

Use of Portable Air Filtration Devices in Penn Schools/Centers Specific to COVID-19 Management

Summary

Portable air filtration devices, or portable air cleaners, are devices that remove particles (including respiratory droplets) from the air in indoor spaces. Portable air cleaners are commonly used in residences and small office spaces to remove allergens and dust from the air. Portable air cleaners can be effective at removing respiratory droplets containing SARS-CoV-2, the virus that causes COVID-19, because of the size of the droplets. However, many commercially available portable air cleaners have not been tested for that specific application.

Portable air cleaners are often not necessary for COVID-19 infection management in a well-ventilated building where the majority of the population is vaccinated. Penn's multi-faceted COVID-19 management program includes building ventilation optimization and community vaccination among other measures. As such, portable air cleaners do not need to be considered for most workspaces, common areas and educational spaces at Penn. There may be some isolated scenarios where portable air cleaners provide additional benefit beyond the COVID-19 management measures already in place. Those few areas would be identified based on risk assessment parameters such as the community incidence rate, vaccination and masking compliance expectations for the space, and expected occupant density. Contact EHRS to assist with a risk evaluation.

How to Select a Unit for Your Workspace

In most cases, a portable air cleaner provides little benefit as a COVID-19 infection control measure and is not recommended. In cases where they may provide a benefit, we offer the following information to guide you in the selection of portable air cleaners for your workspace (**Table 1**).

High Efficiency Particulate Air (HEPA) mechanical filtration devices are the only allowable option for portable air filtration devices at Penn. HEPA devices capture airborne particles on a filter within the unit. HEPA devices are at least 99.97% effective at capturing airborne particles, including airborne respiratory droplets. HEPA filtration devices often come with activated carbon filters for removal of odors and volatile organic compounds. Many chemical or electrical air treatment devices exist on the market. Ultraviolet germicidal irradiation devices, chemical air treatment devices and electrical charge-based air treatment devices are prohibited.

Table 1: Portable Air Cleaners

| Room Size (Examples) | Available HEPA Filtration Units (Click for Weblink) | Air Cleaning Details ^{1,2} | Noise Rating (dBA) | Power Consumption (W) | Unit Price ³ | Replacement Filter Price ³ (Cost for 1 year of filters) |
|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------|--------------------|-----------------------|-------------------------|--------------------------------------------------------------------|
| 100 – 175 ft ² (Small office, cubicle spaces, bathrooms) | BlueAir Blue Pure 411+ | CADR = 105 cfm, ACH = 4.5 – 7.9 hr ⁻¹ | 17 - 46 | 10 | \$140 | \$38 |
| | Honeywell HPA100 and HPA104 | CADR = 100 cfm, ACH = 4.3 – 7.5 hr ⁻¹ | Not listed | 50 (appx) | \$140 | \$79 |
| | Honeywell InSight HPA5100B and HPA5100W | CADR = 114 cfm, ACH = 4.9 – 8.6 hr ⁻¹ | Not listed | 60 (appx) | \$160 | \$84 |
| | Whirlpool Whispure Medium Tower WPT60 | CADR = 67 cfm, ACH = 2.9 – 5.0 hr ⁻¹ | Not listed | 32 | \$116 | \$72 |
| | Fellowes AeraMax 90⁴ | CADR = 68 cfm, ACH = 2.9 – 5.1 hr ⁻¹ | Not listed | 51 | \$210 | \$58 |
| | Fellowes AeraMax Pro AM2⁴ | CADR = 100 cfm, ACH = 4.3 – 7.5 hr ⁻¹ | 45 - 64 | 55 | \$1080 | \$233 |
| | Sharp True HEPA Air Purifier FPF30UH | CADR = 92 cfm, ACH = 3.9 – 6.9 hr ⁻¹ | 23 - 46 | 50 (appx) | \$120 | \$26 |
| 175 – 250 ft ² (Large office, small huddle or group meeting room, small conference room) | Whirlpool Whispure Large Tower WPT80 | CADR = 142 cfm, ACH = 4.3 – 6.1 hr ⁻¹ | Not listed | 43 | \$168 | \$98 |
| | Levoit Core 200S Smart True HEPA Air Purifier | CADR = 118 cfm, ACH = 3.5 – 5.1 hr ⁻¹ | 24 - 48 | 37 | \$90 | \$60 |
| | Levoit Core 300 True HEPA Air Purifier | CADR = 141 cfm, ACH = 4.2 – 6.0 hr ⁻¹ | 24 - 50 | 45 | \$100 | \$60 |
| | Airthereal APH230C Air Purifier | CADR = 135 cfm, ACH = 4.1 – 5.8 hr ⁻¹ | 24 - 49 | 60 | \$90 | \$52 |
| | Coway Airmega 150 | CADR = 138 cfm, ACH = 4.1 – 5.9 hr ⁻¹ | 24 - 48 | 35 | \$190 | \$50 |
| | Fellowes AeraMax 190⁴ | CADR = 126 cfm, ACH = 3.8 – 5.4 hr ⁻¹ | Not listed | 62 | \$300 | \$80 |
| 250 – 400 ft ² (Conference room, meeting room, small reception area/lobby) | BlueAir Blue Pure 311 Auto | CADR = 244 cfm, ACH = 4.6 – 7.3 hr ⁻¹ | 23 - 53 | 35 | \$250 | \$40 |
| | Honeywell HPA200 and HPA204 | CADR = 200 cfm, ACH = 3.8 – 6.0 hr ⁻¹ | Not listed | 85 (appx) | \$198 | \$84 |
| | Honeywell InSight HPA5200B and HPA5200W | CADR = 226 cfm, ACH = 4.2 – 6.8 hr ⁻¹ | Not listed | 95 (appx) | \$230 | \$104 |
| | Coway Airmega 250 | CADR = 249 cfm, ACH = 4.7 – 7.5 hr ⁻¹ | 24 - 51 | 64 | \$400 | \$79 |
| | Fellowes AeraMax 290⁴ | CADR = 191 cfm, ACH = 3.6 – 5.7 hr ⁻¹ | Not listed | 86 | \$380 | \$103 |
| | Fellowes AeraMax Pro AM3 line⁴ | CADR = 220 cfm, ACH = 4.1 – 6.6 hr ⁻¹ | 38 - 67 | 100 | \$1470 | \$522 |

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|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|--------------------|-----------------------|-------------------------|--------------------------------------------------------------------|
| 400 – 550 ft ² (Training room/large conference room, reception area, small shop, breakroom) | BlueAir Blue Pure 211+ | CADR = 350 cfm, ACH = 4.8 – 6.1 hr ⁻¹ | 31 - 56 | 61 | \$300 | \$120 |
| | Honeywell HPA300 and HPA304 | CADR = 300 cfm, ACH = 4.1 – 5.1 hr ⁻¹ | Not listed | 130 (appx) | \$350 | \$79 |
| | Honeywell InSight HPA5300B and HPA5300W | CADR = 335 cfm, ACH = 4.6 – 6.0 hr ⁻¹ | Not listed | 140 (appx) | \$290 | \$99 |
| | Whirlpool Whispure WP500 and WP1000 | CADR = 315 cfm, ACH = 4.3 – 5.9 hr ⁻¹ | Not listed | 110 | \$314 | \$110 |
| | Whirlpool Whispure WPPRO2000 | CADR = 328 cfm, ACH = 4.5 – 6.1 hr ⁻¹ | Not listed | 115 | \$414 | \$154 |
| | Levoit VeSyncCore 400S Smart Air Purifier | CADR = 260 cfm, ACH = 3.5 – 5.1 hr ⁻¹ | 24 - 52 | 38 | \$220 | \$100 |
| | Levoit LV-H133 Tower HEPA Air Purifier | CADR = 274 cfm, ACH = 3.7 – 6.0 hr ⁻¹ | 25 - 54 | 47 | \$200 | \$126 |
| | Levoit LV-H134 Tower Pro HEPA Air Purifier | CADR = 312 cfm, ACH = 4.3 – 5.8 hr ⁻¹ | 23 - 57 | 45 | \$300 | \$126 |
| | Coway Airmega 300 | CADR = 325 cfm, ACH = 4.4 – 5.9 hr ⁻¹ | 22 - 52 | 57 | \$549 | \$99 |
| 550 – 850 ft ² (Large breakroom with kitchen and eating areas, classrooms, shop areas) | BlueAir Classic 605 | CADR = 500 cfm, ACH = 4.4 – 6.8 hr ⁻¹ | 33 - 62 | 100 | \$500 | \$136 |
| | BlueAir Pro L | CADR = 450 cfm, ACH = 4.0 – 6.1 hr ⁻¹ | 32 - 55 | 170 | \$980 | \$238 |
| | Coway Airmega 400 | CADR = 420 cfm, ACH = 3.7 – 5.7 hr ⁻¹ | 22 - 52 | 66 | \$649 | \$129 |
| | Fellowes AeraMax Pro AM4 line⁴ | CADR = 440 cfm, ACH = 3.9 – 6.0 hr ⁻¹ | 42 - 68 | 166 | \$2457 | \$522 |

¹CADR = Clean Air Delivery Rate. This value is the amount of clean air output by the unit specific to removal of smoke-sized particles in the air.

²ACH = Clean Air Change Rate. This value is the effective clean air turnover per hour in the room size range provided, and does not represent additional air changes for the room in which the device is placed.

³Prices current as of September 2021, actual price may vary.

⁴CAUTION: This device contains a bipolar ionizer (plasma ionizer). Bipolar ionizer use is not permitted at Penn. The PlasmaTrue™ bipolar ionizer must be operated in the OFF mode.

When used in a workplace, portable air cleaners must be appropriately sized for the space in order to provide an air cleaning benefit. Generally, the larger a room, the less effective the air cleaner will be when used in that room. See Table 1 for general size information. We have provided generic examples of the types of areas associated with the recommended room sizes for each unit; however, it is best to individually match units to room size. Multiple units can serve a single space; for example, two units designed to be used individually in a 300 ft² space may be used in a 600 ft² space.

Although unnecessary in most indoor spaces, portable air cleaners may be used in offices, conference rooms, classrooms, workshops, waiting areas, reception areas, small exercise facilities and other small- to medium-sized public spaces (**Figure 1**). Portable air cleaners must not be used in laboratories and procedure rooms with single-pass ventilation (100% outside air ventilation, no recirculation) because they may disrupt the designed air flow in those spaces. Portable air cleaners provide no benefit in outdoor spaces.


Placement of the Device

Place the device in an open area; portable air cleaning devices should not be placed in corners, closets, or other closed-in spaces that inhibit air flow. The device should be placed such that air does not directly blow across an individual's workspace. Ensure that the device and its power cord are properly secured to prevent trip hazards.

Maintenance of the Device


Portable air filtration device maintenance should be performed according to the manufacturer instructions. Generally, devices contain a pre-filter that can be vacuumed with a standard vacuum cleaner and internal filters (including the carbon filter and the HEPA filter, which may be separate or combined) that require replacement on a regular schedule.

PORTABLE AIR CLEANER USE ALLOWABLE IN:



- Offices
- Classrooms
- Workshops
- Waiting rooms
- Small exercise facilities
- Other small-to-medium sized public spaces

PORTABLE AIR CLEANERS PROHIBITED IN:



- Laboratories
- Procedure rooms
- Clinical areas
- Other spaces with single-pass ventilation
- Large public spaces (auditoriums, galleries, large gyms)
- Outdoor spaces

Figure 1: Portable Air Cleaner Use Guidelines

Other Important Considerations

The noise generated by a portable air cleaner is an important consideration. Additional noise can be disruptive to staff, faculty and students using indoor spaces. Noise rating ranges are provided by the manufacturer (ranges are provided because the noise produced differs by speed setting). For reference, the noise rating of a standard kitchen refrigerator is approximately 50 dB.¹

Many portable air cleaners also contain activated carbon filters as part of the filtration chain. Activated carbon serves to remove odorous compounds and volatile organic compounds (VOCs) from the room air. Activated carbon filter-containing units are encouraged for use based on their effectiveness for VOC removal, but the presence of activated carbon has no effect on viral load reduction in air.

Do Not Use: Ultraviolet Germicidal Irradiation (UVGI)

Ultraviolet germicidal irradiation (UVGI) units generate ultraviolet radiation to deactivate viruses and microbes in room air. Ultraviolet radiation can be damaging to eyes and skin with improperly or unsafely installed ultraviolet air cleaners. **Penn EHRS prohibits the use of UVGI systems in portable air filtration devices.**

Do Not Use: Other Chemical or Electrical Air Treatment Technologies

Bipolar ionization devices (also called plasma ion devices) and photocatalytic oxidation devices may generate ozone, a toxic gas, in indoorspaces. Additionally, peroxide and chemical fogging disinfection devices can generate reactive oxygen species and other harmful airborne chemicals that have adverse effects on indoor air quality. As such, **PennEHRS prohibits the use of bipolar ionization, photocatalytic oxidation, or chemical disinfection portable air filtration devices.** Some devices in Table 1 (see footnote 4) have switched bipolar ionization; the bipolar ionization mode must be turned OFF in these devices.

¹ https://www.epa.gov/sites/production/files/2018-07/documents/guide_to_air_cleaners_in_the_home_2nd_edition.pdf