP can be installed in a T-Bar ceiling or an exposed ductwork layout. The unit pair perfectly with any Price, grilles or diffusers. The OAP is suitable for offices, classrooms, or any space requiring increased air filtration.

- Quick installation
- Simple air flow adjustments with EC motor
- Easy filter changes
- Quiet, low energy operation
- 200-500 CFM
- Larger sizes available
- Compatible with MERV filters

Air flows from the space through the return grille (A) and then through a MERV13 filter (B). This provides increased filtration while also using the fan to overcome the additional pressure drop. The filtered air exits the OAP and is sent into the occupied space through the ceiling diffuser (C).

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Traditionally hospitals are built with very few airborne infectious isolation rooms (AIIR) as these spaces are seldom used and are more expensive to build and operate than standard patient rooms. The pandemic ready patient room solution from Price and Antec Controls allows the hospital to build one room that can be used for either standard patient care or as an AIIR, and can change between operational modes at the touch of a button, a feature that may be sought after post Covid-19¹.

For more information on Pandemic Ready Patient Rooms, please view the full brochure.


²Air changes per hour

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Increased air change rates and extraction of aerosolized contaminants directly at the source can help protect dentists and hygienists from exposure to any aerosols generated during dental procedures. Dental Operatory solutions from Price make use of engineering controls including high-volume source extraction 1, HEPA filtration 2, and recirculated room air to improve indoor air quality while maximizing contamination control and system efficiency.

The amount of time required for removal of airborne contaminants from a space varies based on the air change rate. The addition of a HEPA air filtration unit can reduce aerosol concentrations in the room and increase the effectiveness of the turnover time 3. As an example, increasing from 4 ACH, typical in many dental operatories, to 12 ACH with the addition of a HEPA filtration unit reduces the time to remove 99.9% of airborne contaminants from 104 minutes to 35 minutes, a 66% reduction.

Dental operatories can be configured in many ways. The system shown here provides complete pressure control of the space to allow the dental operatory to function as a standard operatory or negative pressure isolation room, and can change between operational modes at the touch of a button.

In Normal Operation the room will function similar to the base system with minimal air changes and no pressure requirements. In Pandemic Mode air changes will be increased and the space will be held at negative pressure relative to adjoining spaces.

For more information on Dental Operatories, please view the full brochure.

**ROOM REQUIREMENTS**

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<thead>
<tr>
<th></th>
<th>STANDARD ROOM</th>
<th>RETROFIT ROOM</th>
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</thead>
<tbody>
<tr>
<td>Air changes per hour</td>
<td>4 ACH</td>
<td>12 ACH</td>
</tr>
<tr>
<td>Required airflow</td>
<td>200 cfm</td>
<td>600 cfm</td>
</tr>
<tr>
<td>Time required for 99.9% removal or settling of aerosols</td>
<td>104 minutes</td>
<td>35 minutes</td>
</tr>
</tbody>
</table>


All airflows based on a 15 x 20 ft. room with 10 ft. ceiling.


4 Airflow requirement varies by room size and occupancy, refer to ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality Table 6-1 for guidance. 5 All airflows based on a 15 x 20 ft. room with 10 ft. ceiling.

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RESOURCES

For continuously updated resources relevant to **COVID-19**, please visit our [COVID-19 Resources page](#).

For **retrofit applications** projects, please visit our [HVAC Solutions for Reducing Airborne Pathogens - Retrofit Applications Brochure](#).

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