REVISITING VENTILATION DEMAND AS FALL APPROACHES

Peter Troast, Founder & CEO

Energy Circle Webinar Series

August 18, 2021

The State of the Passive House Market & What It Means for Retrofit Contractors

By Lily Collins | August 18, 2021

Homebuyers of nearly every generation are looking for homes that are easy and affordable to maintain, and passive homes fit the bill perfectly. As these impressively efficient properties increase in popularity and availability, unique third-party organizations like the Passive House Institute US Inc. will be increasingly helpful and worth watching.

Ready to learn more about the current state of the passive house movement? Read on!

What Is the Passive House Movement?

The passive house movement took off in the 1970s when the US Department of Energy (DOE) and the Canadian government partnered to fund the creation of a passive house performance standard.

From there, the concept took off around the world, most notably in Germany in the 80s, but it was soon understood that a universal standard was impossible—factors like climate and lifestyle vary too much across regions for a one-size-fits-all solution.

Since 2003, non-profit organization PHIUS (Passive House Institute US, Inc.) has been "committed to making high-performance passive building the mainstream market standard," and with that goal comes a lot of responsibilities. As confirmed by their website, the organization:

- Trains and certifies professionals
- Maintains the PHIUS+ climate-specific passive building standard
- Certifies and quality assures passive buildings

What We'll Discuss

1. What's the Current State of Consumer Understanding and Demand for Improved Ventilation?
2. Should You Offer a Ventilation Assessment?
3. Steps Towards Seizing the Opportunity

VENTILATION, COVID 2.0, SCHOOL OPENINGS. WHAT'S THE STATE OF THE STATE?

HEALTH

We Need to Talk About Ventilation

How is it that six months into a respiratory pandemic, we are still doing so little to mitigate airborne transmission?

ZEYNEP TUFEKCI JULY 30, 2020

MILLENNIUM IMAGES / GALLERY STOCK

I recently took a drive-through COVID-
Everything was well organized and efficie
seconds and sent home with two pages of
positive, and what precautions people livi
should take. The instructions included m
transmission via surfaces, and also went i

Ventilation and air filtration play a key role in preventing the spread of COVID-19 indoors

As schools and offices open up, here's what building managers should do to reduce SARS-CoV-2 particles in the air we breathe

Ramon Padilla, USA TODAY

Updated 7:38 p.m. EDT Oct. 19, 2020

As the nation reopens after COVID-19 restrictions, people across the country are making decisions about going back to the office or putting their children back in classrooms. But how can you make the right call? We asked the experts how to improve indoor air quality, and what questions to ask your boss or school administrator.

"Often indoors, people are the source of contaminants," says Dr. Shelly Miller, a professor of mechanical engineering at the University of Colorado Boulder.

Your chances of being infected depend on the size of the room and the number of people infected with COVID-19 inside.

"When they talk, talk loudly, when they breathe, small respiratory aerosols are released," Miller said.

If you're in a classroom, office or other enclosed space, these aerosols can build up over time.

Google

ventilation in schools

TP Today's Parent

I can't believe back-to-school is even scarier and more stressful than last year

While the province has ignored expert medical recommendations like smaller class sizes and made minimal efforts to improve ventilation in ...

1 day ago

KitchenerToday.com

Public school board working on ventilation in schools, more measures ahead of new school year

30 per cent of our schools are partially supported through mechanical ventilation, and a tiny portion is not," said Gerard. The board estimates ...

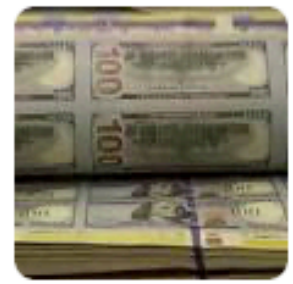
5 days ago

WSLS

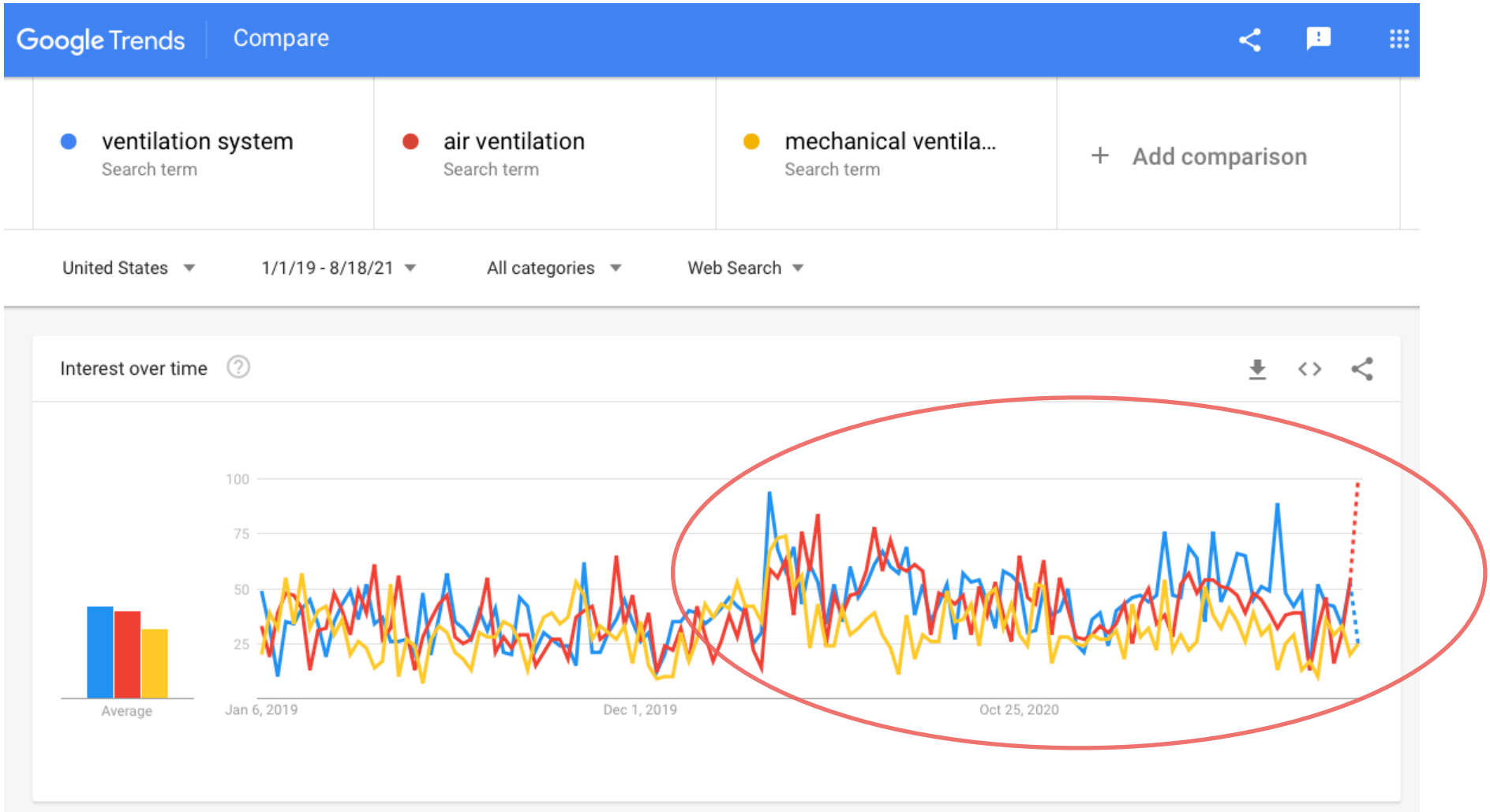
Millions of dollars being used for upgrades at schools across the region

PITTSYLVANIA COUNTY, VA – Millions of dollars in COVID-19 relief money are going to local schools. Replacing heating, ventilation and air ...

6 days ago



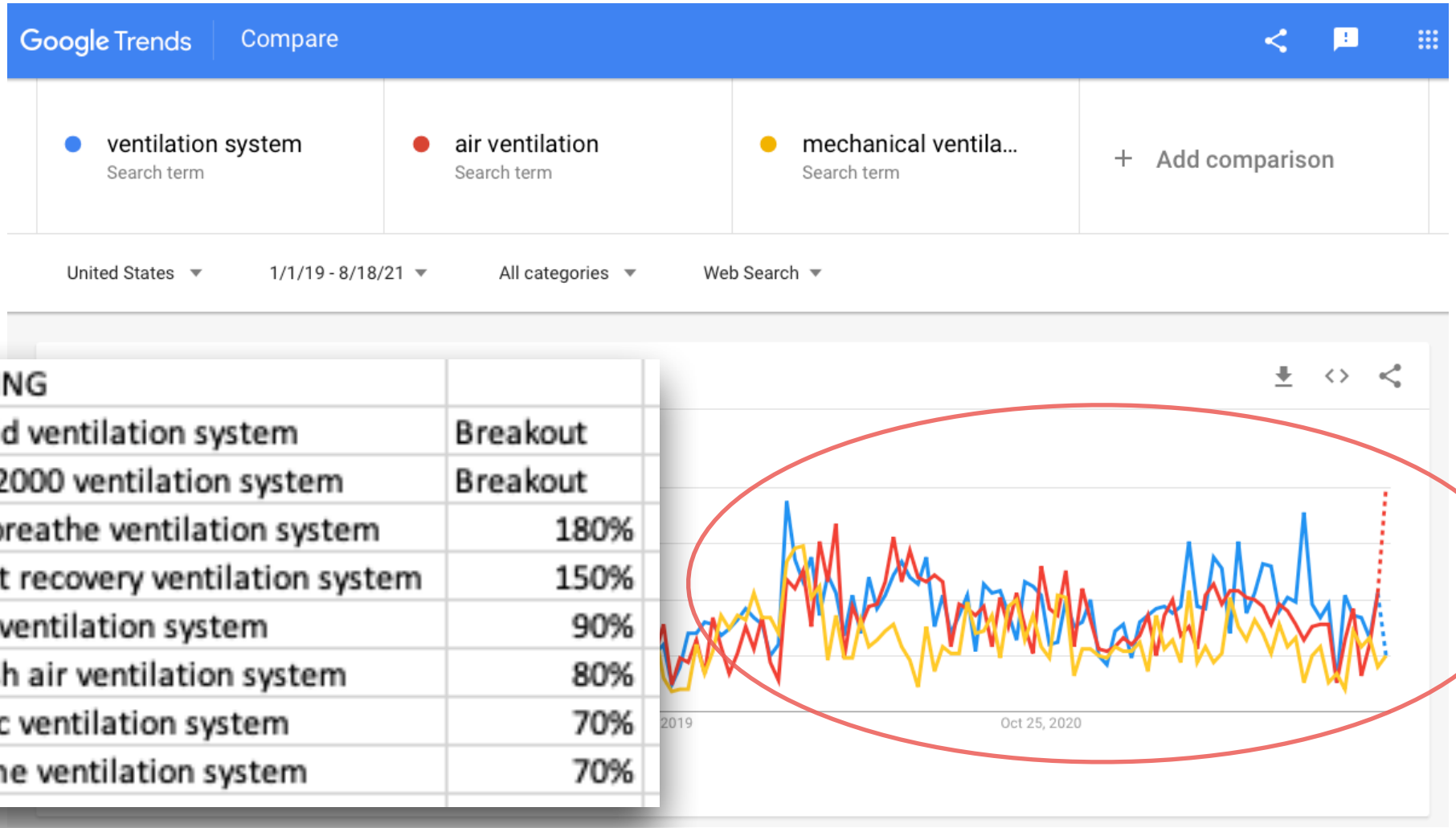
The COVID Bump for Ventilation



Google Trends, 1/1/19 to present

Taken August 18, 2021

The COVID Bump for Ventilation

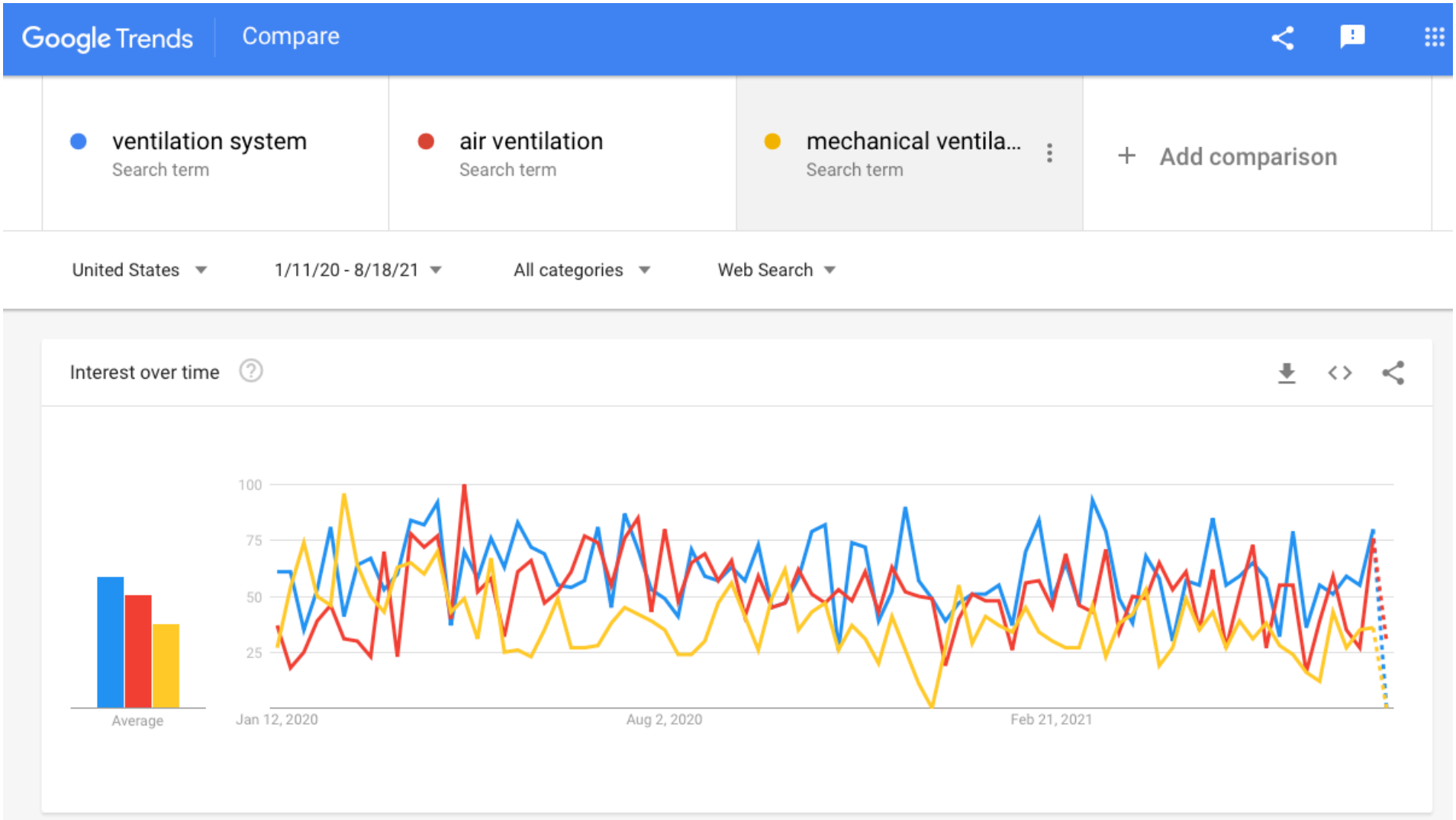


RISING	
covid ventilation system	Breakout
life2000 ventilation system	Breakout
ez breathe ventilation system	180%
heat recovery ventilation system	150%
hrv ventilation system	90%
fresh air ventilation system	80%
hvac ventilation system	70%
home ventilation system	70%

Google Trends, 1/1/19 to present

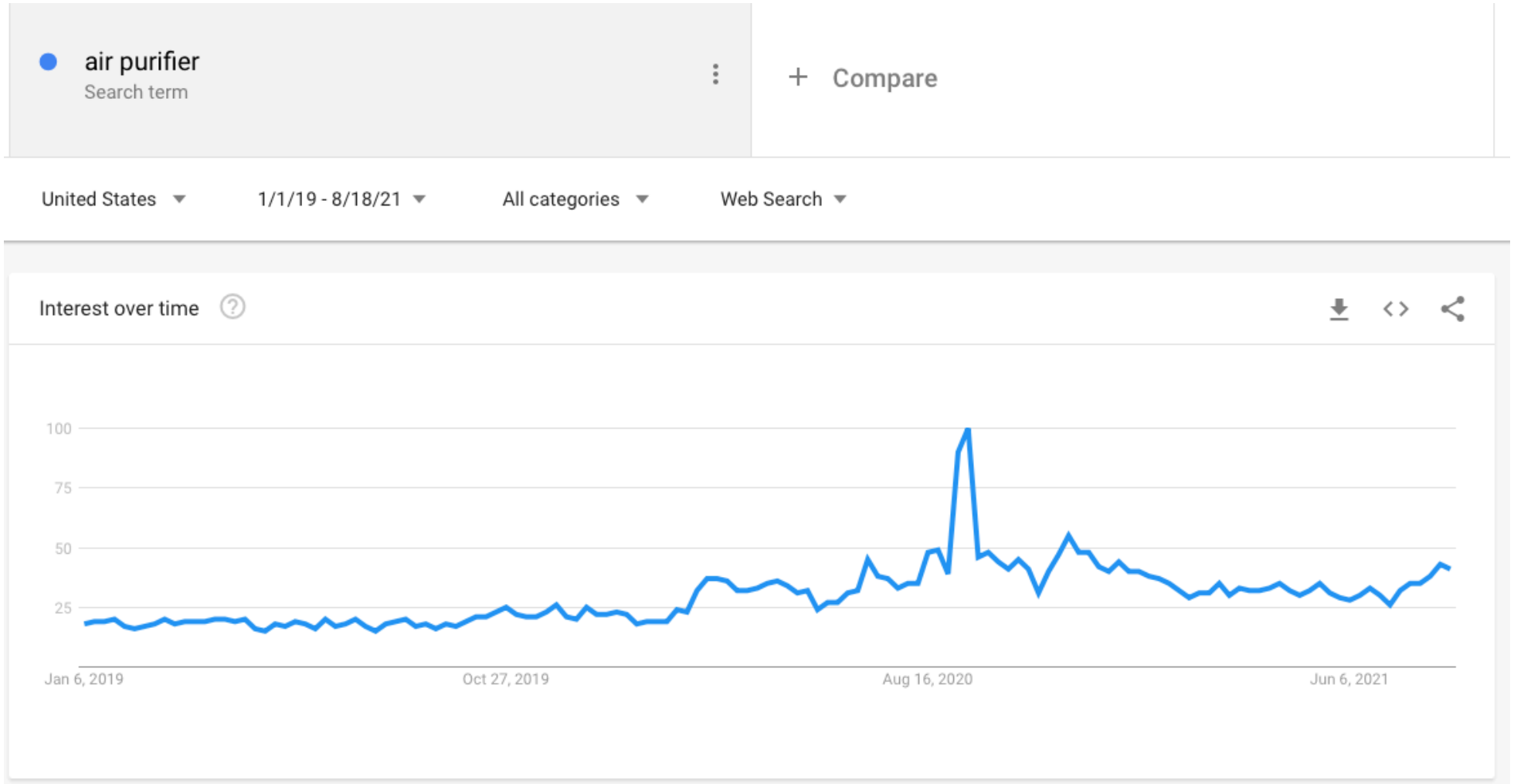
Taken August 18, 2021

Seasonality? I Don't Think So



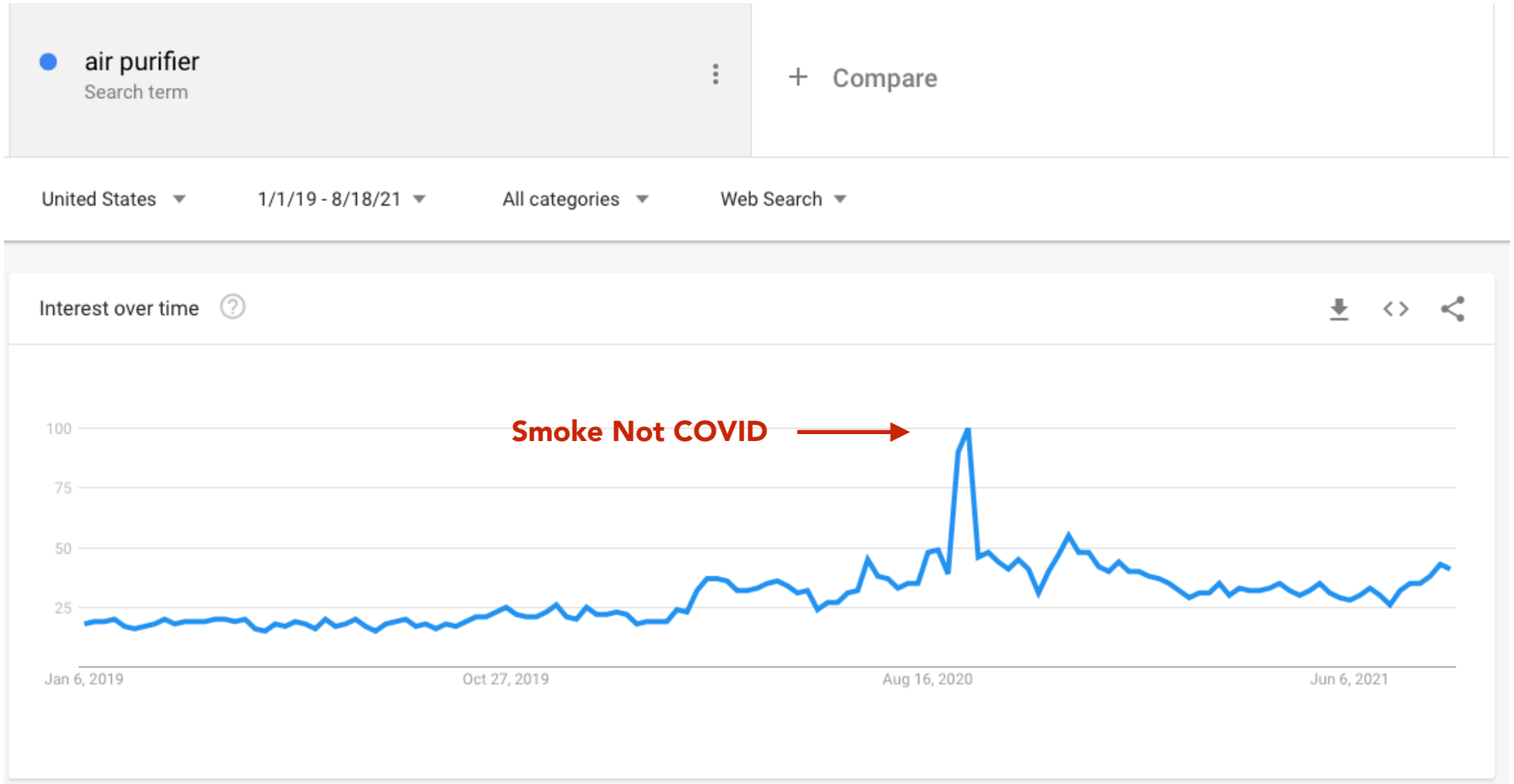
Google Trends, 1/1/20 to present

Taken August 18, 2021



Google Trends, 1/1/20 to present

Taken August 18, 2021



Google Trends, 1/1/20 to present

Taken August 18, 2021

Air Purification Explosion & Trends

RISING	
air purifier covid	Breakout
air purifier for viruses	Breakout
hepa air purifier covid	Breakout
best air purifier for viruses	Breakout
blue air purifier 211	Breakout
iqair healthpro plus air purifier	Breakout
wearable air purifier	Breakout
air sanitizer machine	Breakout
hospital grade air purifier	Breakout
dyson pure cool link, air purifier & fan, tp02	Breakout
aerus air purifier	Breakout
ionizing air purifier	Breakout
nuvomed air purifier	Breakout
jade air purifier	Breakout
best air purifier 2020	3350%
air purifier coronavirus	1650%
nuwave air purifier	650%
partu air purifier	650%
medify air purifier	600%
iwave air purifier	550%
iqair air purifier	500%
what does an air purifier do	400%
air genie air purifier	400%
halo air purifier	400%
air genie	300%

March-July 2020

RISING	
black friday air purifier	Breakout
proton pure air purifier	Breakout
breathe pure air purifier	Breakout
best air purifier for wildfire smoke	Breakout
conway air purifier	Breakout
aurabeat air purifier	Breakout
coway ap-1512hh mighty air purifier with f	Breakout
colzer air purifier	Breakout
pureflow smart air purifier	Breakout
breathe pure plus air purifier	Breakout
proton pure air purifier reviews	Breakout
healthway air purifier	Breakout
medi air purifier	2700%
ps5 air purifier	2650%
filtrete air purifier reviews	2650%
pure enrichment purezone 3-in-1 air purifi	2600%
nature fresh air purifier	550%
renpho air purifier	400%
dyson hot and cool air purifier	350%
nature fresh air purifier bags	300%
thunderstorm air purifier	300%
air police air purifier	250%
oxypure air purifier	200%
wirecutter air purifier	190%
air doctor air purifier	170%

July-Dec 2020

RISING	
instant air purifier	Breakout
azeus air purifier	Breakout
okaysou air purifier	450%
austin air purifier	200%
winix plasmawave air purifier	200%
mooka air purifier	200%
shark air purifier	120%
homedics air purifier	120%
costco dyson air purifier	110%
wirecutter air purifier	100%
thunderstorm air purifier	100%
whole house uv air purifier	100%
what does an air purifier do	100%
fellowes air purifier	100%
best bedroom air purifier	90%
best hepa air purifier	70%
best air purifier 2021	60%
blue air purifier	60%
hunter air purifier	60%
filtrete air purifier	60%
germguardian air purifier	60%
winix air purifier costco	50%
what is the best air purifier	50%
levoit air purifier red light	50%
reme halo air purifier	50%

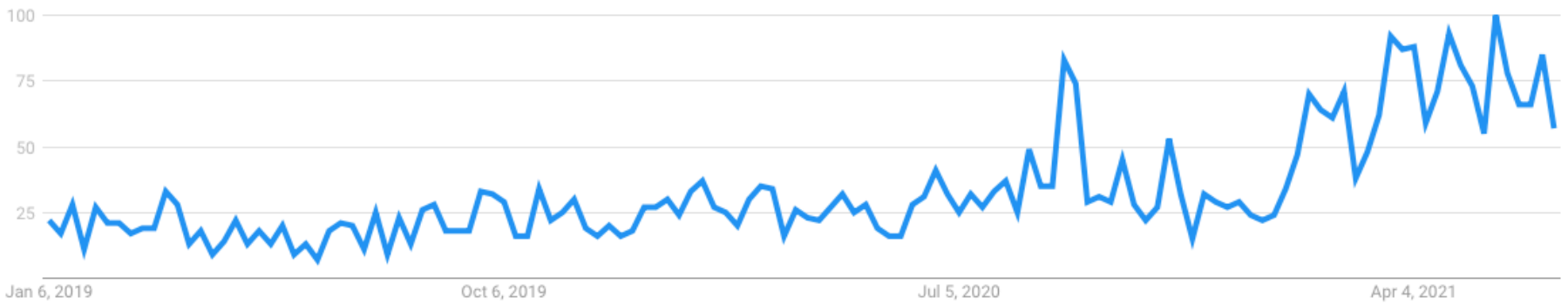
June-Aug 2021

indoor air quality
Search term

+ Compare

United States | 1/1/19 - 6/30/21 | All categories | Web Search

Interest over time

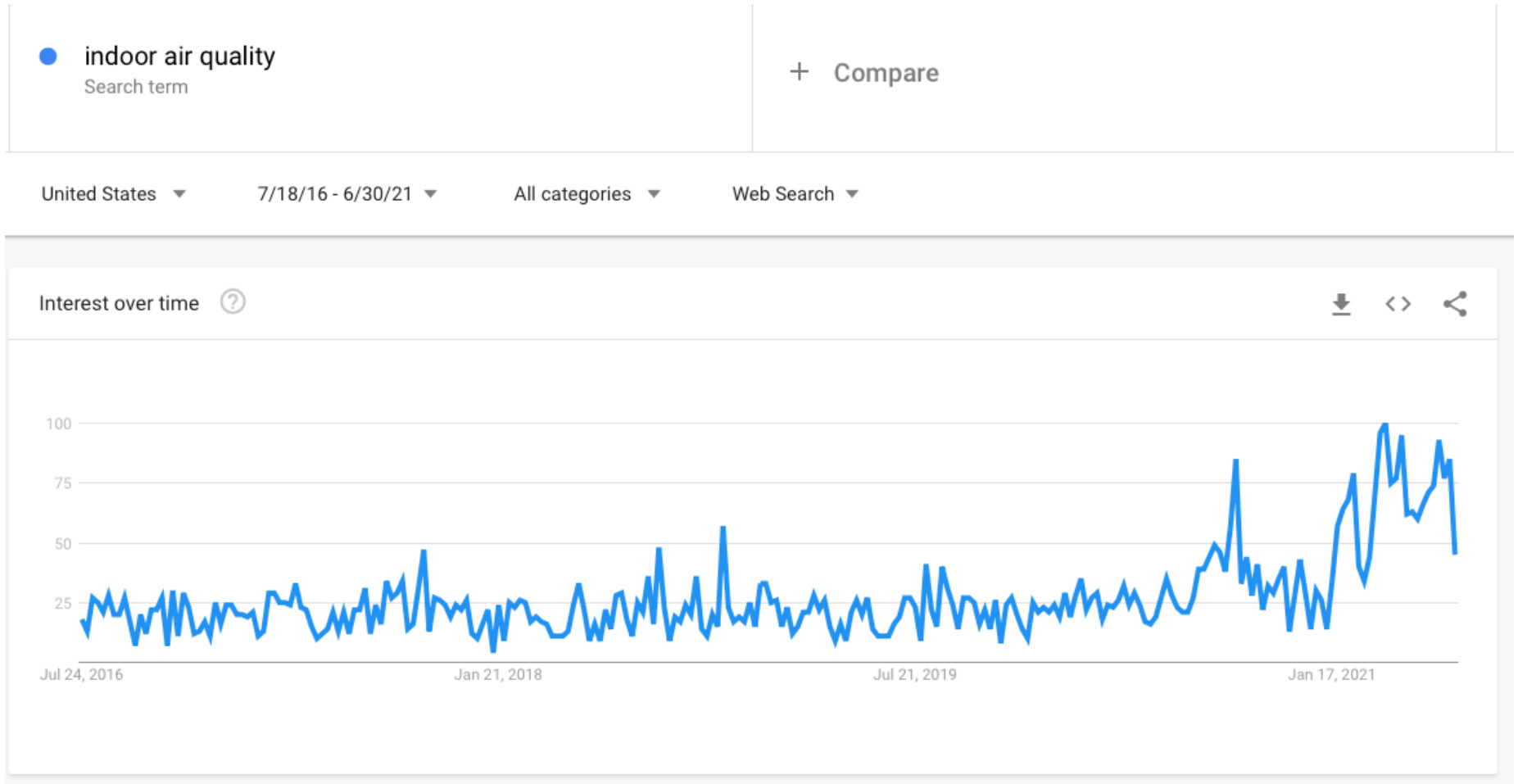


Related queries | Rising

1	how to test indoor air quality	+400%
2	indoor air quality testing companies near me	+250%
3	indoor air quality testing near me	+110%
4	indoor air quality solutions	+110%
5	air quality monitor	+90%

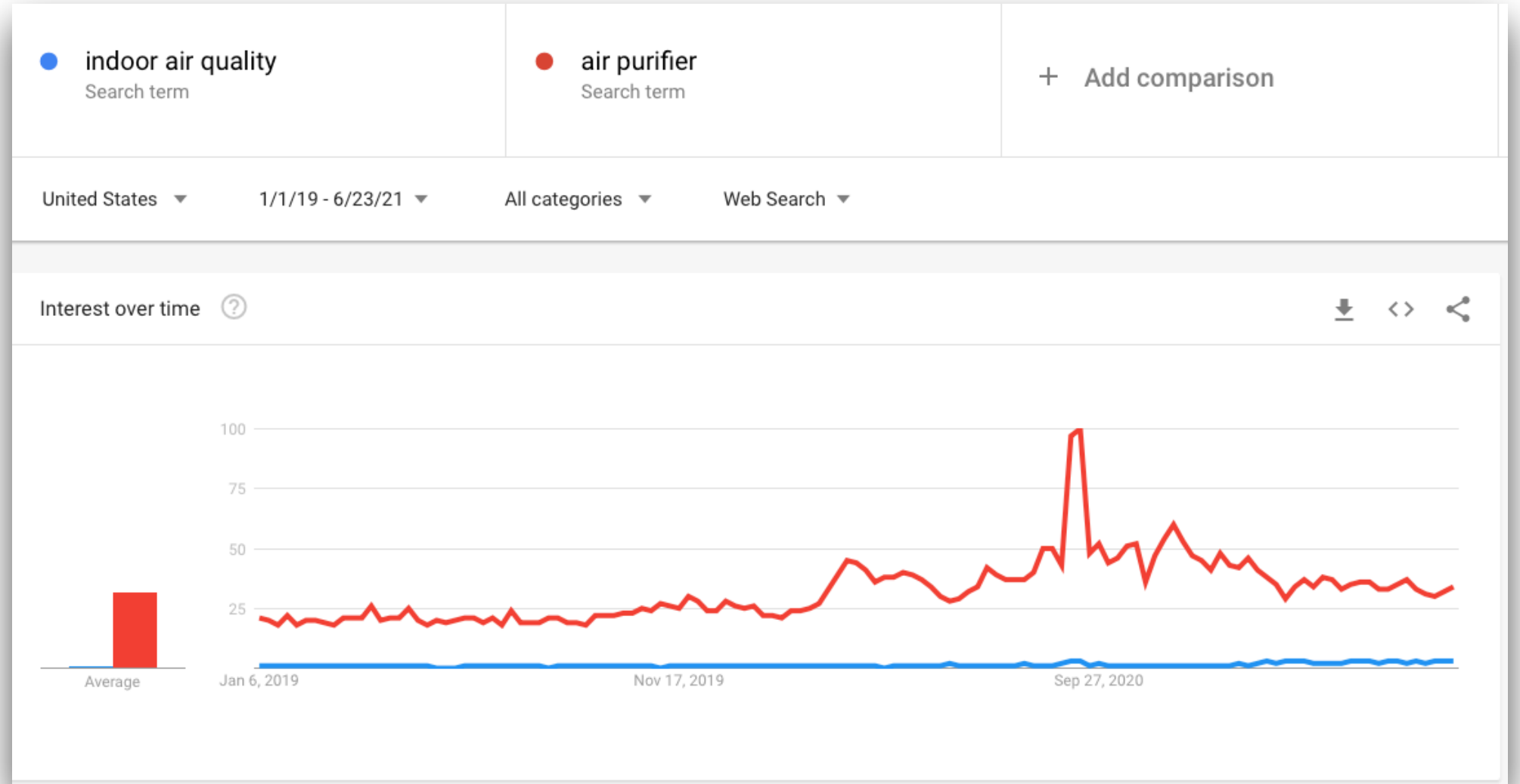
Google Trends, Jan 2019 to present

Taken Aug 18, 2021



Google Trends, Past 5 Years

Taken August 18, 2021

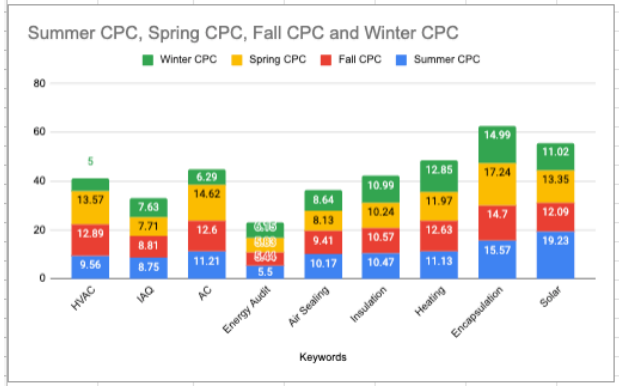


Google Trends, Jan 2019 to present

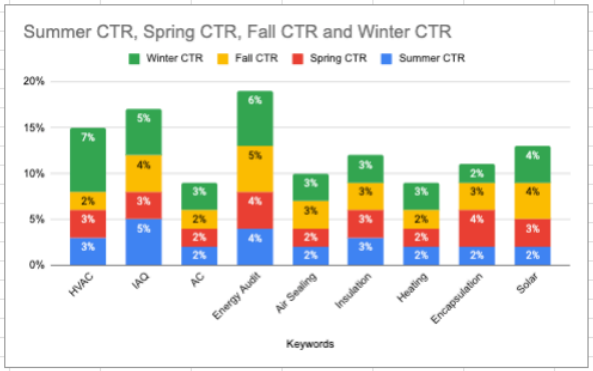
Taken August 16, 2021

Energy Circle Google Ads Dataset

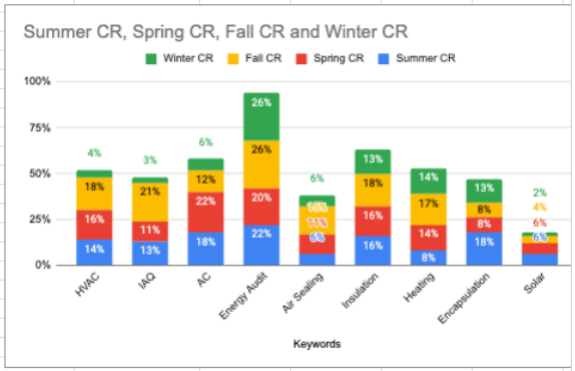
Keywords	Summer CPC	Fall CPC	Spring CPC	Winter CPC	Average
HVAC	9.56	12.89	13.57	5	10.26
IAQ	8.75	8.81	7.71	7.63	8.23
AC	11.21	12.6	14.62	6.29	11.18
Energy Audit	5.5	5.44	5.83	6.15	5.73
Air Sealing	10.17	9.41	8.13	8.64	9.09
Insulation	10.47	10.57	10.24	10.99	10.57
Heating	11.13	12.63	11.97	12.85	12.15
Encapsulation	15.57	14.7	17.24	14.99	15.63
Solar	19.23	12.09	13.35	11.02	13.92



Keywords	Summer CTR	Spring CTR	Fall CTR	Winter CTR
HVAC	3%	3%	2%	7%
IAQ	5%	3%	4%	5%
AC	2%	2%	2%	3%
Energy Audit	4%	4%	5%	6%
Air Sealing	2%	2%	3%	3%
Insulation	3%	3%	3%	3%
Heating	2%	2%	2%	3%
Encapsulation	2%	4%	3%	2%
Solar	2%	3%	4%	4%



Keywords	Summer CR	Spring CR	Fall CR	Winter CR
HVAC	14%	16%	18%	4%
IAQ	13%	11%	21%	3%
AC	18%	22%	12%	6%
Energy Audit	22%	20%	26%	26%
Air Sealing	6%	11%	15%	6%
Insulation	16%	16%	18%	13%
Heating	8%	14%	17%	14%
Encapsulation	18%	8%	8%	13%
Solar	6%	6%	4%	2%



~$250,000 per month for 8 years

125,000 keywords

Major regions of US

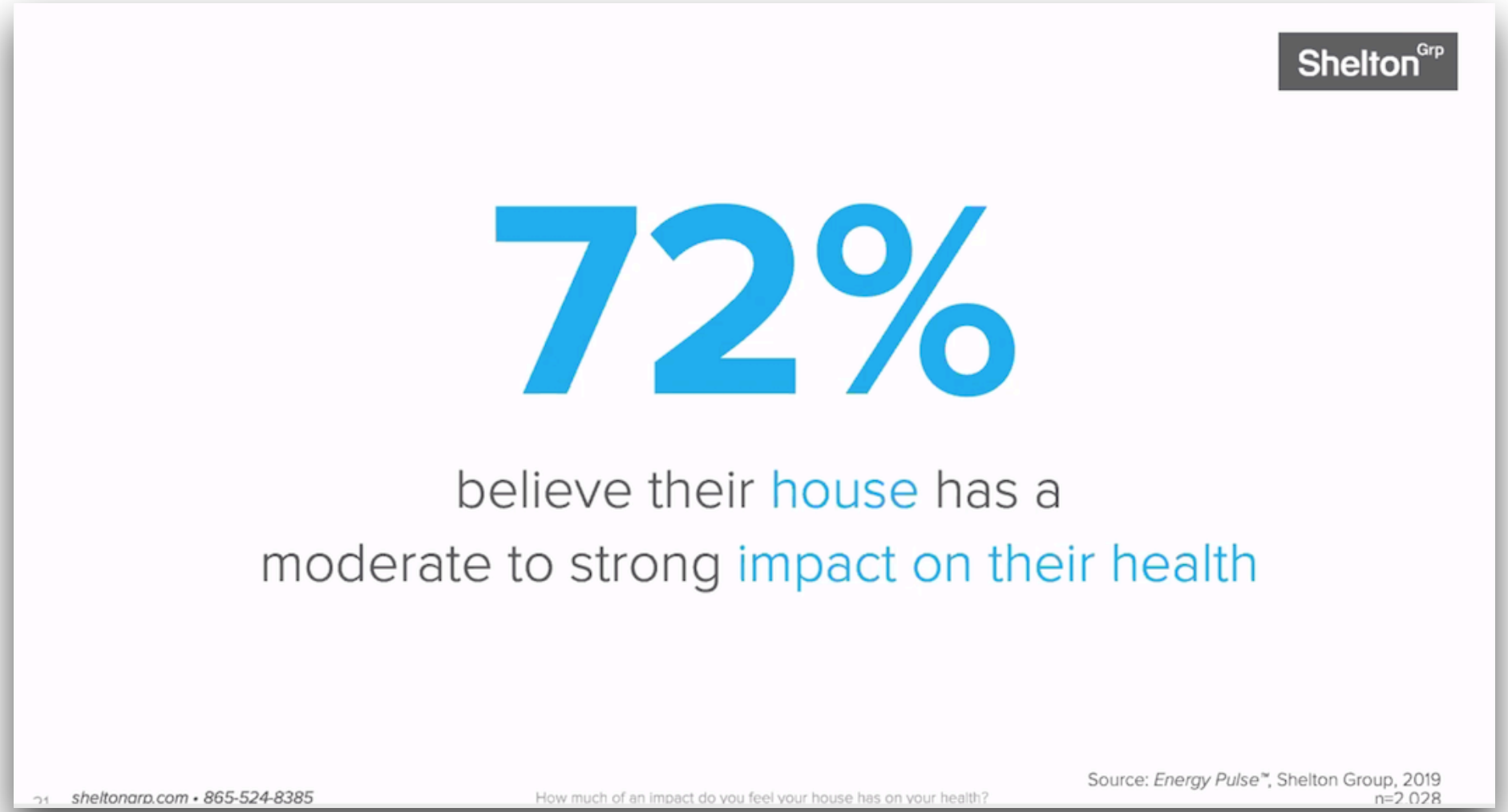
Growing Competition

Average Cost Per Click (Google)

2020 $4.19

2021 $7.56

Energy Circle
Healthy Homes/IAQ/Purification
Dataset



Suzanne Shelton, EEBA Webinar
April 14, 2020

Shelton Grp

Which has often led to considering upgrades to ventilation systems

51%

of consumers say it is important to upgrade the air ventilation system in their homes

Source: *Energy Pulse*™, Shelton Group, 2019

Suzanne Shelton, EEBA Webinar
April 14, 2020

Summary Observations

- **Purification Mania is Subsiding**
  - But it is STILL the first thing on most consumer's minds
- **Indoor Air Quality Testing is on the Rise**
  - Perhaps this is the legacy of the COVID era
  - A diagnostic starting point remains the key entry point
- **Ventilation Got a Boost**
  - General awareness continues to grow
  - Consumer understanding remains very modest
  - Whole house ventilation has become an easier sell, but it must be sold
- **Competition is Growing**
  - Higher marketing costs
  - New entrants

WILL HOMEOWNERS RESPOND TO A VENTILATION ASSESSMENT?

The Chasm

Pathway to Meaningful Business

1 DIAGNOSTIC PROCESS

2 MEASURES WITH BUSINESS VALUE

Pathway to Meaningful Business

1 DIAGNOSTIC PROCESS

- Onsite Visual Assessment
- Pressure Test
- CAZ
- IAQ Logging
- *Ventilation Assessment?*

2 MEASURES WITH BUSINESS VALUE

Pathway to Meaningful Business

1 DIAGNOSTIC PROCESS

- Onsite Visual Assessment
- Pressure Test
- CAZ
- IAQ Logging
- *Ventilation Assessment?*

2 MEASURES WITH BUSINESS VALUE

- Whole House Ventilation
- Envelope Control (air leakage)
- Crawlspace Encapsulation
- Duct Cleaning and Sealing
- Moisture Control
- Equipment Replacement

DOE Assessment Guidance

ENERGY.GOV
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

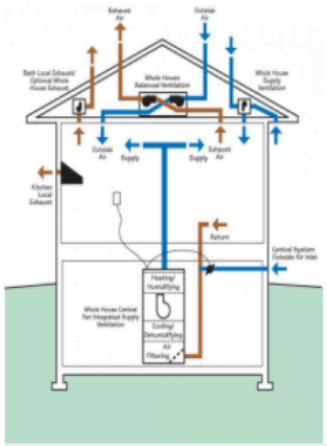
Building America Solution Center

Help User Enter keywords

PROGRAMS & GUIDES RESOURCES PUBLICATIONS & RESEARCH

EERE » BTO » Building America » Solution Center Home » Guides A-Z » Pre Retrofit Assessment of Ventilation Systems

Pre-Retrofit Assessment of Ventilation Systems



Example whole-house and local ventilation systems.

The first step in developing a plan for upgrading ventilation systems in existing homes is to perform a thorough evaluation of existing systems and how well they are functioning. Existing systems may form the basis for meeting ventilation standards. But they may also need upgrades or replacement to meet modern requirements. This assessment should be conducted by an energy auditor or HVAC contractor. The assessment provides an approach to evaluating existing ventilation systems. It does not provide design guidance or recommendations for which new systems to install.

The U.S. Environmental Protection Agency has published a protocol for assessing indoor air quality and ventilation systems (the *Healthy Indoor Environment Protocols for Home Energy Upgrades*). This protocol directs users to "determine whether the home complies with either the local exhaust requirements or the whole-house ventilation requirements of ANSI/ASHRAE Standard 62.2-2010. The EPA protocol was published in 2011. Building America recommends using the latest version of American National Standards Institute (ANSI)/American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 62.2 (2016, as of the date of publication of this guide in 2017). In 2011, a Building America team noted that ANSI/ASHRAE Standard 62.2 is, or is becoming, the most common standard referenced for ventilation requirements in homes (Evaluating Ventilation Systems for Existing Homes).

The performance of a fan—especially the delivered flow rate—is typically tested and verified using the Home Ventilating Institute (HVI) Airflow Test Procedure Publication 916. These test procedures—and the associated Product Performance Certification Procedure Publication 920—provide standardized ratings for most mechanical ventilation fan products used in homes.

HVI also publishes guidelines on recommended ventilation rates in homes (How Much Ventilation Do I Need?). HVI's recommended ventilation levels are typically higher than those recommended by ASHRAE 62.2. With kitchen ranges, for example, HVI recommends 100 CFM per linear foot of range width (e.g., 250 CFM for a standard 30-in. range). This is considerably higher than the 100 CFM minimum specified in ASHRAE 62.2.

Two documents prepared by the Consortium for Advanced Residential Buildings (CARB), led by Steven Winters Associates, formed the basis for the assessment approach described here. The reports are Evaluating Ventilation Systems for Existing Homes and Measure Guideline: Selecting Ventilation Systems for Existing Homes.

In All Ventilation Systems

- Examine name plates for all ventilation equipment and determine ratings for sones, wattages, and flow rates.
- Ensure that all electrical connections are secure, insulated, and do not involve knob-and-tube wiring. If knob-and-tube wiring is connected to the

STEPS TOWARD VENTILATION AS A STANDALONE SERVICE

First: Get Your Content in Order

AN ESSENTIAL SERVICE PROVIDER. Read our Statement on Coronavirus

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SOBIESKI

BENEFITS OF WHOLE-HOUSE VENTILATION

One good thing could be said about the drafty, inefficient houses of yesteryear: they got a lot of ventilation to eliminate stagnation and dilute contaminants. Unfortunately, ventilation was completely uncontrolled and heating and cooling loss—as well as energy costs—were high. Today, mechanical ventilation is often limited to single-room fans installed in a bathroom or kitchen. Whole-house systems offer several alternatives that improve indoor air quality throughout all living spaces.

Exhaust Ventilation

Exhaust-only systems utilize a single, powerful fan located in the attic. The fan induces a strong negative pressure, pulling a high volume of fresh outdoor air in through open windows and doors, replacing the home's entire air volume up to 60 times per hour. Exhaust-only systems are most useful in climates where temperatures at night and early morning are comfortably cool.

Supply Ventilation

By pulling in fresh air through a single roof inlet and adding it to existing HVAC ductwork, supply-vent systems provide better control over air intake and can coexist with an operating central A/C and furnace. Supply-only systems tend to pressurize the home, however, forcing humid indoor air to

Shifting the Narrative (and the Keywords)

HRV/ERV

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building America Building Science Translator

Building Science Measure	New Building Science Terminology
Indoor Environment System (cont.)	
Dilution - Whole-House Ventilation	Fresh Air System
Supply-Only Ventilation	Fresh Air Supply System
Exhaust-Only Ventilation	Fresh Air Exhaust System
Balanced Ventilation	Fresh Air Balanced System
Properly Installed Whole-House Ventilation	Professionally-Installed Fresh Air System

February 2015

DOE Home Improvement Expert Program

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Home Improvement Expert™ Checklist
Balanced HRV/ERV

This U.S. Department of Energy checklist includes important s… and quality installation. All work shall comply with these specifi… manufacturer installation instructions. The contractor shall chec… at the bottom to certify the work is completed.

PREPARATION

- ☐ For continuous operation, the target ventilation rate for the home shall be b… 70 cfm for 1,501 to 2,500 ft², and 100 cfm over 2,500 ft². For intermittent op… target ventilation rate specified above (e.g., if the controller operates the air… three times the target ventilation air flow is needed).
- ☐ Appropriate ventilation equipment shall be selected based on the target ver…

INSTALLATION

- ☐ The ERV/HRV shall either be connected to the central air handler and use th… supply ducts. Return air intakes can either be individually ducted from severa… or the ERV/HRV can use the HVAC system returns. It is recommended that e… supply, or one ducted return, or both.
- ☐ An HRV/ERV that is connected to the central system supply side shall have a… unit when the ventilator is off. Each occupied room should have one ducted…
- ☐ Outdoor air shall be filtered with a MERV 11 filter or higher, and the pressure… The filter shall be installed to be easily accessible by occupants.
- ☐ The fan shall be oriented so the equivalent length of the duct run is as short… accordance with ANSI/ACCA Manual D Residential Duct Systems.
- ☐ The exhaust duct outlet vent shall be located on the exterior of the home wh… situated at least 10 feet from any air inlet.
- ☐ Outdoor air intakes shall be equipped with screens to keep out insects and … prevent water intrusion, and sealed with caulk or spray foam where the edge… infiltration of exterior air into the home.
- ☐ All duct seams and connections shall be sealed with mastic or UL 181 tape.
- ☐ Ducts installed outside of the thermal envelope shall be insulated to a minim…

COMMISSIONING

- ☐ The ventilation rate shall be measured using a flow hood, flow grid, or anem… RESNET/ICC 380-2016, to ensure that the fan is providing the minimum ven…
- ☐ All operation and maintenance procedures shall be reviewed with the home…
- ☐ All operation and maintenance procedures shall be reviewed with the home…

I hereby certify that, to the best of my knowledge and ability, all checked i… accomplished as part of completion of this home upgrade.

Contractor Signature: _____

Contracting Organization: _____

THE U.S. DEPARTMENT OF ENERGY DOES NOT W…

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

For more resources, visit basc.pnnl.gov/home-improvement…

PNNL-SA-139926 • March 2019

HOME IMPROVEMENT EXPERT

ENCLOSURE UPGRADES

- Attic Air Sealing and Insulation
- Basement Wall Insulation
- Framed Wall Insulation
- Masonry Wall Insulation
- Home Air Sealing
- Vented to Unvented Attic
- Vented to Unvented Crawl Space
- Window Replacement

HEATING & COOLING

- Air Conditioner Replacement
- Gas Furnace Replacement
- Heat Pump Replacement
- Duct Sealing and Insulation
- Oil or Gas Boiler Replacement

HOT WATER HEATING

- Gas Tank Water Heater
- Gas Tankless Water Heater
- Heat Pump Water Heater

FRESH AIR SYSTEM

- Bathroom Exhaust Fan
- Kitchen Exhaust Fan
- Balanced HRV/ERV
- Balanced Supply plus Exhaust
- Supply Integrated with HVAC

PROPER SEQUENCI…

Through the U.S. Depart… research program, exper… optimizing whole-house… includes a recommende… (shown below) to help e… their upgrade investmen… safety, indoor air quality…

STEP 1: ENSURE SA…

Have experts assess o… efficiency and identify … health, and safety issu…

STEP 2: ENSURE FF…

Ensure effective ventil…

STEP 3: ENSURE M…

Ensure adequate wate… of walls to dry by addi…

STEP 4: ENSURE DI…

Capture air sealing opp… insulation is installed.

STEP 5: ENSURE TH…

Insulate at least to the … for your location after … quality, and moisture n…

ANYTIME: EQUIPM…

Replace heating and co… windows, appliances, li… they fail or become ou… qualified products or b… more efficiently.

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For more resources, visit basc.pnnl.gov/home-improvement-expert

PNNL-SA-139926 • March 2019

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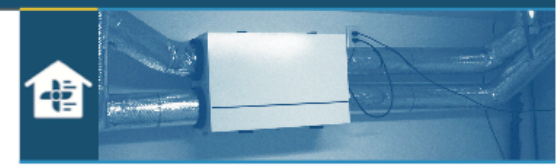
Home Improvement Expert™ Factsheet
Balanced HRV/ERV



WHY HOME IMPROVEMENT EXPERT?

An easy way to get a quality job.

Research findings reveal significantly reduced energy savings and potential performance risks where home improvements are not properly installed. To help homeowners address this challenge, the U.S. Department of Energy has compiled world-class expert guidance from industry leaders and national laboratories in factsheets and checklists under the name ***Home Improvement Expert***. Homeowners can leverage these expert recommendations to help ensure quality installation by attaching Home Improvement Expert checklists to vendor contracts and ensuring the vendor completes and signs the checklist before accepting the work.

READY TO DO MORE?

This factsheet and accompanying checklist cover one of more than 20 home improvements covered by the U.S. Department of Energy Home Improvement Expert. Use them to help optimize energy savings and improve performance related to comfort, health, safety, and durability.

To download other checklists: basc.pnnl.gov/home-improvement-expert

For more customized home improvement recommendations:

- Get your ***Home Energy Score*** from a qualified assessor (www.home-energy-score.gov)
- Schedule an expert assessment through **Home Performance with ENERGY STAR®** (www.energystar.gov/homeperformance).

BENEFITS

Installed correctly, a whole-house fresh air system with heat recovery can help ensure a healthier and more comfortable indoor environment with optimum efficiency.

Contaminants in homes can trigger asthma and allergy attacks as well as other health problems. Whole-house fresh air systems dilute, exhaust, and filter these contaminants. Balanced ventilation systems like heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs) bring in fresh outside air and distribute it throughout the home using either their own dedicated ducts or the home's central heating and cooling system ducts. While bringing in this fresh air, the ERV/HRV exhausts an equal amount of stale air from the home, ensuring balanced pressures throughout the home. The incoming and outgoing air pass through a heat exchanger where heat is transferred from the warmer air stream to the cooler air stream, thus heating incoming air in the winter and cooling incoming air in the summer. An ERV also transfers moisture.

RELATED HOME IMPROVEMENT CONSIDERATIONS

Before purchasing a balanced whole-house fresh air system, consider working with a qualified home energy assessor to evaluate other related home performance needs and opportunities. This includes:

- duct sealing to ensure effective whole-house ventilation when existing heating and cooling ducts are used to distribute fresh air;
- bathroom and kitchen exhaust fans that remove contaminants, moisture, and odors;
- integration of high-capture filters in the heating and cooling system return duct to more effectively remove particulates from the air you breathe.

For more information on ventilation, please search the Building America Solution Center, basc.pnnl.gov.

TIPS FOR HIRING A CONTRACTOR

- Look for licensed, insured, and certified contractors.
- Check references and reviews on home improvement web sites.
- Get multiple bids in writing.
- Check with your utility and state, local, and federal weatherization programs for rebates and incentives.
- Include the Home Improvement Expert™ checklist in bids and contracts to ensure quality installation.
- Consider using a Residential Energy Services Network (RESNET) certified Home Energy Rating System (HERS) rater, Building Performance Institute (BPI) certified Building Analyst, or other qualified professional (e.g., licensed engineer or architect) to inspect the work.

BPI Keep It Principles

- Keep it Clean
- Keep it Dry
- Keep it Pest-free
- Keep it Contaminant-free
- Keep it Safe
- **Keep it Ventilated**
- Keep it Comfortable
- Keep it Maintained

Building Performance Institute Healthy Housing Principles Reference Guide

Blog Content on Ventilation

- The Benefits of a Fresh Air Ventilation System
- Ventilation's Role in COVID Safety
- Ventilation & Filtration—You Need Both
- The Air in Your House--Where's it Come From?
- Air Purifiers & COVID-19
- How to Make Your House More Like the Outside, and Not Freeze
- Could a New Fresh Air System Make Thanksgiving Safe?

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Interactive Graphics on Airflow

The New York Times

What Happens to Viral Particles on the Subway

By Mika Gröndahl, Christina Goldbaum and Jeremy White

Aug. 10, 2020

At the same time, outside air is pulled into the system, combined with the existing mix and released into the car through the duct panels, which span the ceiling.

QUESTIONS?

Peter Troast

peter@energycircle.com

207.847.3644