

Do-It-Yourself Air Cleaners

One of the best ways to protect your health from wildfire smoke is to create a cleaner air space at home. Commercially available portable air cleaners with HEPA filters are ideal for removing small particles from the air, but they may be expensive or not easily available. A home-made Do-It-Yourself (DIY) air cleaner with box fans and furnace filters can also help to improve air quality. Research suggests that DIY air cleaners perform similarly to commercial portable air cleaners in terms of their ability to remove small particles from air and their energy use.



DIY air cleaners can be very effective, but there are some limitations that are important to understand

- Box fans are not designed to operate with a filter attached. Studies show that adding a filter to a newer model fan is unlikely to pose a fire risk, but caution is needed to operate DIY air cleaners safely.
- The effectiveness of DIY air cleaners depends on proper construction and operation, and quality of materials used. They may be less effective if they are incorrectly placed, not maintained, or if they are damaged.
- It may help to use low-cost particulate matter sensor to measure how the concentrations of small particles change when using air cleaners in your home. Learn more about low-cost sensors: <https://rb.gy/a7zfn>
- DIY air cleaners only remove small particles from air and DO NOT remove other indoor air pollutants, such as ground-level ozone, radon, volatile organic compounds, carbon monoxide, or carbon dioxide.
- Studies have found DIY air cleaners to be effective in homes and schools when used over short periods, but there are no studies yet of their use over longer periods.
- Consider more permanent measures to create cleaner air spaces indoors (e.g., purchasing a commercial air cleaner, upgrading the Heating, Ventilation, and Air Conditioning system) if possible.



BEST



BETTER



GOOD

FIGURE 1: Different types of air cleaners, including a commercially available unit (TOP), a double box fan model (MIDDLE), and a single box fan model (BOTTEM). Commercially available units tend to provide the best safety and effectiveness features, but DIY air cleaners can still provide adequate air cleaning.



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If you choose to make and use a DIY air cleaner:

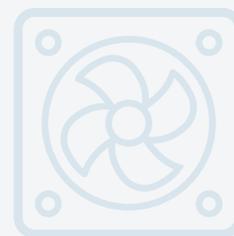
- Use a clean, newer (2012 or later) box fan with a safety fuse and multiple speed options.
- Look for marks from recognized certifying organization such as the Underwriters Laboratories (UL), Canadian Standards Association (CSA) and Intertek ETL program.



- Use a high efficiency filter, preferably MERV 13 (FPR 10 or MPR1500-1900) or higher.
- Consider using two or more filters, which increases the surface area for filtration and the overall effectiveness (e.g., Figure 1, middle).
- Use in a small room (e.g., a single bedroom) that is kept at a comfortable temperature.
- Use in a room where doors and windows are closed, unless it is too hot to do so. Overheating can be a bigger health risk than smoke exposure.
- **DO NOT** leave the fan running unattended (including with people who cannot turn off the fan in case of emergency, such as young children or people with limited mobility).
- **DO NOT** block the back or the front of the fan – keep it away from walls, curtains, furniture, etc.
- Change filters when they are visibly soiled.

Commercial units have additional features that may be important for some people:

- They can alert when the filter needs to be changed.
- They can be set to automatically adjust fan speed when high levels of particulate matter are detected.
- They can help remove odour if they have an activated carbon pre-filter.
- The units are fully housed – no parts are exposed so they are less likely to create hazards in the home.



SCIENCE IN ACTION

Previously, there was little research on the effectiveness of DIY air cleaners. However, both peer-reviewed literature and technical reports now suggest that they perform similarly to commercial models. They are a safe and effective alternative to more expensive commercial portable cleaners, for lower material costs and without excessive energy use or large differences in noise generation. <https://rb.gy/gj9em>



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LAST UPDATED: AUGUST 2023

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SUPPLIES YOU NEED

- 20" x 20" box fan
- One or two 20" x 20" MERV 13 (comparable with FPR 10 or MPR1500-1900) furnace filters (these come in different depths, 1" is adequate)
- Tape
- Marker
- Cardboard (if using two filters)

Plug in the fan and turn it on to test the direction of air flow, and use the marker to **draw an arrow from the back (where air goes in) to the front (where air comes out)** on top of the fan.

Supplies you need to make a single or double box fan filter. Look for filters with MERV 13 rating.

For a double box fan filter:

- Cut two triangles out of cardboard with each side measuring 21" and each angle measuring 60 degrees.
- Tape the two filters together along one side, make sure the arrows on the edges of the two filters point to the same direction.
- Tape the tops of the two filters to one triangle, and the bottoms to the other triangle. Make sure the arrows on the edges of the filters point to the inside of the triangle, where the fan will go.
- Tape both filters and triangles to the back of the box fan.



Double box fan filter. Align the arrows on the filter with the air flow of the fan.

For a single box fan filter:

- Align the filter against the back of the fan.
- Turn the filter so that the arrows marked on the edges of the filter face the same direction as the arrow drawn on the fan.
- Tape the filter onto the fan.



Single box fan filter. Align the air flow arrow on the filter with the air flow of the fan.

For DIY air cleaners designed with more filters and/or fans for higher air cleaning capacity, visit <https://rb.gy/gj9em>

