

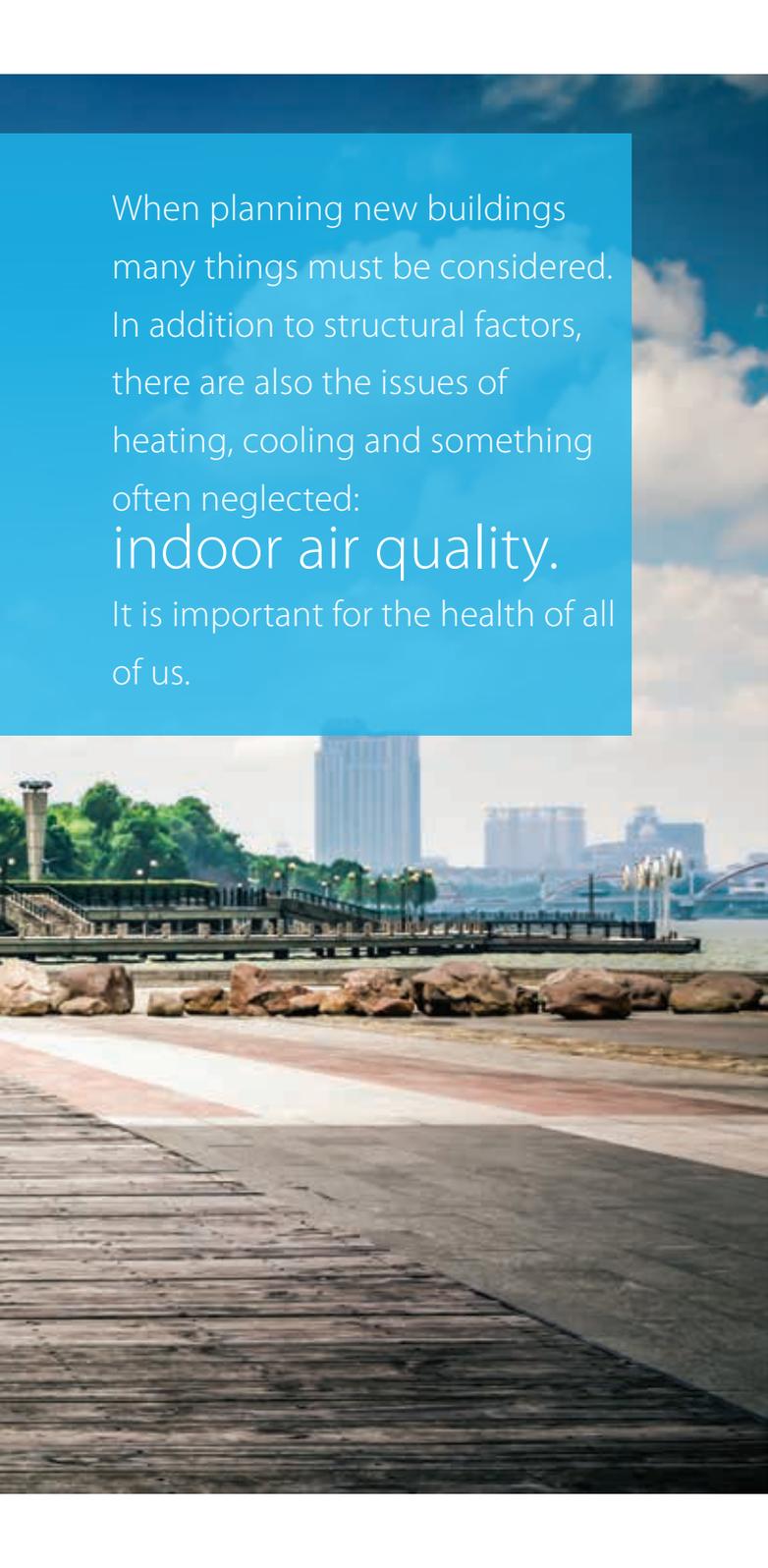


Indoor Air Quality Solutions



All you ever wanted to know
about Indoor Air Quality





When planning new buildings many things must be considered. In addition to structural factors, there are also the issues of heating, cooling and something often neglected:
indoor air quality.
It is important for the health of all of us.

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Indoor Air Quality & the Effect on Healthy and Productive Workplace



Indoor air pollution is ranked as one of EPA's* **TOP 5 environmental risks to public health.**

An extensive body of scientific evidence demonstrates that short- and long-term exposure to **fine particle pollution negatively affects the cardiovascular system.**

Proper air filtration and air treatment has been proven to **reduce the spread of viruses and other contaminants.**

Numerous studies (e.g. conducted by the **Harvard School of Public Health***), established **a clear link between indoor air quality and workplace performance & productivity.**

*EPA - United States Environmental Protection Agency

*Economic, Environmental and Health Implications of Enhanced Ventilation in Office Buildings by MacNaughton P, Pegues J., Satish U., Santanam S., Spengler J. and Allen J., International Journal of Environmental Research and Public Health, November 2015

Common Indoor Air Pollutants



Pollen



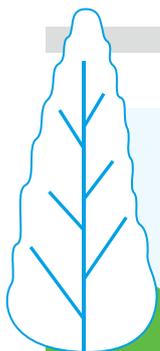
Spores



Germs



Dust

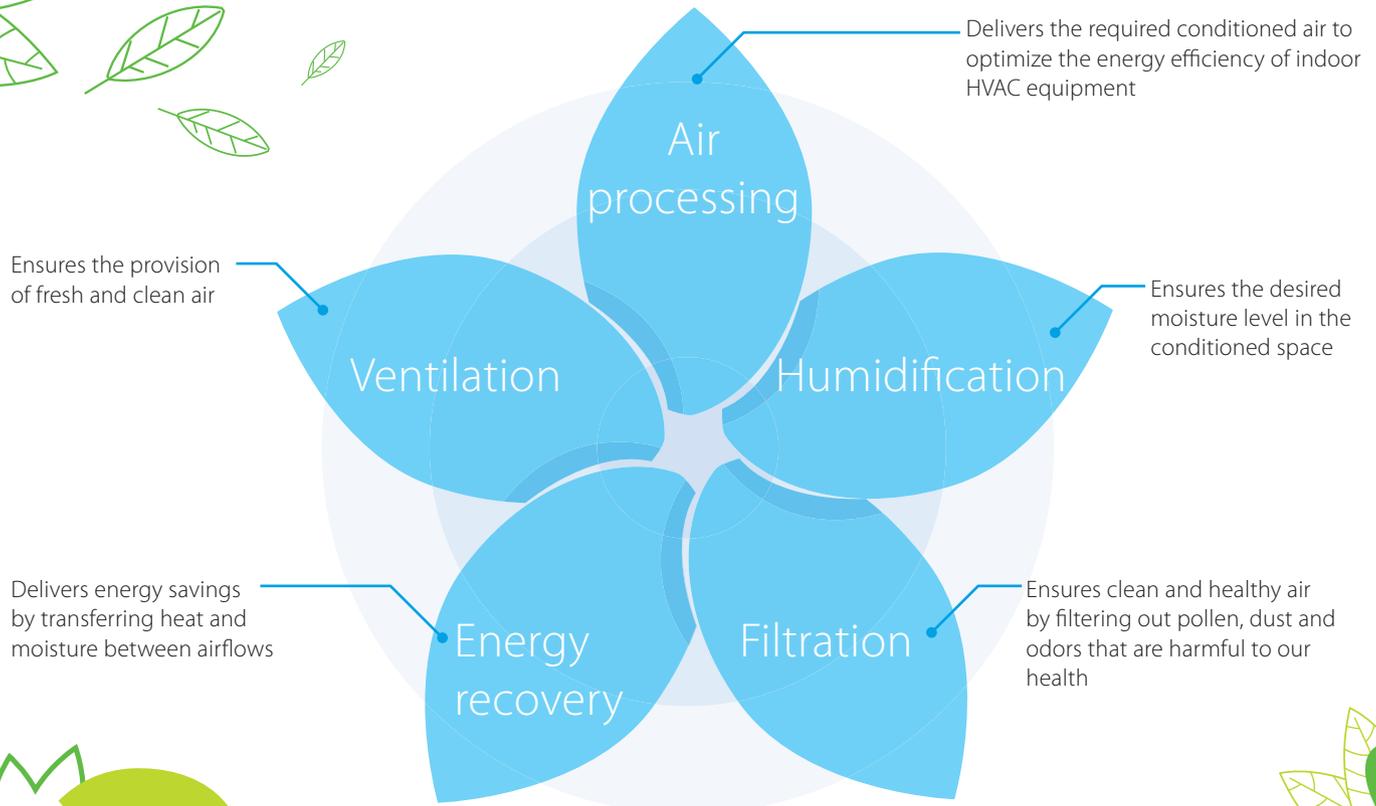


Microbes
(bacteria, viruses & microorganisms)



Carbon
Dioxide

Five Components of Indoor Air Quality



Particulate Matter and their Harmfulness to the Human Body



The particles
in the air

can vary from simple pollen grains
to germs, bacteria and viruses



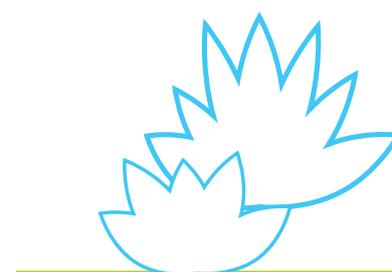
Particulate
matter

are categorized based on their size



The smaller
the particle,

the more dangerous for our health



Aerodynamic diameter of particles and their region of deposit



PM10
all particles
up to 10 μm
(0.01 mm)

deposit in the nose and pharynx
of the human respiratory system



PM2.5
all particles
up to 2.5 μm
(0.0025 mm)

are small enough to reach
the human lung



PM10
all particles
up to 1 μm
(0.001 mm = 1 micron)

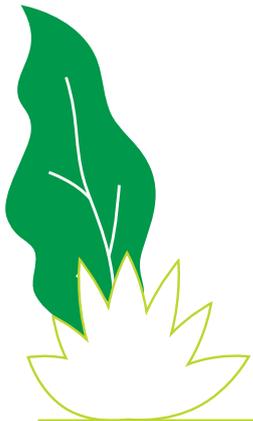
are small enough to find their way
through the cell membranes of the
alveoli into the human blood stream
and cause life-threatening diseases

Human hair
100 μm

Influenza virus
0.08 - 0.12 μm

SARS Covid-19 virus
0.1 μm

*ISO 16890 filter ratings – classification is oriented
towards the region of deposit in the human lung



Sick Building Syndrome



1

Sick Building Syndrome (SBS) describes a medical condition where people in a building suffer from symptoms of illness or feel unwell for no apparent reason.

2

The symptoms tend to increase in severity with the time people spend in the building, and improve over time or even disappear when people are away from the building.

3

SBS causes reduced work performance, loss of productivity and increased absenteeism.

SBS May Occur in Most Type of Buildings



office



shop



hotel



production
facility



restaurant



gym

A building where there are a substantial number of people with SBS symptoms is referred to as a "sick building".

Common SBS Symptoms



irritated, dry or watering eyes
itching, tiredness, redness, burning or difficulty wearing contact lenses

irritated, runny or blocked nose
congestion, nosebleeds, itchy or stuffy nose

dryness, itching or irritation of the skin
occasionally with a rash

dry or sore throat
irritation, upper airway irritation or difficulty swallowing

less specific symptoms
such as headache, lethargy, irritability and poor concentration

Often several symptoms are experienced at the same time and accompanied by complaints about poor air quality, dry air, noise or temperatures which are too warm or too cold.

A sick building may result from the way in which the building is designed and constructed or from the way, it is operated, maintained and used.



Why do I Need to Ventilate?



In a completely closed room in a building, air cannot easily enter/leave the room, causing air pollutants to remain and accumulate in the room. This situation can impact the health of people in the room.

Ventilation is essential for diluting and removing these air pollutants.



The goal of ventilation units is to bring fresh air into closed spaces and exchange it with stale air

Ventilation systems with adequate air-exchange rate are proven to be an effective solution to protect people from contaminants, including viruses

Ventilation systems need to be used and maintained correctly in order to be effective

What to Consider When Choosing a Ventilation System?

Filtration

After the intake of fresh outdoor air a filtration stage is needed, to clean the air. Also the return air filtration is important. Particles from the room moving towards the return air grills have to be filtered out to prevent contamination of the whole ventilation system.

Hygiene

Ventilation units need to be designed in a way to avoid any kind of contamination to prevent the proliferation of molds and bacteria.

Energy efficiency

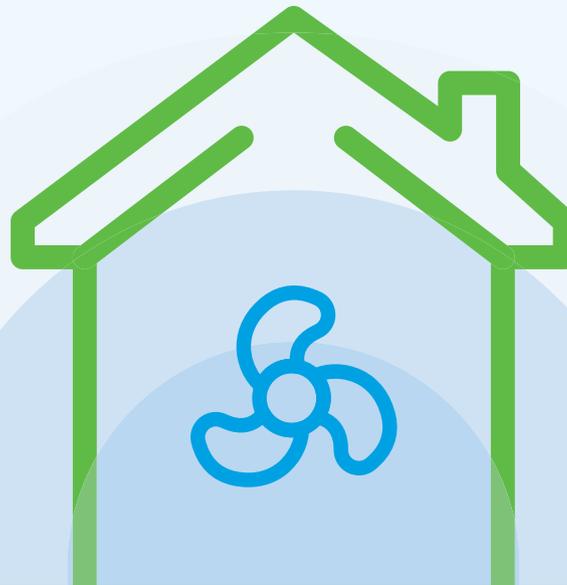
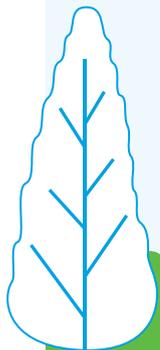
When air is exchanged, thermal energy in the exhaust air needs to be recovered and transferred to the fresh air in the most efficient way.

Noise level

Having a ventilation system able to provide fresh air and air-exchange with the lowest possible noise emission is key to not bother occupants in the building.

Compactness

A compact ventilation unit makes installation easier and allows saving space. It is important to optimize the use of building space and be cost efficient.



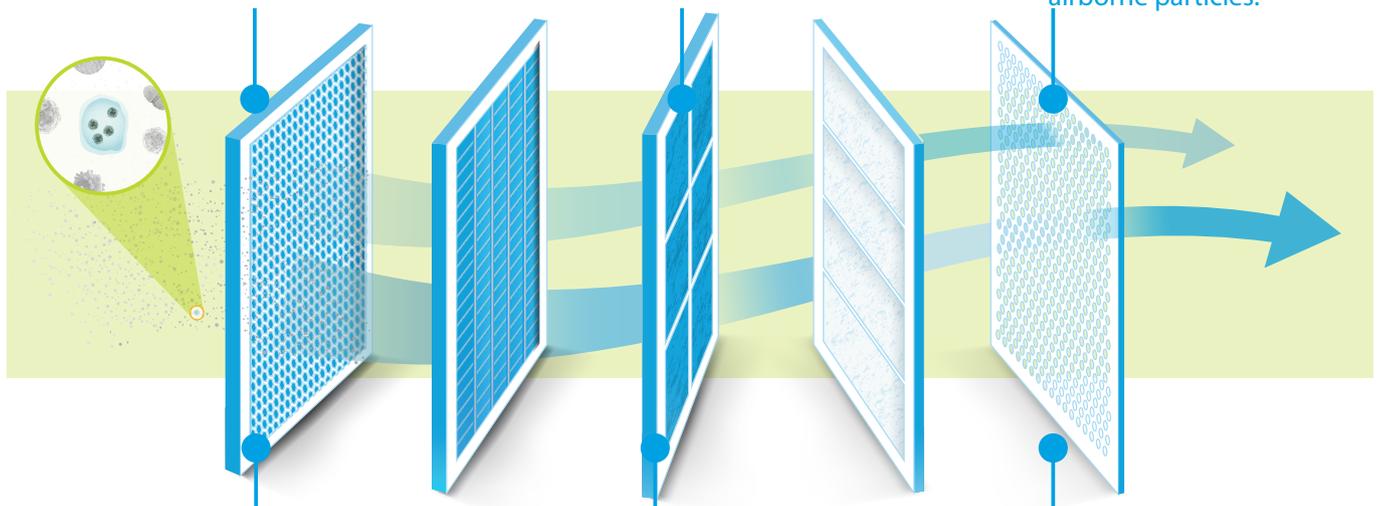
The Role of Filtration



Infectious diseases can be controlled by interrupting the transmission routes used by a pathogen.

Virus particles can piggyback on larger dust particles or droplets and travel through a building.

Using high efficiency air filters in HVAC and ventilation systems can help to capture the majority of airborne particles.



Mechanical filters consist of media with porous structures of fibers or stretched membrane material to remove particles from airstreams.

Some filters have a static electrical charge applied to the media to increase particle removal.

The fraction of particles removed from air passing through a filter is termed "filter efficiency".

High efficiency particulate air (HEPA) filters are at least **99.97%** efficient at filtering $0.3 \mu\text{m}$ particles and in general more efficient than ePM1 filters

Choosing the Right Filter

New ISO16890 standard

The filter classification is made based on the capability to filter out certain particulate matter according to the particle size (i.e. particles $\leq 1 \mu\text{m}$, $\leq 2.5 \mu\text{m}$ or $\leq 10 \mu\text{m}$)

Filter Groups (ISO 16890)	Required minimum filtration			Particulate Matter filtered out:
	ePM _{1,r} min	ePM _{2.5,r} min	ePM ₁₀	
ISO ePM1	$\geq 50 \%$			Nanoparticles, exhaust gases, viruses
ISO ePM2.5		$\geq 50 \%$		Bacteria, fungal and mold spores, pollen, toner dust
ISO ePM10			$\geq 50 \%$	Pollen, desert dust
ISO Coarse			$< 50 \%$	Sand, hair

Filter Efficiency

Overall effectiveness of reducing particle concentrations depends on several factors:



Filter efficiency



Airflow rate through the filter



Size of the particles



Location of the filter in the HVAC system or room air cleaner

- Higher filter efficiency generally results in increased pressure drop through the filter.
- Therefore, it is important to ensure HVAC systems can handle filter upgrades without negative impacts to pressure differentials and/or airflow rates prior to changing filters.



Air disinfection through UV-C light



1

Ultraviolet energy inactivates viral, bacterial, and fungal organisms so they are unable to replicate and potentially cause disease.

2

The entire UV spectrum is capable of inactivating microorganisms, but UV-C energy (wavelengths of 200 – 280µm) provides the most germicidal effect.

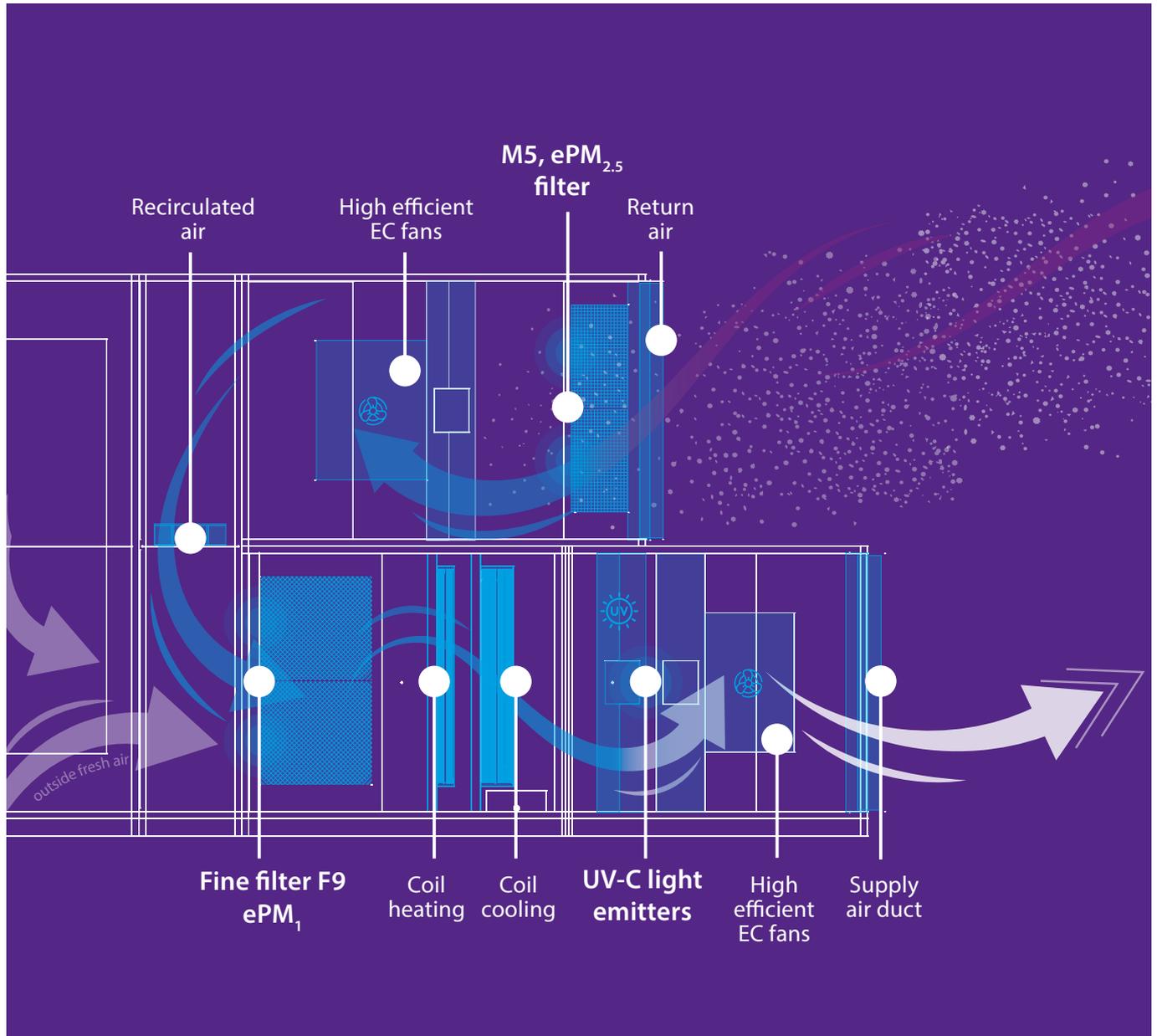
3

Disinfection and sanitization through UV-C light is widely used in hospitals. UV-C light however is a health hazard to the human body.

4

Recirculated & fresh air can be treated with UV-C light directly within the Air Handling Units so clean air, and microbe free air can be achieved without exposing the human body to harmful UV light.

UV-C Light Treatment in Air Handling Units



What Can You Do to Support Better Indoor Air Quality?

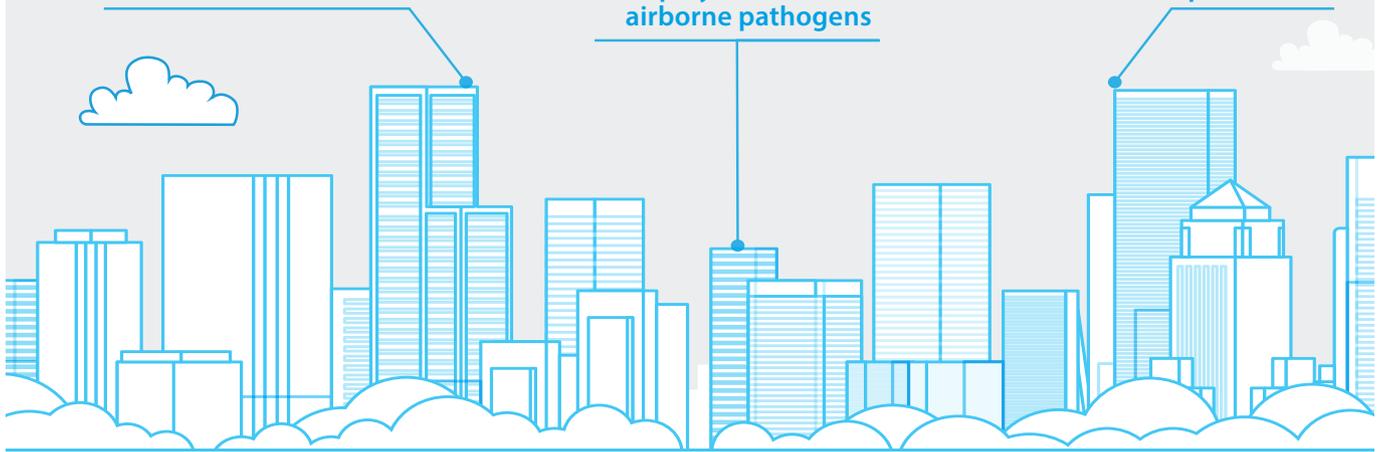


Every building requires regular safety checks

HVAC and ventilation systems need to be operated and maintained properly in order to be effective

Possibly upgrading filter efficiency to capture even smallest particles, helping to keep customers and employees safe from airborne pathogens

Healthy buildings experts suggest replacing current air filters as part of this process



Do you want to know out more?

Check out the information at our website: www.daikin-ce.com/iaq

HVAC industry guidance on Indoor Air Quality & COVID-19:

REHVA: www.rehva.eu/activities/covid-19-guidance

ASHRAE: www.ashrae.org/covid19

World Health Organisation

<https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19>

Daikin Central Europe resources:



DAIKIN

Daikin improves your indoor air quality

Top air treatment through unique filtration and fresh air input

We live in times when we are getting more concerned about the environment we live in and the air we breathe, especially at home.

How can we take care of the indoor air quality among all other things?
It is actually more than easy by investing into the state-of-the-art air conditioning solutions by Daikin.

- Flash streamer
- Auto cleaning filter
- Titanium spatula filter
- Silver allergen removal and air purifying filter
- Ventilation



DAIKIN

Delivering good indoor air quality

Through whole building climate control solutions

General Recommendations

by REHVA | Federation of European Heating,
Ventilation and Air Conditioning Associations



Increase air supply and exhaust ventilation

As Corona virus (COVID-19) restrictions become part of our daily reality, concerns have been raised about the role of HVAC in the risk of spreading airborne viruses.

First and foremost, building owners and managers should follow government guidelines. But, as with any airborne contaminants, the risk of potential spread of viruses can be mitigated by ventilation and proper and effective filtration, along with regular cleaning and maintenance of systems.

HVAC industry bodies such as REHVA or ASHRAE provide guidance documents with a number of recommendations for buildings with mechanical heating and ventilation systems.



Air exchange rate is quite important – higher ventilation rate per hour in a room, better air quality

Ventilation systems need to be properly sized in order to guarantee the adequate air exchange rate in indoor environment and properly clean the air



Use more window airing
see Tips in "Daikin Expert Ventilation Methods for Offices & Stores"

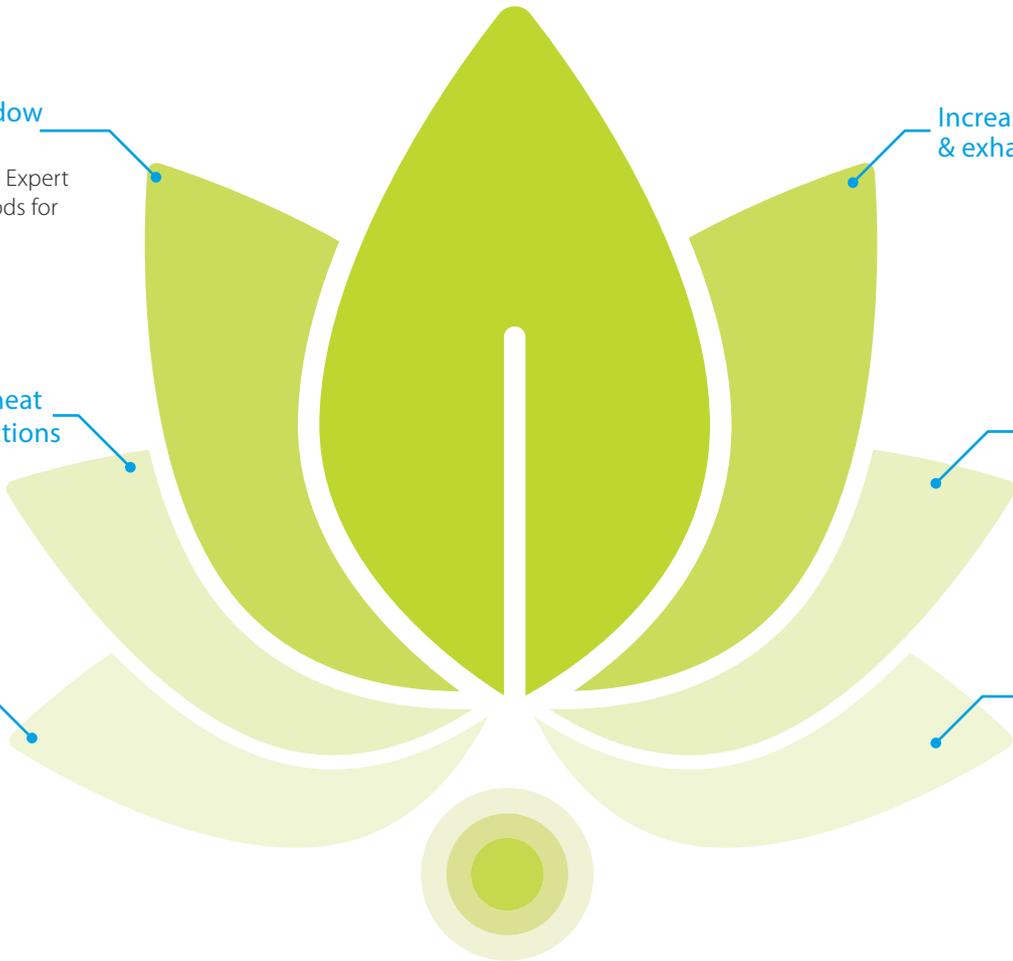
Increase air supply & exhaust ventilation

Safe use of heat recovery sections

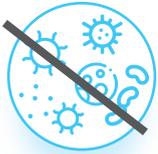
Regular maintenance
(duct cleaning & filter replacement)

Upgrade & improve filtration

Reduce recirculation



Daikin Fresh Building Offering



Ventilation and the use of highly efficient particle filtration

provided by HVAC systems can reduce the airborne concentration of bacteria and viruses and thus the risk of transmission through the air.



By using or replacing the current filters

in Air Handling Units with F7 (ePM₁) and above or HEPA (high efficiency particulate air) filters up to 99.9% of microbes (virus & bacteria) can be captured and stopped from free air circulation.



Even the combination of pre-filter (ePM_{2.5}) & fine filter (ePM₁)

would help in reducing the risk of pathogen transmissions.

Modular Light Air Handling Unit - for Best in Class Indoor Air Quality



Having the right ventilation equipment is crucial to **provide you fresh air and to filter out air pollutants** like pollen, spores, cement dust, bacteria, viruses and germs.

Daikin's **Modular Light** unit offers a **unique double filtration feature** to eliminate these particles as much as possible with the possibility to have a pre-filter and an optional CO₂ sensor.

The unit has an aluminium **heat exchanger with an efficiency above 92 %**.

The casing consists of a double skin with a 50 mm thick mineral wool insulation to ensure a **lower noise level**.

In addition, the height of the unit has been **optimised to save as much space as possible** when installed in a suspended ceiling.



The Importance of Clean Filters



Round Flow Cassette Units

Equipped with a special auto-cleaning filter, our 360° Round Flow Cassette ensures consistent operation and increases efficiency by up to 50%.



The dust collected during the daily automatic cleanings is stored in a box that can hold up to 12 months' worth of dust.

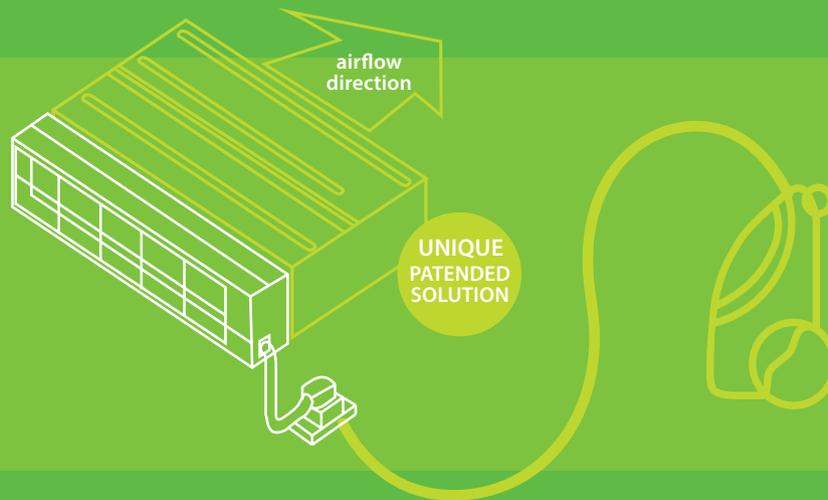


Forget the ladders and a cleaning technician. All you need to do to extract the dust from the box is to hook it up to your regular vacuum cleaner.

Auto-Cleaning Filter for Ducted Units

Our concealed ceiling units have optional self-cleaning filters that increase efficiency, comfort and reliability for your guests and clients maximizing customer satisfaction.

Automatic filter cleaning prevents clogged filters for seamless operation and ensures low maintenance cost as there will be no more dirty ceilings.



1

Scheduled automatic filter cleaning



2

Dust collects in a dust box that's integrated into the unit



3

The dust can easily be removed with a vacuum cleaner

Daikin IAQ Services

Daikin offers a ReFilter program for analysis, optimization and improvement of your HVAC system with a total focus on Indoor Air Quality



Indoor air quality audit



Fresh Air program
for optimization of settings



Customized action plan with improvement
and countermeasures



Our experts offer a site visit
with an IAQ oriented
technical checklist.

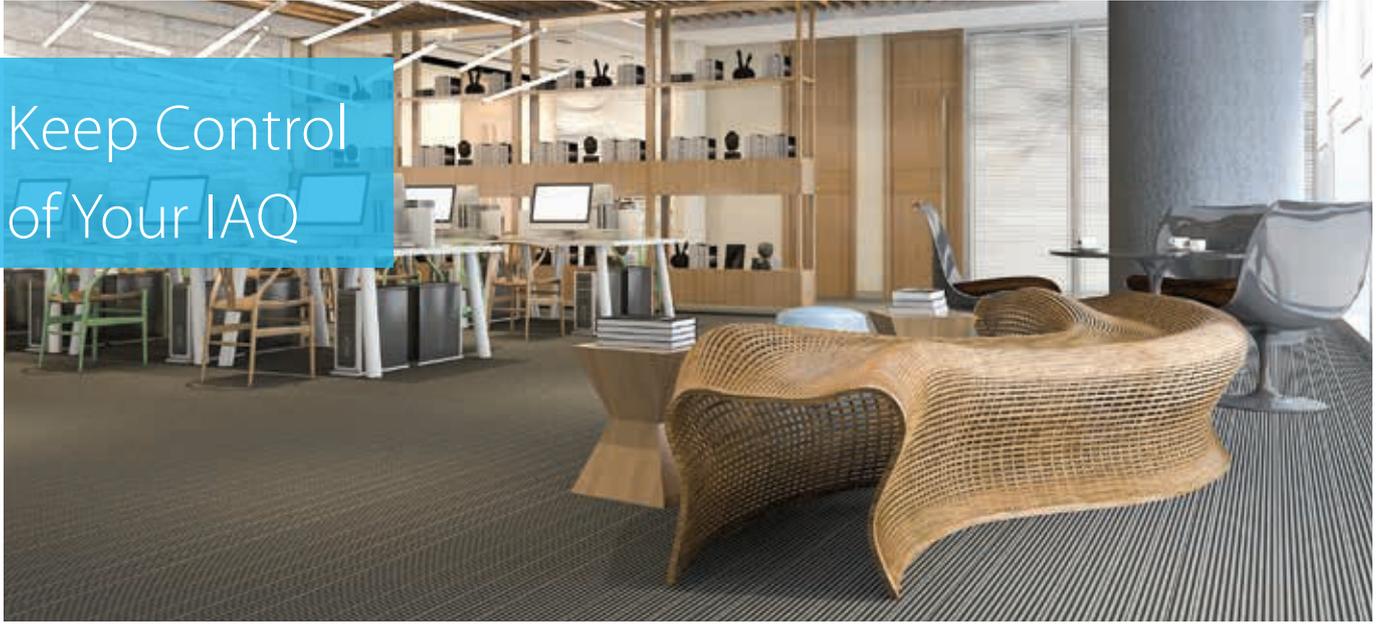


ReFilter
program



We support you with our
expertise to verify the status
of your HVAC system and
give you a clear report of the
condition of your system, AHU,
ducts, ventilation units and
indoor units.

Keep Control of Your IAQ



We support you to identify any improvable point of your HVAC system, with a dedicated set of options from Daikin's full range of services and experience. Such as:



Remote monitoring



Additional ventilation



Air purifier - Replacement



24/7 support



Working ambient cleaning



Rental



IAQ monitor



Special filters



UV cleaning

Check List for Ventilation Equipment



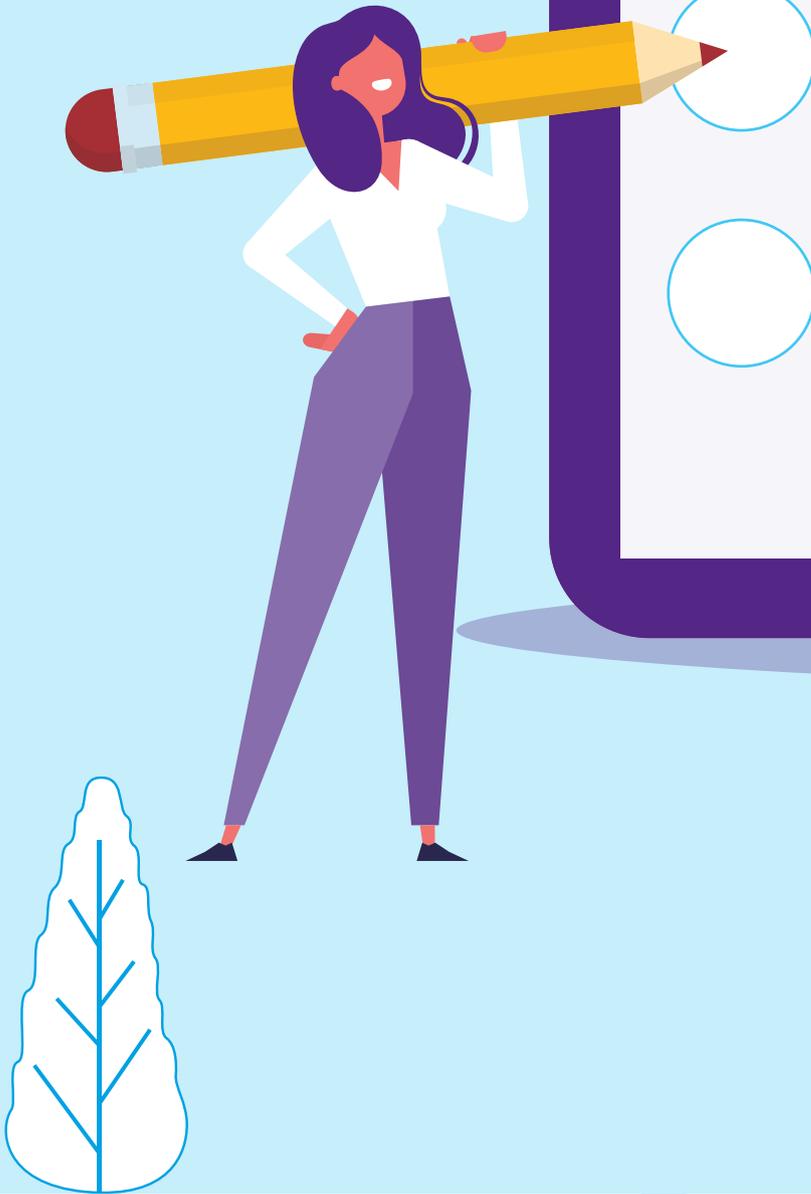
Check Installation location and type of ventilators and ventilation equipment (ventilation vents: air exhaust vents, air supply vents, etc.)* ...



Operating hours for ventilation equipment (weekdays / holidays)



Air-flow rates set for ventilation (weekdays / holidays)



Ventilation equipment maintenance times and schedule

Schedule and cycle for cleaning and replacing filters

* Check out our Daikin Expert ventilation methods for offices & stores

Daikin Air Purification Solutions



For your home & for your business



Daikin streamer technology air purifier (MC55W) & Humidifying streamer technology air purifier (MCK55W)

- › Pure air thanks to active plasma ion flow out and flash streamer technology
- › High performance HEPA filter to catch fine particles of dust
- › Humidification and purification in one (MCK55W only)
- › Powerful suction and whisper quiet
- › New stylish and compact design



AAF AstroPure 2000

- › Self-contained stand-alone recirculation unit (1628mm height)
- › Standard high efficiency HEPA H14 filters
- › Optional UV germicidal irradiation
- › Plug & Play
- › Air flow rate 2000 m³/h
- › For commercial areas up to 200 m²

Clean the air from

Viruses and bacteria



Fine particles of dust



Odors and allergens



www.daikin-ce.com/iaq



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