

High Efficiency Particulate Arresting (HEPA) filters have been around since the 1950s to clean indoor areas. HEPA filters may be an important part of alleviating symptoms that may be caused by dust, dander, bacteria, molds and other airborne pollutants.

A HEPA filter only allows very tiny particles to pass through. If a single sheet of this HEPA paper is placed in front of a fan constrained as it would be in air purifiers, very little air would be able to pass because of the small size of the holes. In addition, air purifiers made like this would need to have the filter changed often because the holes would plug rapidly. Now if the size of the sheet were doubled the result would be twice the airflow and filter life. However, you cannot keep growing the sheet larger because it would be impractical. Instead in a HEPA filter the paper is folded back and forth so as to present a very large surface area to the airflow. This is how HEPA filters are made. Some have as much as 40 square feet of the filter material folded into the HEPA section.

HEPA material does not look like a screen or a colander. Instead it looks like a very thin bail of fibers. Thus the air has to find a route through this maze of fibers. There are three ways the HEPA filter stops particulates. First, is that a particle runs into a fiber and sticks. Second, the particle gets within one diameter of a fiber of the HEPA filter and while it tries to “skid by” the fiber it gets stuck on the fiber. Third, as a very small, about 0.1 micron, particle moves in the gas flow it bounces about due to collisions with molecules and again happens to slide close to a fiber and gets caught.

HEPA air purifiers stop mold spores as well as many bacteria and viruses and of course larger items such as dust. Most air purifiers claim to be 99.97% efficient at removing particles 0.3 microns and larger from the air that passes through the HEPA filter. The operative phrase is “pass through.” If the airflow does not have an opportunity to pass through the HEPA filter it will not be cleaned. Therefore the claim of 99.97% of all 0.3 and larger particles being removed is not accurate in poorly designed HEPA air purifiers where some of the airflow may pass around the HEPA filter and return to the room not cleaned. Thus the HEPA filter should specify that at least 90–95% of the airflow that enters the air purifier goes through the HEPA filter.

Pure HEPA air purifiers do not remove odors, chemicals or gasses. These are substances that are smaller than the 0.3 micron holes in a HEPA filter. Therefore typical HEPA air purifiers have some level of activated carbon based material to absorb odors and chemicals that will not be caught by the HEPA element itself.

