

PERFORMANCE [1]

**A \$38-62 DIY build delivers the same clean air as a \$549 commercial purifier.**

*Lab-tested side by side. One tenth of the cost.*

INDOOR AIR [EPA]

**Indoor air can be 2-5× more polluted than the air outside your front door.**

*Running your purifier on medium overnight actively cleans the air your family breathes while they sleep.*

BRAIN HEALTH [6,7]

**PM2.5 particles are small enough to travel from your lungs into your bloodstream and reach your brain.**

*Cleaner indoor air is one of the most direct ways to protect your family's long-term brain health.*

### 3 Rules Before You Buy Anything

- **Only buy MERV-13 filters.** Not MERV-8 (too weak). Not HEPA (chokes the fan, cuts airflow 50-70%).
- **Only use a box fan made in 2012 or later.** Must have a thermal cutoff safety feature. Check the box.
- **For wildfire smoke only:** also buy an activated carbon sheet. Only carbon catches toxic gases in wildfire smoke.

**⚠ Carbon Monoxide Warning** — No filter captures CO. Always run a separate CO detector during wildfire events.

### Step 1 — Find Your Room Size

Target: 4-6 air changes per hour (ACH) — the EPA and ASHRAE recommendation for wildfire smoke.

**Small Room — 200 sq ft** (Bedroom, office, study)

Clean air needed	<b>133 cfm minimum</b>
Fan to buy	<b>20-inch box fan, 1,200+ cfm, 2012 or later</b>
Filter to buy	<b>20 x 20 x 2 inch MERV-13</b>
Wildfire add-on	<b>Carbon sheet: 20 x 20 inch</b>
<b>Total: \$38-62</b>	

**Large Room — 500 sq ft** (Living room, open plan)

Clean air needed	<b>333 cfm minimum</b>
Fan to buy	<b>20-inch box fan, 1,500+ cfm, 2012 or later</b>
Filter to buy	<b>20 x 20 x 4 inch MERV-13</b>
Wildfire add-on	<b>Carbon sheet: 20 x 20 inch</b>
<b>Total: \$45-75</b>	

## Step 2 — Buy Your Parts

Part	Exactly What to Look For	Brand Examples	Where	Cost
<b>Box Fan</b> — 20 inch	<b>Made 2012 or later. Box must say: thermal cutoff or fused plug</b>	Lasko 3723, Lasko 3300, Hurricane Classic 20", Genesis 20"	Walmart, Amazon, Target	<b>\$20-35</b>
<b>MERV-13 Filter</b> — 2 inch for 200 sq ft	<b>NOT MERV-8. NOT HEPA.</b> Size: 20x20x2". Look for MERV-A rating. Recommended: Nordic Pure, 3M Filtrete, Glasfloss.	Nordic Pure MERV-13, 3M Filtrete MERV-13, Glasfloss MERV-13	Amazon, Home Depot, Lowe's	<b>\$15-22</b>
<b>MERV-13 Filter</b> — 4 inch for 500 sq ft	Size: 20x20x4". Must say MERV-13. Thicker = more capacity.	Nordic Pure 4", 3M Filtrete 4", Glasfloss 4"	Amazon, Home Depot, Lowe's	<b>\$22-35</b>
<b>Carbon Sheet</b> <i>Wildfire only</i>	Size: 20x20". <b>Must say activated carbon — not just "charcoal"</b>	Veva Carbon Pre-Filter, Smart Air Carbon Sheet, OdorStop Carbon Pad	Amazon	<b>\$10-25</b>
<b>Duct Tape</b>	Standard duct tape or packing tape. Any brand.	Any brand	Hardware or Amazon	<b>\$3-8</b>

**Total cost summary:** Small room: \$38-62 | Large room: \$45-75 | Add wildfire carbon: +\$10-25

## Steps 3-7 — How to Build It

Step 5 is for wildfire smoke only — skip it if you do not need it.

### 3 Find the Arrow on the Filter

Look at the cardboard frame. There is a small arrow — it may say "airflow" next to it. This shows which way air travels: from the room, through the filter, toward the fan.

### 4 Hold the Filter Against the BACK of the Fan

The back is the side that pulls air IN. Hold the filter flat against it — arrow pointing toward the fan. Not sure? Turn the fan on briefly: the side where air blows OUT is the front. Put the filter on the other side.

### 5 OPTIONAL — Wildfire Smoke Only: Add the Carbon Sheet

Tape the carbon sheet to the outside face of the MERV-13 — the face pointing toward the room. Air flows: **Room → Carbon (gases) → MERV-13 (particles) → Fan → Clean air out.** Skip entirely for everyday use.

### 6 Tape All Four Edges — No Gaps

Seal every edge where the filter meets the fan frame — top, bottom, left, right. Any gap lets dirty air sneak past. Run your finger along every edge and add tape where needed.

**Free upgrade:** Wrap cardboard around the gap between fan and filter frames. Boosts clean air delivery by up to 40%. [Holder et al., EPA 2022]

## 7 Place in the Room and Turn On

Put it in the middle of the room or near where you spend most time. **Fan speed:** Medium for everyday use and sleeping. High only during active wildfire smoke.

## When to Replace Your Filter

**Easy check:** Hold the filter up to a light. Grey or brown instead of white = replace it.

How You Are Using It	Replace MERV-13 Filter Every...	Replace Carbon Sheet Every...
Everyday use — dust, allergens	Every 2 to 3 months	Every 1 to 3 months
Active wildfire smoke	<b>Check DAILY — replace when grey, brown, or smells of smoke</b>	<b>Check DAILY — replace every 1-2 weeks in heavy smoke</b>

## Safety Checklist

- ✓ Only use fans made in 2012 or later with a thermal cutoff
- ✓ Unplug the fan before removing or changing the filter
- ✓ Do not block the fan ventilation slots on the sides or back
- ⚠ Carbon monoxide is NOT captured by any filter. Always run a CO detector separately during wildfire events.

### RESEARCH SOURCES

[1] Srikrishna D. Science of the Total Environment. 2022;838:155884. [2] Prathibha P, Turner M, et al. Atmospheric Environment. 2024;333:120650. [3] Holder AL et al. Indoor Air. 2022. DOI:10.1111/ina.13163. [4] US EPA. epa.gov/air-research. July 2025. [5] ASHRAE 52.2 Appendix J. [6] Block ML & Calderón-Garcidueñas L. Trends Neurosci. 2009;32(9):506–516. [7] Maher BA et al. PNAS. 2016;113(39):10797–10801.

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# THE CLEAN AIR QUEST

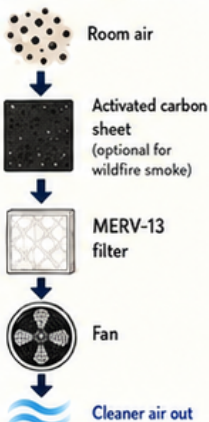
Build your DIY clean-air purifier!

## OUR MISSION

Wildfire smoke can enter our homes. As a family, we can build a simple purifier that helps reduce many tiny smoke particles indoors.



## HOW IT WORKS



Activated carbon is optional for wildfire smoke and does NOT remove carbon monoxide (CO).

## MEET THE INVISIBLE TRAVELERS



### DUST

Tiny bits of dirt and stuff that float in the air.



### POLLEN

From plants and trees. Can cause sneezes and itchy eyes.



### SMOKE (PM2.5)

Tiny smoke particles from wildfires that can go deep into your lungs.



### INVISIBLE GASES

Odors and gases we can't see, but can smell.

## WHY MERV-13?

### HEPA



Too dense. Less airflow.

VS.

### MERV-13



Excellent filtration. More clean air per minute.

## HOW SMALL IS SMOKE?

Smoke particles (PM2.5) are much smaller than a human hair.



HUMAN HAIR  
50–70 microns wide



PM2.5 PARTICLE  
2.5 microns wide or smaller

About 30 particles of PM2.5 could fit across the width of a human hair!

## FAMILY CHALLENGE

- 1 What things in your home can make smoke or dust?
- 2 Why is MERV-13 better than HEPA on a box fan?
- 3 Where would you place your purifier so it works best?

## YOUR SUPERHERO TOOLS (AND APPROX. COSTS)



20-inch box fan (2012 or newer)

approx. \$25–\$35



MERV-13 filter 20x20x2 for small room or 20x20x4 for larger room

approx. \$15–\$35



Duct tape strong adhesive tape

approx. \$5–\$10



Optional cardboard shroud approx. \$5–\$10 or free / scrap cardboard



Optional activated carbon sheet for wildfire smoke add approx. \$15–\$25

## SAFETY FIRST!



Unplug before changing the filter.



Do not block side or back vents.



Use a separate CO detector.

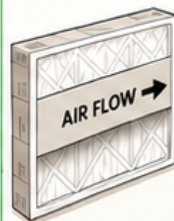


Do not let small children or pets play with the fan.



## BUILD IT IN 5 EASY STEPS!

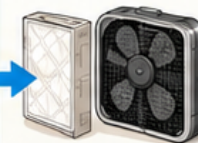
- 1 Find the airflow arrow on the filter.



- 2 Optional for wildfire smoke: place the activated carbon sheet on the room-facing side of the filter.



- 3 Place the MERV-13 filter on the BACK of the fan, with the arrow pointing toward the fan.



- 4 Seal all edges with tape. No gaps.



- 5 Put it in the room and turn it on.

Use MEDIUM for daily use; HIGH only during active smoke.



## TOTAL COST (approx.)



Small room (20x20x2): about \$40–\$70



Large room / 4-inch filter (20x20x4): about \$55–\$80



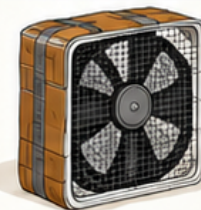
Wildfire carbon add-on: add about \$15–\$25

Prices vary by store, brand, and filter pack size. Checked June 2026.

## BONUS: CARDBOARD TURBO BOOST

Add a cardboard shroud around the edges to help increase clean-air delivery by up to

**40%!**



## DAILY USE AND FILTER CHECK



Everyday use: Change MERV-13 every 2–3 months.



Active wildfire smoke: Check daily; replace when gray, brown, or smells smoky.



Carbon in heavy smoke: Change every 1–2 weeks or when it no longer helps.

## MEASURE YOUR RESULTS (CLEANER AIR)

- 1 RATE THE SMELL

Score the odor from 0 (none) to 5 (very strong).

- 0 None
- 1 Barely there
- 2 Light
- 3 Noticeable
- 4 Strong
- 5 Very strong

Ask the average score for your family!

- 2 FLASHLIGHT TEST

Shine a light in a dark room. How many particles do you see in the beam?



- Lots
- Some
- Few

Take a photo before and after!

- 3 REAL PM2.5 MONITOR

Use a monitor to see particle levels.



Good 0–12  
Moderate 13–35  
Unhealthy for Sensitive Groups 36–55  
Unhealthy 56+  
Lower numbers are better!

## CLEAN AIR LOGBOOK

Date: \_\_\_\_\_ Wildfire smoke?  Yes  No

	BEFORE (my air)	AFTER (30–60 min)	CHANGE
Odor score (0–5)			
Particles in beam (Lots / Some / Few)			
PM2.5 (µg/m³)			

What did you change or learn today? \_\_\_\_\_

## JUNIOR SCIENTIST CERTIFICATE

Congratulations on building your DIY air purifier and helping your family breathe cleaner air! You are making a healthy difference.

Name \_\_\_\_\_  
Date \_\_\_\_\_  
Signature \_\_\_\_\_



## AMAZING FACTS!



Adults breathe about 20,000 times a day!



Trees help clean the air we breathe. More green, more clean!



MERV-13 filters can catch many tiny particles you can't see.



A DIY purifier can help reduce smoke and make your indoor air cleaner on smoky days.