

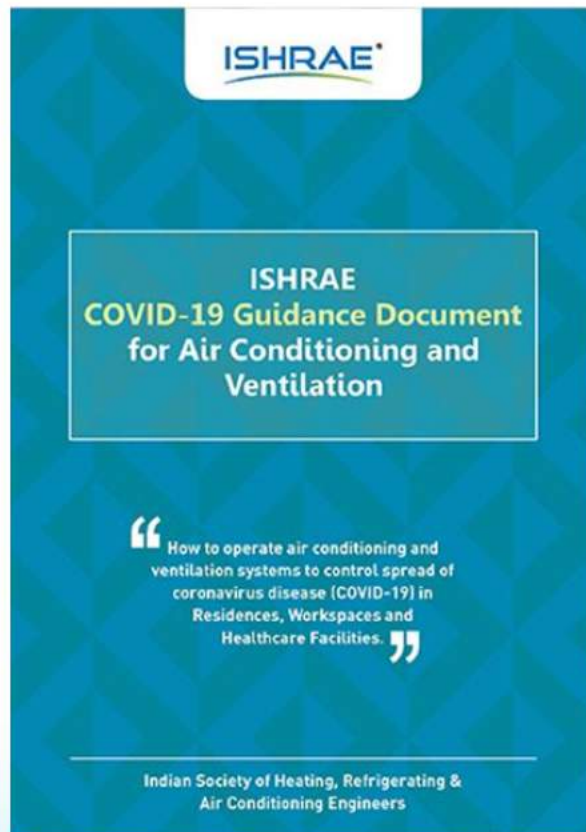
**To prevent the spread of COVID-19
infectious disease at Workplace in
Commercial Buildings with Energy
Optimization**



**Energy Saving
15-20%
for HVAC**

Mumbai | Pune | Hyderabad | Gurgaon | Bengaluru

ISHRAE GUIDELINES RELATED TO COVID-19

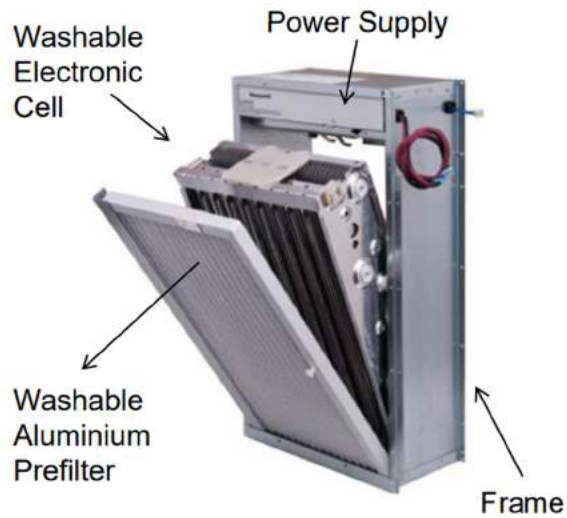


- **ISHRAE** has recently released a set of recommendations for facilities operated with air conditioning and ventilation on the Indian Sub-Continent to effectively control the spread of infectious diseases.

Key aspects of these guidelines are –

- **Reduction of indoor dust levels** (particulate matter) which acts as a substrate for viruses and their transmission by using filters with MERV rating of 13 and above.
- **Provide adequate ventilation** (Fresh air and Exhaust) - A minimum fresh air volume of 3 cubic m/hour per person and 3.75 cubic m per hour per sqm (5 cfm per person and 0.6 cfm per sqft) is recommended.
- **Maintain relative humidity level of 40% - 70%** for comfort of building occupants and also reduce problems related to pathogens.

- **Electronic Air Filter with UV :**



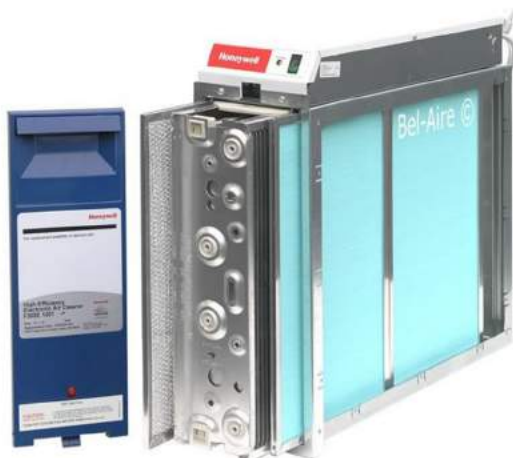
Honeywell Electronic Air Filter with UV - MERV 14 Rating

In the indoor environment, one of the sources of dust is atmospheric dust (PM2.5 and PM10) coming in through fresh air intakes.

Reduction of indoor dust levels is a step towards mitigation of this source of Infectious disease transmission.

Honeywell EAC filter with UV having MERV-14 (97% efficiency) rating help to reduce PM 2.5 and PM 10 and will also help to save Energy Cost of AHU by 10-15%.

- **Electronic Air Cleaners :**

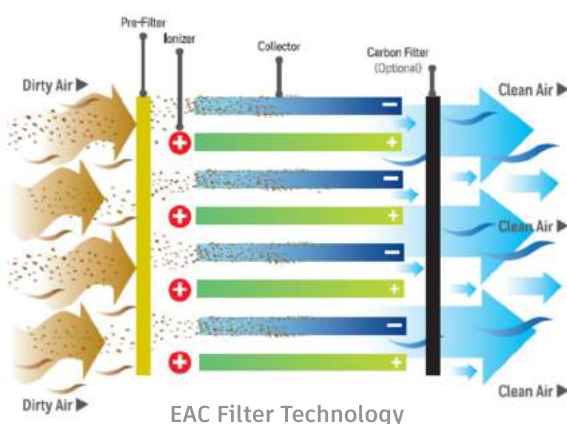


EAC – Low Air Flow Resistance, Efficient Fan Operation

Just like in face masks, highly efficient media air filters offer **too much resistance to the airflow.**

This causes the fan to **work harder, run longer** and **use up more energy** to achieve the desired thermal comfort.

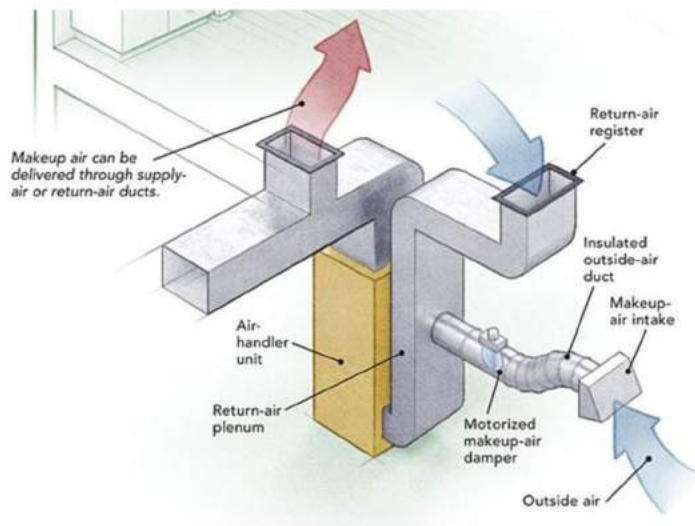
Electronic air cleaner does not restrict air flow. It has high air filtration efficiency and very low pressure drop.



Air Filtration Efficiency for Various Particle Sizes:

Particle Size	Filter Type		
	EAC + Carbon	EAC	Media
>0.3 µm	87%	72%	2%
>0.4 µm	90%	75%	5%
>0.5 µm	95%	82%	14%
>0.65 µm	98%	90%	35%
>0.8 µm	99%	93%	51%
>1.0 µm	100%	95%	65%
>1.6 µm	100%	97%	76%
>2.0µm	100%	98%	85%
>3.0 µm	100%	99%	96%
>4.0 µm	100%	99%	98%
>5.0 µm	100%	100%	99%
>7.5 µm	100%	100%	100%
>10.0 µm	100%	100%	100%
>15.0 µm	100%	100%	100%
>20.0 µm	100%	100%	100%

- **Fresh Air Intake with Demand Control Ventilation:**



To determine ventilation rates in breathing zone, there are two procedures recommended by ASHRAE.

- Ventilation Rate Procedure (VRP) - $(V_{bz} = R_{pZ} + R_{aZ})$
- Indoor Air Quality Procedure (IAQP)

Minimum ventilation requirement

As per VRP (Most commonly used method) –

- 5 cfm per person
- 0.06 cfm /Sqft
- 5-7 Person/ 1000 Sqft

As per IAQP (Method suitable for current environment) –

- 7.5 – 11.66 CFM Per Person
- 4-5 ACPH
- Limits of Containment (CO₂,PM level)

Importance of IAQP in current scenario:

- Build positive air pressure in workspace
- Replace exhaled air
- Reduce recirculation of contaminated air
- Reduce bacterial growth
- Control PM_{2.5} and PM₁₀ pollutants

Case Name	IAQ Strategy	Economizer Strategy
Base Case (VRP)	Fixed min outside air	No economizer
Temp	Fixed min outside air	Dry bulb
Enth	Fixed min outside air	Enthalpy
BaselAQ	Demand-controlled ventilation	No economizer
TemplAQ	Demand-controlled ventilation	Dry bulb
EnthIAQ (IAQP)	Demand-controlled ventilation	Enthalpy

We designed HVAC Retrofit and Demand Control Ventilation will help customer to Save Energy by 15-20% along with Fresh Air Intake requirement as per ISHARE guidelines.

- **Relative Humidity and Area Temperature :**



Thermostat for Humidity and Temperature Control

Relative humidity is found to affect the infectivity (the ease with which infection can take place) of viruses through the respiratory route.

Moisture in the air is the first arm of our immune system and we now know that our body cannot fight off foreign particles or invaders as adequately as when we're in a dry environment.

Further, the infectivity of the bacteria too increases with low humidity.

Relative humidity of at least 40% is considered the threshold.

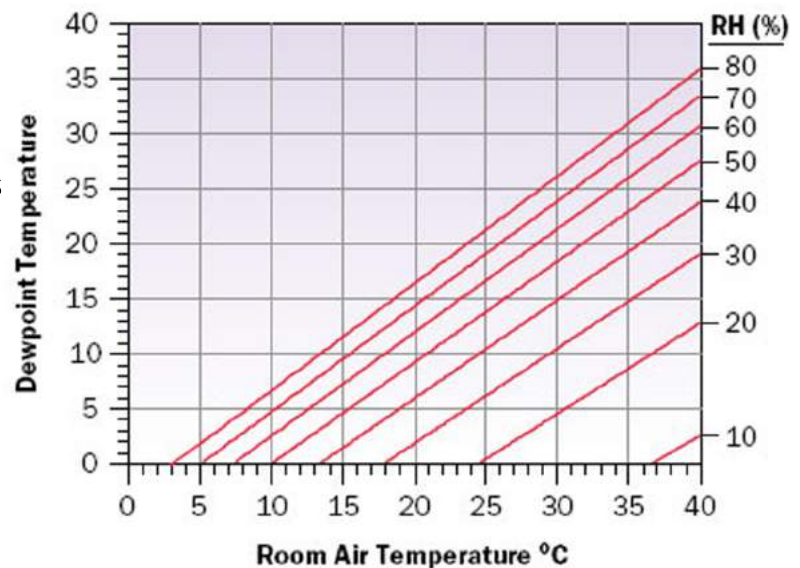
Studies indicate that 80% relative humidity and above tend to neutralize the infectious disease virus.

However, environmental effects lead to-

- Hourly variation in RH
- Season variation in RH - 38% to 70 %
- Low humidity during winters
- Different humidity level in different zones

New Guidelines-

- Maintain **RH 50-55%**
- Maintain **Temperature 20-24 Deg C**



Dewpoint temperature vs. room air temperature for lines of constant relative humidity.

- **HVAC Indoor Air Quality with Energy Optimization :**

- Fresh air volume modulation - Volume selection based upon Enthalpy and Demand
- Dynamic pressure balancing by Damper Control to maintain positive pressure
- Indirect heat transfer from Exhaust Air
- 2-way valve control based upon Mix/supply air temperature
- Humidifying / De-humidifying control with respect to Dew Point
- EAC & UV for PM and pathogens

BuildINT

Transforming Energy Lives!



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