



# Guidance Document on Air Conditioning and Risk Reduction of COVID 19 Transmission



## Scope of this Document

- ✓ Air Conditioning is essentially a method of air treatment to render the ambient temperature more comfortable for the user. With the gradual release of measures and the return to work and resumption of economic activity superimposed on a gradually rising temperature as summer unfolds, the need for thermal comfort and air quality will become imperative. This will also apply in the case of vulnerable persons and others who may still be working from home, since they will be spending more hours at home than usual. It is therefore essential to provide the necessary guidance regarding any risks incurred with the use of air conditioners in relation to the efforts that need to be done to control the spread of COVID-19.
- ✓ The document will provide recommendations as applicable to 5 distinct scenarios which include:
  1. Shopping malls and large establishments
  2. Small shops and offices
  3. Open plan offices
  4. Home air conditioning systems
  5. Car air conditioning systems.
- ✓ ***Air conditioning and ventilation systems related to hospital and healthcare establishments fall beyond the scope of this document.***
- ✓ It is not intended to replace any mandatory national and international standards and norms that are in place.



## Summary Recommendations

- ✓ Ventilation of **establishments, offices and workspaces shops and households** should be through fresh air from either windows and doors or air-conditioning units equipped with ventilation systems. Mitigation measures are required to reduce the risk linked to the horizontal movement of air potentially laden with suspended viral particles across a room and between persons.
  - **Air-conditioning systems in large establishments, shopping malls and large office buildings** that are equipped with ventilation systems are suitable if they provide at least 3 air changes per hour of fresh air so as to satisfactorily dilute the air being circulated - this information can be obtained either from the installer or by contracting a ventilation engineer.
  - **Air-conditioning systems in large establishments, shopping malls and large office buildings** that are ***not*** equipped with ventilation systems are to be kept switched off unless they can be fitted with a suitable ventilation system that can provide at least 3 air changes per hour of fresh air - this can be done by contacting the installer or contracting a ventilation engineer. Until ventilation is available, windows and doors should be kept open to provide natural ventilation. Additional extractors are recommended which must be thoroughly cleaned at least weekly.
  - **Stand-alone units that service one single room used by a single person (or the same household or always the same persons)**, can be utilised normally so long as the filters are cleaned well and maintained properly.
  - **Stand-alone units which service areas used by a number of persons (e.g. shops, salons, common areas, reception areas, waiting rooms)**, can be utilised as long as doors and windows are kept open, the flaps are directed towards the ceiling, the filters are cleaned well and maintained properly, and recirculated air-conditioning avoided. Additional extractors are recommended which must be thoroughly cleaned at least weekly.
- ✓ **Vehicles** (e.g. buses, coaches, private cars, taxis, vans, etc.):
  1. Avoid using the recirculated air option for the vehicle's ventilation
  2. Operate the AC with ventilation selector on outside air. Typically, this is presented with the following icon.



3. On long trips either keep windows slightly open or open windows frequently to ventilate with fresh air
- ✓ **Indoor fans** should be used in combination with open doors and windows and arranged to blow air either towards the ceiling or towards the floor, in a way that horizontal movement of air is avoided.



## Background

There are a number of different Heating, Ventilation and Air Conditioning (HVAC) systems. It is important to understand the different HVAC provisions as they are applied to the different buildings.

## Types of Ventilation and Air-conditioning systems

### Natural ventilation

Natural ventilation is when a building is supplied with fresh air and air is removed from an indoor space (ventilated) without any mechanical means. This can be achieved through the use of windows, louvers, ventilators, doors and other openings.

### Mechanical Ventilation

This type of ventilation uses mechanical systems such as fans. In many instances these use ductwork to carry air inside the building and extract to the outside.

There are 4 main mechanical ventilation systems

- Extract only; a fan is used to extract air from a space and is replaced through any openings such as trickle vents or gaps under doors.
- Supply and extract; whereby the fresh air is distributed through the building through ducts and grilles located in the different areas or spaces, and stale air is extracted through a different set of ducts and grilles to the outside.
- Heat Recovery Systems; these systems recover heat or dissipate heat to save energy. In summer months the cold air being extracted is used to cool the incoming warm air thus avoiding energy wastage on cooling the supply air. In winter the reverse occurs
- Mechanical Ventilation with Heat Recovery (MVHR): are function in a similar manner as Heat Recovery but is a term normally associated with standalone systems that provides such function used for smaller spaces and homes.

**Air handling unit (AHU)** is the term used to describe a system of one or more fans and other necessary equipment to perform one or more of the functions of circulating, cleaning, heating, cooling, humidifying, dehumidifying and mixing of air...."

### Mixed mode ventilation

In mixed mode ventilation is where the strategy to ventilate the space includes both mechanical ventilation as well as natural ventilation such as openable windows to augment the ventilation for instance to help cool the rooms in non-peak seasons as well as to purge ventilation from spaces.



## Air Conditioning systems

Air conditioning is the term used to cool or warm the air as well as adjusting the humidity within a space. Some of these systems form part of the mechanical ventilation system whereby the outside air is 'conditioned' before moving along the ductwork to the space. Hence the air conditioning system acts as a heating, cooling, dehumidifying and ventilation system.

Some systems commonly known as "air conditioning" condition the air within the room or area, but do not form part of a ventilation system. They type of systems or machines draw in warm air from a room or vehicle, remove the heat by passing it over refrigerant pipework, remove any excess moisture through condensation, and blows back (recirculate the air) into the room by a fan. Heating works in a similar session but with the indoor and outdoor units operating in reversed mode, so heat is released into the conditioned area.

In some installations, a centralized chilled water system is applicable, then usually the heating is achieved with hot water either replacing the chilled water line in 2-piping system or in parallel in 4-piping system.

**It is important to note that these systems are not delivering outside air and are therefore not diluting any possible contamination.**

Different types of air conditioners are used in cars, households, small and large establishments. However, the principles of air conditioning remain the same in most circumstances.

For the purpose of Guidance for operation during a Pandemic like COVID -19, Air Conditioning is categorized based on the below:

**Split Air Systems: commonly referred to as VRF or split type air conditioners.**

Multiple Cassette Units: Ceiling mounted units that can each cool up to 50 sqm and can be controlled individually or as a group





High Wall Units: Used due to ease of installation and low Cost.



Tower Units: For larger spaces where most occupants are not stationary thus allowing for higher drafts.



Fan Coil Units or concealed indoor units: Installed normally above soffit with grills for supply and return air. They can be connected to ventilation ducting from an air handling unit to provide outdoor air or recirculate room air with a fan.





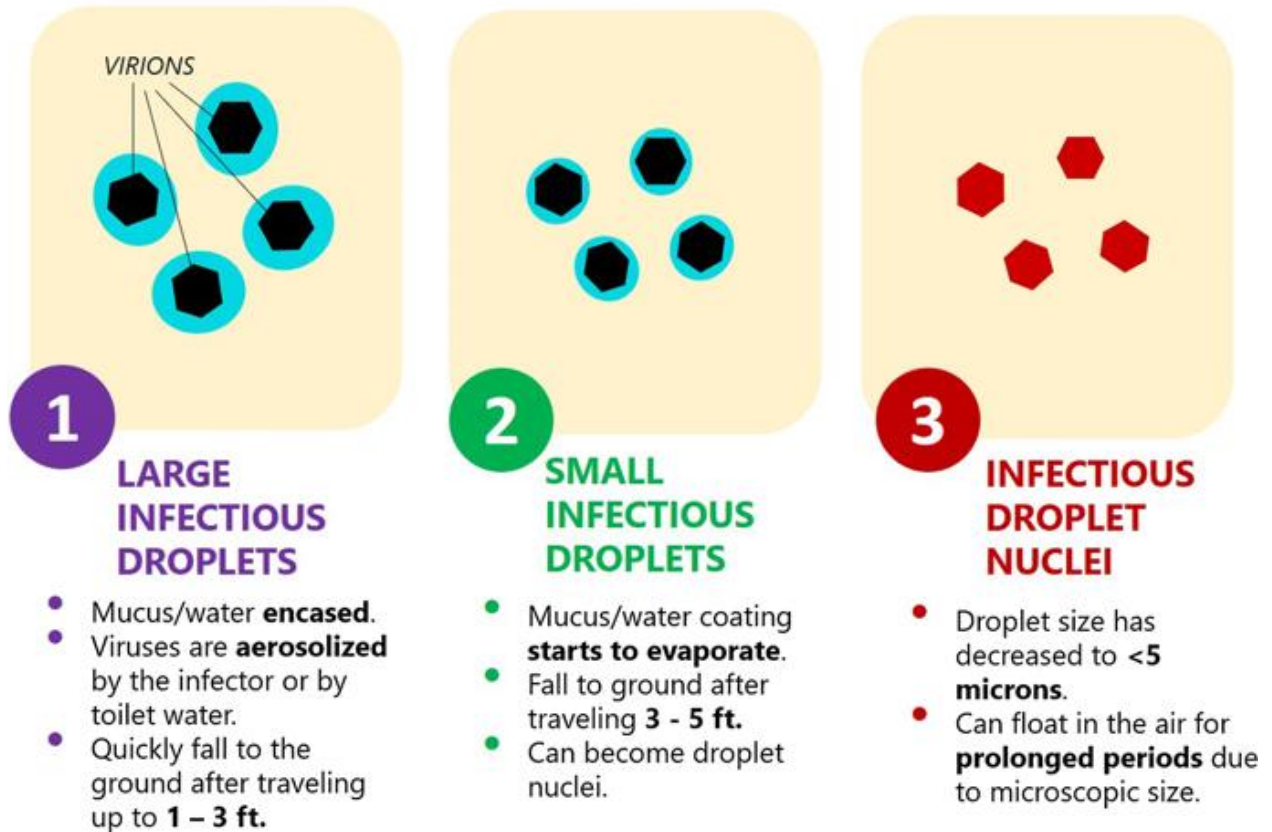
## Types of Exposure Mechanisms via Air

Concerns have been raised about the likelihood of the spread of the disease through operation of Air-conditioning and Ventilation Systems. Infectious diseases can spread by several different routes including transmission through air. The questions being asked are whether their spread can be accelerated or controlled by heating, ventilating, air -conditioning and refrigeration (HVACR) systems, depending on how the system is designed and operated. There are two exposure mechanisms via air:

1. Close contact transmission through large droplets (> 10 microns), which are released and fall to surfaces not further than about 1-2 m from the infected person. Droplets are formed from coughing and sneezing (sneezing forms many more particles typically). Most of these large droplets fall on nearby surfaces and objects – such as desks and tables. People could catch the infection by touching those contaminated surfaces or objects; and then touching their eyes, nose or mouth. If people are standing within 1-2 meter of an infected person, they can catch it directly by breathing in droplets sneezed or coughed out or exhaled by them.
2. Airborne transmission through small particles (< 5 microns), which may stay airborne for hours and can be transported long distances. These are also generated by coughing and sneezing and talking. Small particles (droplet nuclei or residue) form from droplets which evaporate (10 microns droplets evaporate in 0.2s) and desiccate. The size of a coronavirus particle is 80-160 nanometre and it remains active for many hours or couple of days (unless there is specific cleaning). SARS-CoV-2 remains active up to 3 hours in indoor air and 2-3 days on room surfaces at common indoor conditions. Such small virus particles stay airborne and can travel long distances carried by airflows in the rooms or in the extract air ducts of ventilation systems.



## Stages Of Infectious Droplets And Droplet Nuclei



Airborne transmission has caused infections of SARS-CoV-1 in the past. For Corona disease (COVID-19) it is likely.

One indication for this: Corona virus SARS-CoV2 has been isolated from swabs taken from exhaust vents in rooms occupied by infected patients. This mechanism implies that keeping 1-2 m distance from infected persons might not be enough and increasing the ventilation is useful because of removal of more particles.

Since people remain the carriers of COVID 19 infection, and since air conditioning for an optimum thermal and air quality environment is an important requisite for resuming activity and the gradual return to normality, it is logical to recommend increasing ventilation as well as increasing the fresh air flow as measures to remove these particles from occupied spaces and hence reduce the risk of a potential source of infection.

Air conditioning systems can efficiently ventilate the indoor environment with outdoor air much more efficiently than simply opening windows, because they also improve the quality of the outdoor air with filtration.



## Air Quality and Transmission of COVID-19

Apart from cough generated aerosols, the particulates suspended in the air also represents a substrate for viruses and consequently their transmission through this path. In the indoor environment, one of the sources of dust is atmospheric dust (PM 2.5 and PM10) coming in through fresh air intakes. The other prominent source is the dust generated by humans and processes.

Reduction of indoor dust levels is a step towards mitigation of this source of COVID -19 transmission.

## Considerations for Other relevant Modes of Transmission

### Can Air Conditioning Spread COVID 19?

A recent study, published in Emerging Infectious Diseases, found that nine people in Wuhan, China (the first epicentre of the new coronavirus outbreak) were infected with the virus simply by sitting near an air conditioning vent in a restaurant. According to researchers, the virus was spread by one asymptomatic diner who sat at a table in front of the AC unit. Four people at the table later tested positive for COVID-19, as did five people at neighbouring tables.

## What is the effect of Humidity and Temperature in relation to COVID 19 transmission?

### Relative Humidity

Relative humidity is found to affect the infectivity (the ease with which infection can take place) of virus through the respiratory route. The normal human body has excellent protection systems to prevent respiratory infections. There are several layers of filters starting with the mouth and the windpipe. The moist surfaces having mucous layer collect the larger particles before they enter the trachea and pharynx in the upper respiratory tract. In the lower respiratory tract, the bronchi & alveoli can trap smaller particles to various degrees of efficiency.

When we breathe dry air the mucous membrane in the lungs become dry. The fluid over lining the cells becomes more viscous, and the little hairs called cilia, which protect our lungs from deep settling of viable & non-viable particles, cannot work and particles settle more deeply in the lungs. If we consider oxygen & CO<sub>2</sub> transport and the blood, it is only one cell membrane that separates the airspace from the blood. So, if something goes from our lungs into the blood, we get infected.

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 are in a dry environment.



Furthermore, 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 COVID-19 virus. However, too much humidity leads to higher levels of dust mites and fungi, two of the worst culprits for indoor allergy sufferers. Mould and fungi are known to exacerbate respiratory conditions such as asthma.

All things considered, the relative humidity level of 40%~70% is the most suitable environment for humans & decreases problems from pathogens.

## Recommended Temperatures

Air conditioners at home should ideally operate between 24-30 degrees Celsius and the humidity should be between 40-70 per cent.

Rooms should be well ventilated by keeping the windows slightly open and exhaust by natural exfiltration.

If an exhaust fan is located nearby, it can be switched on to provide better ventilation

## Ventilation

When performing aerosol-generating procedures, WHO recommends 6-12 air changes/hr. This however is a recommendation that applies to healthcare settings where exhaust air is most likely to contain particles carrying a viral load **Concerns have been raised about the pertinence of the recommended 1 -2m distance, in view of possible long-range airborne transmission.**

Additionally, research has shown that a person sneezing emits a multiphase turbulent gas cloud containing droplets of all sizes which travel for up to 7-8m. Whilst probably of limited impact outdoors, it seems therefore important to provide an adequate ventilation of rooms to reduce the risk of transmission. Two-and a-half air changes are required to eliminate 90% of airborne contaminants. Opening doors and windows can generate around 5-17 air changes per hour. When using air conditioning, it is advisable to use the 'extraction mode' and avoid recirculation of air.

A cluster was described in a windowless restaurant in Guangzhou, China, where the air current from the air conditioning presumably facilitated the infection of people sitting at 2 neighbouring tables (up to about 5metres).

## General Principles

The guidelines provided in this document relate specifically to ventilation and air conditioning of indoor spaces. These guidelines are intended to limit any risk of COVID 19 infection by ventilating indoor environments with outdoor air as much as possible. The general advice is to increase the air supply to dilute airborne pathogens, and to extract them to the outside thus reducing the chances that they deposit on surfaces or are inhaled by others.



The key actions can be summarized below:

1. Understand the ventilation and AC system; if in doubt ask for advice from a Warranted Engineer
2. Run ventilation systems at the highest rates possible
3. If central controllers and/or timers are installed, set points may need to be adjusted to increase flow rates and the operating time of ventilation system
4. Avoid as much as possible the transfer through recirculation of air from one room to another, however if this is the only way to provide fresh air to occupied spaces do not switch off system
5. Recirculation of air within a space such as through the function of an AC system which can be augmented with fresh air supply, such as through mechanical ventilation systems or the use of windows, is acceptable
6. Clean filters and maintain systems regularly
7. Use both air condition systems with mechanical ventilation systems rather than only opening windows makes it possible to improve indoor air quality through filtration.



## System Specific Recommendations

### Mechanical Ventilation Systems

For mechanical ventilation systems installed within buildings the recommended interventions together with their complexity of changes in an incremental manner according to the necessary modifications needed are:

	Intervention	Use of additional resources/modifications or not
1	The continuous 24-hour operation of ventilation system	Only require action on control systems
2	Keeping the relative humidity setpoint above 40%.	Only require action on control systems
3	Deactivation or bypass of the heat recovery unit	Requires: Action on control systems Maintenance Staff Actions
4	Force dampers to introduce outdoor air only	Requires: Action on control systems Maintenance Staff Actions
5	Increase air flow	Requires: Action on control systems Maintenance Staff Actions Plant modifications
6	An engineer should check the pressure balance. Higher pressure on the extract side of the thermal wheel can cause air leakage to the supply side	Requires: Action on control systems Maintenance Staff Actions Plant modifications
7	Provide a higher-class filter fitted on the Air Handling Unit, such as F7 or higher filters (EN779:2012), EPA, HEPA and ULPA filters (EN1822:2009).	Requires Maintenance staff Actions Plant Modification <b>(Not all system can accept all filters change of filters needs to be done by specialist HVAC contractors. Required either to change the fan or to introduce new fans in series to compensate the pressure drop)</b>
8	Install UVGI (Ultraviolet germicidal irradiation) for larger Ducted Units and AHUs to keep coils continuously clean and disinfected on the return side recirculation/ exhaust system as a supplement to help inactivate the virus.	Requires Maintenance staff Actions Plant Modification



## Multiple Cassette Units, Multiple High Wall Units and Tower Units categories of Indoor Units

If fresh air is not provided, it is advisable where possible to introduce a fresh air duct attached to a central inline fan filter unit and distribute the fresh air by grilles into the space or near the indoor units.

For Cassette Units the fresh air duct may be connected to the available port of the Cassette Unit. In case fresh air cannot be provided through a fan it is recommended to actively use operable windows.

### Ducted Units

Fresh air must be provided by an inlet duct and fan.

### Recirculating Fans

The use of electric fans is very common. Where these are located close to open windows it is recommended that these are kept on as they would assist in ventilation. It is not recommended to use these fans in enclosed spaces with no adequate fresh air ventilation. Consideration should be made to as much as possible increase the fresh air supply of all enclosed spaces through the use of windows and if necessary, installation of exhaust fans, ideally located at high levels.

### Ozone Emitting Devices

Devices that emit ozone or other potentially hazardous by-products must not be used in spaces whilst occupied and need to be timed according to the working schedule.



## Shopping malls and Large establishments

Commercial Establishments and Industrial Facilities have multiple occupancy as well as transient visitors. It is this aspect that necessitates precaution in operating their Air Conditioning Systems. Whilst there is a consensus that isolated domestic air conditioners are generally safe under normal circumstances, potential problems can occur with the use of central air conditioning. These central air conditioning systems are used in malls, corporate and government offices, hospitals etc. and may lead to an increased chance of spreading the coronavirus to other people in the same building, if one person contracts it. Therefore, for these indoor facilities, ventilation with outdoor air is strongly advised.

It is to be stressed that the primary risk of carrying the infection remains by people movement, proximity, and sharing of common areas such as toilets and lifts. Appropriate measures aimed at generally removing the risk of infection via respiratory and hand hygiene measures, personal protective measures, social distancing measures and cleaning and disinfection of commonly touched areas and environments are assumed. Proper use of air conditioning and ventilation systems can be an added measure for risk reduction of COVID-19 diffusion.

### Recommendations

1. Ensure proper ventilation of spaces with outdoor air
2. Switch ventilation to nominal speed at least 2 hours before the building usage time and switch to lower speed 2 hours after the building usage time
3. If central controllers and/or timers are installed, set points (such as CO<sub>2</sub> sensor set points) may need to be adjusted to increase flow of outside air and the operating time of ventilation system.
4. At nights and weekends, do not switch ventilation off, but keep systems running at lower speed.
5. Where buildings are served with natural ventilation through openable windows, leave these open at nights and weekends to improve indoor ventilation.
6. Ensure regular airing with windows (even in mechanically ventilated buildings). Open windows for 15 min or so when entering the room (especially when the room was occupied by others beforehand). Also, in buildings with mechanical ventilation, window airing can be used to further boost ventilation.
7. Minimise the percentage of air recirculation and favouring when possible the use of fresh air in accordance with international guidance for ventilation of indoor public spaces. Where



possible turn off recirculation.

8. Keep toilet ventilation 24/7 in operation
9. Avoid open windows in toilets to assure the right direction of ventilation
10. Instruct building occupants to flush toilets with closed lid.
11. Inspect heat recovery equipment to be sure that leakages are under control
12. Switch Air conditioning units either off or operate so that fans are continuously on wherever possible and whilst ensuring thermal stress is not affecting the occupiers.
13. Do not change heating, cooling and possible humidification setpoints
14. Do not plan duct cleaning for this period
15. Replace central outdoor air and extract air filters as usually, according to maintenance schedule
16. Regular filter replacement and maintenance works shall be performed with common protective measures including respiratory protection.
17. Perform air balancing of the system checks to avoid having areas with negative or positive pressure which result to air movements within the ventilated space.
18. Where necessary close each air recirculation damper to avoid propagating infection with the air to places where it would not be carried by the movement of people from one zone to another.
19. Ensure that the extract and supply grill of the mechanical ventilation system are adequately spaced apart to reduce the risk of contamination, and where possible increase to a minimum of 3m.
20. Any recommended national and international standards and norms that are in place are still to be adhered to.





## Open Plan offices

Larger offices that may include open plan areas should have proper ventilation as indicated by the local codes. This may be provided through mechanical ventilation, or for older buildings provided mostly through windows and natural ventilation.

For offices and zones constantly occupied by the same group of people, the risk of transfer through airborne exposure is low. It is recommended to increase the outdoor air supply as much as possible either through increase operation of the mechanical system or opening windows.

For open plan offices that also receive a number of external visitors and where physical separation such as through the use of plexiglass is not possible, the risk is higher. The dynamics of air movement in buildings varies widely depending on the layout of the building. In some instances due to changes in internal layouts of offices such as the introduction or removal of partitions, the original design of the ventilation system may not remain valid.

Where in doubt it is recommended to obtain professional advice from a Warranted Engineer as to methods of how ventilation rates can be improved.

### Recommendations

1. Increase the fresh air into the office as much as possible
2. Where mechanical ventilation is utilized refer to recommendations applicable to shopping malls and large establishments.
3. For natural ventilation keep windows open for as long as possible during nights and weekends.



## Small shops and offices

Small shops and offices normally have limited ventilation openings and a split type AC installation.

### Recommendations

1. Where possible ventilate frequently by leaving windows open as much as possible even when shop is closed.
2. External doors may be used to increase ventilation.
3. Keeping open doors may be appropriate where this provides a significant increase in ventilation and air movement.
4. ACs should be properly maintained
5. ACs may be used to minimize thermal stress to people.
6. Where possible introduce mechanical ventilation to assist to provision of fresh air into the space



## Further specific establishments

The Malta Tourism Authority's checklist for these establishment types requires that these establishments shall provide records of maintenance and operation procedures for air conditioner maintenance.

- ✓ Accommodation Establishments -Collective Accommodation and Holiday Furnished Premises
- ✓ Catering Establishments
- ✓ Beach Establishments and Beach Concessions

Refer to [https://deputyprimeminister.gov.mt/en/health-promotion/Documents/COVID19MT\\_Mitigation%20Conditions\\_Outdoor%20Restaurants%20Pools%20Hotels%20Accommodation\\_18-May-2020.pdf](https://deputyprimeminister.gov.mt/en/health-promotion/Documents/COVID19MT_Mitigation%20Conditions_Outdoor%20Restaurants%20Pools%20Hotels%20Accommodation_18-May-2020.pdf)



## Domestic Air Conditioners

Room air conditioners re-circulate air within a single occupied zone. Installed for a single room application, the entry of occupants into such spaces is controllable. The following recommendations are to be followed:

1. Recirculation of cool air by Room Air conditioners, must be accompanied by outdoor air intake through slightly open windows and exhaust by natural exfiltration.
2. Fresh Air intake through a fan filter unit will prevent outdoor dust entry (containing high levels of PM 10 and PM 2.5 particles).
3. Set Room Temperature between 24°C and 27°C.
4. Maintain relative humidity between 40% and 70%.
5. If ambient becomes dry, do not allow Relative Humidity to fall below 40%. Water evaporating from a pan kept in the room will increase humidity if it falls below 40%.

## Domestic Air Conditioners and Persons in Quarantine

1. In the case of central air conditioning, turn off the AC and open a window if someone in your home has COVID-19, or has been exposed to the virus.
2. If central air disperses infectious virus, being close to the exhaust point is a risk factor
3. If a person has a sick relative and central air, therefore, keep the sick person distant from the intake point.
4. You can use duct tape to seal the return vents in the room of someone in self-isolation.



## Air Conditioning in Public Transport (Buses)

Buses used for the Malta Public Transport (MPT) should have air conditioning systems with the maximum number of air changes per hour, certainly not less than 8 times per hour. Particulate air filters are to be upgraded to reach 90%-95% efficiency. MPT should also consider the installation and use of UV systems for sterilization.

Furthermore, MPT should add a waiting time upon completion of each trip with all the doors open to ensure proper ventilation of the bus.

These measures will be taken in combination to the measures to limit the number of persons in every bus, whilst keeping the safe distance and wearing always masks.



## Air conditioning in Shared Vehicles (Persons who are not same household members)

CDC (Centers for Disease Control and Prevention) mentions the HVAC system in its guidance for ride-share operators and other commercial passenger drivers and recommends:

1. Avoiding using the recirculated air option for the car's ventilation during passenger transport
2. Using the car's vents to bring in fresh outside air



3. Lowering the vehicle windows



## Air conditioning in Vehicles with persons from the same household

Members of the same household are technically already significantly exposed if a household member is infected with COVID 19, more so if the person is symptomatic. The above precautions for persons who are not same household members should ideally apply also to same household members but in this case, it may be practical to accept the increased risk added by leaving the windows closed. In any case, the following precautions would still mitigate the risk:

1. Avoid using the recirculated air option for the car's ventilation
2. Operate the AC with ventilation selector on outside air. Typically, this is presented with the following icon.



3. On long trips open windows to ventilate with fresh air frequently



## Precautions to be taken by Car Air Condition Servicing Technicians and by Car repairers

Should there be reason to suspect that an automobile ventilation system was contaminated with SARS-CoV-2, the following suggestions, based upon current knowledge provide enhanced worker (car repairers and car air conditioner servicing technicians) protection from exposure:

- ✓ If possible, a 24-hr wait period that maximizes sun exposure will increase the likelihood that any previously generated virus will be deactivated.
- ✓ Conduct a ventilation system “Blow Out” by carefully positioning the vehicle outdoors, setting the heater to max temperature, ensuring the system is not set to recirculation mode, then operating the blower motor at max setting for approximately 5-minutes, with the car vacant, doors open and windows down. (Note: a partial vehicle interior surface disinfection may be required to enable safe car relocation and ventilation system setting adjustments)
- ✓ Upon conclusion of the waiting period and/or system Blow Out, initiate surface disinfection of the car’s interior following the disinfection guidance.

## Guidance for other Air Condition Servicing Technicians

The safety of service technicians is paramount. The recommendations are as follows:

- ✓ Do not perform works in houses of persons under quarantine. Postpone the servicing till after 72 hours from the end of quarantine.
- ✓ Maintain social distancing norm and wear a face mask. Avoid personal contact, including handshakes with co-workers /customers
- ✓ Wash hands often for at least 20 seconds using soap. Wash or sanitise your hands after you remove the gloves at the end of each job. Please refer to Figure 1 for guidance on handwashing. Always carry alcohol-based sanitizer and use whenever hand washing is not possible.
- ✓ Use prescribed PPE (Personal protection Equipment). (Mask, Gloves, Goggles or Visor). Refer to Figure 2 for guidance on the proper removal of gloves
- ✓ Carry a disposal bag of adequate size, to keep the replaced item and dispose safely.
- ✓ Follow proper disposal methods for used PPE's (Mask, Gloves, Goggles or Visor).
- ✓ Monitor your health closely. If you develop symptoms like fever, cough, sore throat, tiredness or shortness of breath, immediately inform the office and take necessary action as advised by the government. Do not continue to work under these circumstances.
- ✓ Avoid using of alcohol-based sanitizer, before working with electrical sources.
- ✓ Do not share the pen especially for service report signature from customer, instead ask the customer to use their own pen.





## 10 STEPS TO CLEAN YOUR HANDS



Figure 1: Recommended Handwashing Technique



Fig.2 proper removal of gloves



## Cleaning and disinfecting measures-How to disinfect tools and Tackles

A combination of cleaning and disinfection will be most effective in removing the COVID- 19 virus.

### How to clean and disinfect

- ✓ Cleaning means to physically remove germs (bacteria and viruses), dirt and grime from surfaces using a detergent and water solution. A detergent is designed to break up oil and grease with the use of water. Anything labelled as a detergent will work.
- ✓ Disinfecting means using chemicals to kill germs on surfaces. It is important to clean before disinfecting because dirt and grime can reduce the ability of disinfectants to kill germs.
- ✓ Disinfectants containing  $\geq 70\%$  alcohol, ammonium compounds, chlorine bleach or oxygen bleach are suitable for use on hard surfaces (surfaces where liquids pool, and do not soak in). The packaging or manufacturer's instructions will outline the correct way to use disinfectant. Disinfectants require time to be effective at killing viruses. If no time is specified, the disinfectant should be left for ten minutes before removing.
- ✓ Delicate electronic equipment will need special precautions for cleaning/disinfection. Always check with the equipment's manufacturer about this.



## Further Technical Information

Engineers, Technicians and Management of Establishments are encouraged to seek further detailed information such as:

1. The REHVA (Federation of European Heating, Ventilation and Air Conditioning Associations) COVID-19 guidance document, April 3, 2020 available online at:  
[https://www.rehva.eu/fileadmin/user\\_upload/REHVA\\_COVID-19\\_guidance\\_document\\_ver2\\_20200403\\_1.pdf](https://www.rehva.eu/fileadmin/user_upload/REHVA_COVID-19_guidance_document_ver2_20200403_1.pdf)
2. AICARR's Protocol for Risk Reduction of SARS-COV2-19 Diffusion with the Aid of Existing Air conditioning and Ventilation Systems  
[https://www.rehva.eu/fileadmin/user\\_upload/HVAC\\_COVID19\\_PROCEDURE.pdf](https://www.rehva.eu/fileadmin/user_upload/HVAC_COVID19_PROCEDURE.pdf)
3. CIBSE (Chartered Institution of Building Services Engineers) COVID-19 Ventilation Guidance Version 2, 12 May 2020 available online at:  
[https://go.cibse.org/l/698403/2020-05-13/28tz75/698403/76378/CIBSE\\_Covid\\_Ventilation\\_Guidance\\_version\\_2.pdf](https://go.cibse.org/l/698403/2020-05-13/28tz75/698403/76378/CIBSE_Covid_Ventilation_Guidance_version_2.pdf)
4. ASHREA (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Position Document on Infectious Aerosols April 14,2020, available online at:  
[https://www.ashrae.org/file%20library/about/position%20documents/pd\\_infectiousaerosols\\_2020.pdf](https://www.ashrae.org/file%20library/about/position%20documents/pd_infectiousaerosols_2020.pdf)
5. CDC (Centers for Disease Control and Prevention) Interim Guidance for Businesses and Employers Responding to Coronavirus Disease 2019 (COVID-19), May 2020, available online at:  
[https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html](https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html)