



## **Room Air Cleaner Guidance for Schools.**

**Rev 1. December 2021**

The implementation of the COVID-19 Response Plan is the means through which schools can best prevent the introduction and spread of COVID-19 and demonstrate that they are operating in accordance with the requirements of the Public Health advice from the Health Protection Surveillance Centre (HPSC) and the Return to Work Safely Protocol developed by the Health & Safety Authority. These documents are available at [www.gov.ie/backtoschool](http://www.gov.ie/backtoschool). For information on ways to optimise ventilation, refer to the guidance provided in Practical Steps for the Deployment of Good Ventilation Practices in Schools.

Where the practical measures for the deployment of good ventilation practices have been undertaken, and poor ventilation continues to exist in a particular room/area, air cleaners may be considered as an additional measure in conjunction with other methods of ventilation that are available.

Room air cleaner selection is dependent on the particular setting and it is not possible to give a “one size fits all” solution, or a simple rule that everyone can follow.

The Air Infiltration and Ventilation Centre<sup>1</sup> notes that measures to reduce risk of exposure that causes COVID-19 from spreading indoors generally fall into three categories: source control, ventilation control and removal/ control.

Air cleaners can assist in removal control and provide an additional measure of precaution where poor ventilation exists. They should not be used to fully replace ventilation and should be used in conjunction with and to support other methods of ventilation that are available.

Some air cleaning units use ionising processes. Therefore care should be taken to avoid any devices that produce ozone or other chemicals as these may be a respiratory irritant.

Ultraviolet radiation (UVC) technology uses ultra violet lamps and has been typically utilised in areas such as healthcare settings to sterilise operating theatre type spaces. Ultra-violet lamps should not be used to disinfect hands or other areas of your skin and exposure of the eyes and bare skin to UVC radiation must be avoided.

Rooms cannot be occupied while direct UVC devices are activated and the lamps are emitting. Therefore use of direct UVC lamps is limited to sterilisation of spaces between uses and cannot assist with removal control during occupancy and should not be utilised in schools. UVC can feature in occupied spaces as an integrated part of an enclosed clean air unit, however they are normally more expensive than a HEPA unit.

You should consult with the air cleaner unit supplier to best match your requirements. This guidance document will help you understand the areas to consider during this consultation.

Air cleaner units can be purchased outright or rented from hygiene service suppliers and hire companies (these rental companies often maintain the units also).

If, following consultation with a supplier a school feels that their individual space may require specific technical specialist advice then the assistance of a Chartered Engineer or Registered Architect should be sought.

Room air cleaners are self-contained units that sit in the room they are to serve and must be plugged into an electrical power socket. They typically comprise a filter or multiple filters and a fan that sucks room air in over the filter system and discharges purified air back into the room. As air moves through the filter, pollutants and particles are captured.

When selecting an air cleaning unit the following should be considered and compared.

1. Matching the cleaning unit to the room in which it is to be located
2. The efficiency of the air cleaner
3. Filter types in the unit
4. Noise levels
5. Maintenance
6. Additional features

### **1.0 Matching the air cleaning unit to the needs of the room it is to be located in**

It is important to select a unit that is capable of dealing with the needs of the space it is to serve. Small desktop devices aren't effective in large spaces, while larger air cleaners may be overkill in smaller rooms.

One metric included in air cleaning unit specifications is the unit's ability to deliver either air flow in m<sup>3</sup>/hour or air change rate in air changes per hour (ACH). This metric is normally included in the air cleaning unit performance data sheets.

Additional reading and excel calculators are available online such as [https://www.researchgate.net/publication/347575728\\_Guide\\_for\\_ventilation\\_towards\\_healthy\\_classrooms](https://www.researchgate.net/publication/347575728_Guide_for_ventilation_towards_healthy_classrooms).

### **2.0 The efficiency of the air cleaning unit**

Most air cleaners are labeled with a clean air delivery rate (CADR) number. The CADR defines an air cleaning unit's effectiveness in reducing particles and is typically expressed in m<sup>3</sup>/hour. In general, the higher the number, the more particles the air cleaner can remove and the larger the room the device can reasonably be expected to clean.

To compare various units you can calculate the air change rate of cleaning equivalent to the air cleaner's CADR as:

$$\text{ACR(cleaning)} = \frac{\text{The CADR}}{\text{Volume of air in the room}}$$

Depending on the room volume and number of occupants you may need more than one unit. When calculating the room air volume be sure to exclude the volume taken up by built in furniture items.

Remember that you are using the air cleaner as a support to the natural ventilation and this should be taken into account when selecting your unit. It should be selected to bridge the ventilation gap in the short term until permanent ventilation solutions are put in place.

### **3.0 Filter types in the unit**

Air cleaners typically use mechanical filtration, meaning that their filters physically trap the pollutants that pass through them. Air cleaners normally have at least two such filters: a pre-

filter, which catches large particles of dust, pollen, insects and animal hair, and the main filter, which nabs smaller pollutants. Typically, filters are made of paper, fibre (often fiberglass), or mesh, and require regular replacement to maintain efficiency.

The pre-filter is a filter that removes large unwanted contaminants from the air. They can be disposable or capable of being washed or vacuumed. The pre-filter also has a role in the extension of the life of the more sensitive filters that come after the pre-filter such as the HEPA filter. Air cleaners that are based on filtration with a HEPA filter are likely to be most effective.

HEPA stands for high-efficiency particulate air and it is an efficiency standard for air filters. HEPA filters trap 99.97% of particles that are 0.3 microns (millionths of a metre) or larger in size. To put that in perspective, the smallest objects that the average human eye can see are around 70 microns in size.

You may find devices that advertise "HEPA-type" filters but that aren't actually rated to meet a HEPA filtration level. Since individual HEPA filters aren't tested, it's hard to say that "HEPA-type" filters will always perform more poorly than actual HEPA filters. It is important that you only consider an air cleaning unit that says it uses HEPA filters or "True" HEPA filters, which amount to the same thing.

Some air cleaners have additional filters, such as activated carbon or charcoal, which trap gases, volatile organic compounds (VOCs) and odour compounds. These extra filters can be helpful in a smoky or pet environment but would be of limited value in a school setting.

#### **4.0 Noise levels**

As noted above most air cleaners have internal fans that pull air through a series of filters. Some of these fans are low noise emitting, especially on low settings, whereas others may be noisier as the speed is turned up.

It is important to choose a device that suits the required noise levels of the space the unit is serving. This can be assisted by selecting the unit that can deliver the required ACH and CADR at its mid/lower speed settings. For information on acoustic performance in various school spaces see <https://www.education.ie/en/School-Design/Technical-Guidance-Documents/Archived-Technical-Guidance/TGD021-5-Acoustic-Performance-in-New-Primary-Post-Primary-School-Buildings.pdf>.

#### **5.0 Maintenance**

Filters have to be replaced periodically based on their usage. Therefore, it is necessary to keep a record of the unit's running hours and follow the manufacturer's recommendations on filter cleaning and replacement. It may be a good idea to have some spare filters in stock.

Filter-replacement costs vary from unit to unit. Some have very expensive filters that last for years, while others use cheap filters that have to be changed frequently. Some of the pre filters are washable. However, the HEPA filters themselves are disposable and must be entirely replaced. It is important to compare the replacement filter costs of the units you are considering.

#### **6.0 Additional features**

Some air cleaners have additional features, such as a filter-replacement indicator light, dimming and display shut-off options, programmable timer, remote control unit and smart functions (digital assistant and/or app integration). These extras may add a little bit of convenience which needs to be factored against the additional cost

### Quick Summary Check List

There is no single air cleaner that's right for every situation. When you're buying or renting an air cleaner, consult with suppliers, determine the air volume of the space to be served, and ACR (cleaning) and have your suppliers give you the information on the CADR ratings and filter types and noise ratings and confirm to you how effective the air cleaning will be for your specific needs.

<b>Comparison Table</b>			
<b>Items</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
ACH			
CADR			
ACR(cleaning)			
Pre filter			
HEPA Filter			
Noise level			
Filter Replacement Interval			
Filter cost			

1. The Air infiltration and Ventilation Centre (AIVC) is the International Energy Agency's information centre on energy efficient ventilation.

## Appendix One: HEPA air cleaner Technical Guidance.

Managing ventilation is one of a suite of public health measures in place to keep our schools safe.

The Department's ventilation guidance for schools is very clear and practical on the steps to be taken by all schools to manage ventilation levels. The practical steps and stepwise approach set out in the guidance are sufficient to ensure good ventilation practices in school while at the same time ensuring an appropriate balance between ventilation and comfort.

The over-arching approach in the guidance is for schools to have windows open as fully as possible when classrooms are not in use and partially open when classrooms are in use.

HEPA air cleaning devices are not a substitute for good ventilation but can be considered as an additional measure in conjunction with other methods of ventilation that are available pending the completion of structural interventions. This is line with the Expert Group recommendations.

There is no one solution that fits all scenarios, each application requires bespoke analysis and selection of the appropriate unit(s) matched to the specific room size and volume. If a school feels that its individual space may require specific technical specialist advice then the assistance of a Chartered Engineer or Registered Architect can be sought.

It is very important to note that:

- Air cleaning devices are not a substitute for good ventilation.
- Air cleaners do not remove Carbon dioxide (CO<sub>2</sub>).
- The best way to reduce CO<sub>2</sub> levels in a room is to dilute it with fresh air.

The parameters below are based on 2 ACH from natural ventilation and 3 ACH from an air cleaner for a 58m<sup>2</sup> classroom example with a floor to ceiling height of 3.1m.

Requirements HEPA 13/14 Filtration Only	
Parameters (estimated range)	
Floor Space (m <sup>2</sup> )	58.52
Room Volume (m <sup>3</sup> )	184
Additional air changes per hour required (ACH) (to be confirmed following advice from Chartered Engineer/Registered Architect)	3 (for this example only)
Minimum airflow rate per hour (m <sup>3</sup> /h)	552
Minimum airflow rate per hour (l/h)	552000
Required minimum airflow (l/s) to achieve ACH	153
Technical	Parameters
Maximum sound pressure level in space (all units combined)	< 48 dBA (based on the required airflow from the unit for a specific classroom)
Airflow (l/s)	153
Air Flow m <sup>3</sup> /h (clean air)	552
Air changes per hour	3
Filtration - %age of airflow HEPA filtered	100%
Mountings	Free Standing
Location	Floor
Certificate of HEPA filter classification to EN 1822:2019/ISO 29463 or equivalent	In house/third party certification (supplier to provide HEPA filter test certificate classification to EN 1822:2019/ISO 29463 with unit)