



## FREE Tool for Occupants

**70,000+** Individual Scores

Joe Medosch  
Healthy Building Scientist



House Type



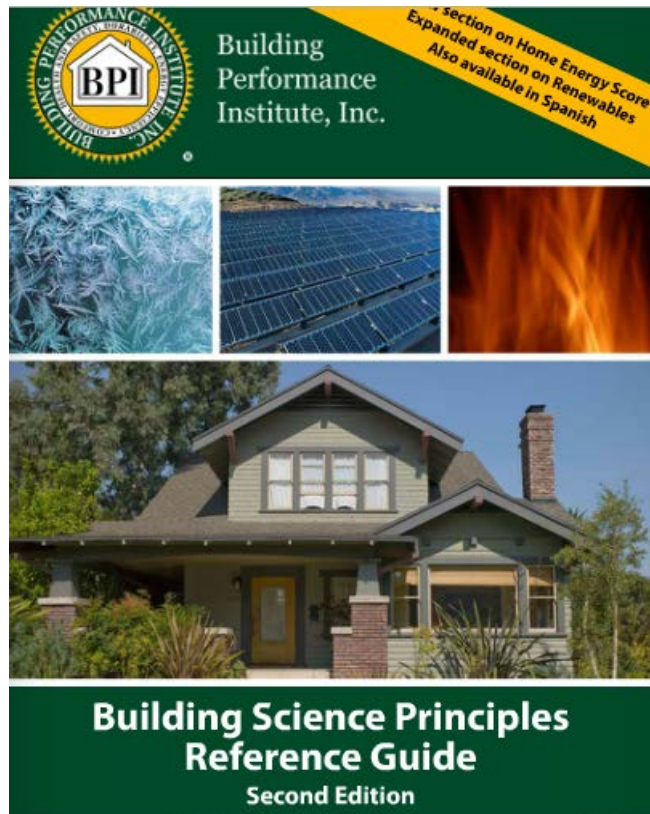
Occupant Behaviors



Occupant  
Health Symptoms

# Determine if your home is impacting your health!

## Building Science Principles Reference Guide and Certificate of Knowledge Exam



## Healthy Housing Principles Reference Guide and Certificate of Knowledge Exam





Clean



Dry



Pest-Free



Contaminant-Free



Safe



Ventilated



Comfortable



Maintained



Building  
Performance  
Institute, Inc.



Healthy Housing Principles  
Reference Guide  
First Edition

# Healthier Homes vs Health of the Occupants



Train your staff



*[redacted] leverages latest smart and sustainable living technologies to create a home that actively contributes to health and wellness and adapts to its owners' needs*



## 4 Pillars of Design

Attainable Home that is:

- ▶ **Sustainable**
- ▶ **Healthy**
- ▶ **Smart**
- ▶ **Flexible**

... and with tomorrow's connect

THE HOMEBUYER MOTIVATION

# Healthy Washing

Mounting evidence suggests homebuyers are increasingly aware that their homes impact their health and that the spaces they are living in may actually be harming them.

75%

believe housing plays a key role in their health & well-being

76%

believe that their homes are harming their health & well-being

UP TO

66%

believe the right housing could cut their annual medical costs by as much as 40%

DELOS EXPANDS ITS RESEARCH PLATFORM TO CREATE

# THE INTERNATIONAL WELL BUILDING INSTITUTE (IWBI)



The WELL Building Standard:  
The premier standard for buildings,  
interior spaces and communities seeking  
to implement, validate and measure  
features that support and advance  
human health and wellness

The International WELL Building Institute  
(IWBI): A public benefit corporation  
whose mission is to improve human  
health and well-being in buildings and  
communities across the world through  
its WELL Building Standard (WELL)

## WELL for Residential Homes - coming soon



Starting with the flooring Shaw flooring can warm up a room and reduce energy bills with a natural insulation and comfort of carpet and Certainteed drywall helps reduce noise levels in the bedroom

Here is the Delos Darwin Home Wellness Intelligent Platform. I will show you how it **monitors calibrates and activates indoor home environments to respond to and help improve human health well being and performance.**

The Darwin sensors throughout the home monitor and then calibrate air filtration, water purification circadian lighting, and comfort features.



Now here is an example of an indoor air quality reading and as you can see in this reading a high CO2 was detected by the monitors and a remediation was activated

- visitor commented too many people - tour guide added and hairspray





**Introducing**

**DARWIN**  
HOME WELLNESS INTELLIGENCE

**the World's First Home Wellness Intelligence platform  
that aims to improve human health, wellbeing and  
performance.**



# Healthy Brain Washing

## Reduce Allergens

Our air filtration system keeps allergens at bay by filtering out the particles from the outdoor air, to give you fresh and clean air inside your home.

## Expel Odours

Bad smells can affect your mood, thoughts, behaviors, and dreams, and can leave you uncharacteristically grumpy and irritable. Eliminating unwanted odours can improve your mood, reduce stress, lower your heart rate and improve your wellbeing.



CO<sub>2</sub>, PM 2.5, PM 10, TVOC



## Remove Toxins

The DARWIN Air Purification System helps remove toxins and pathogens that can be prevalent in materials and furnishings that can cause both short and long term health impacts.



# WELLNESS REAL ESTATE IS ON THE RISE. INSIDE HEALTHY HOMES WITH CYBER-WELLNESS.

April 27, 2020

The world's first home automation system was invented in 1966 by Jim Sutherland. ECHO IV, or Electronic Computing Home Operator, allowed users to control their home's temperature, store recipes or shopping lists, and power appliances. However, ECHO was never commercially sold.

It would only be until the 1970s when general-purpose home automation technology would be first introduced to the public. At first, the technology was only simple enough to make appliances and light fixtures in homes run more efficiently. Since then, home automation has evolved into smart-home technology and integrative systems for climate, entertainment, security, and more. One such system is the 2019 DARWIN Home Wellness Intelligence platform, the first of its kind ever.

DARWIN is a network designed to be integrated into the home and target respiratory, cardiovascular, and immune and cognitive health through methods including air purification, water filtration, circadian rhythm lighting, and comfort-focused technologies to simulate the outdoors. According to Delos, the company behind DARWIN, the system uses algorithms and sensor technology to help reduce stress, improve quality of sleep, and increase performance.

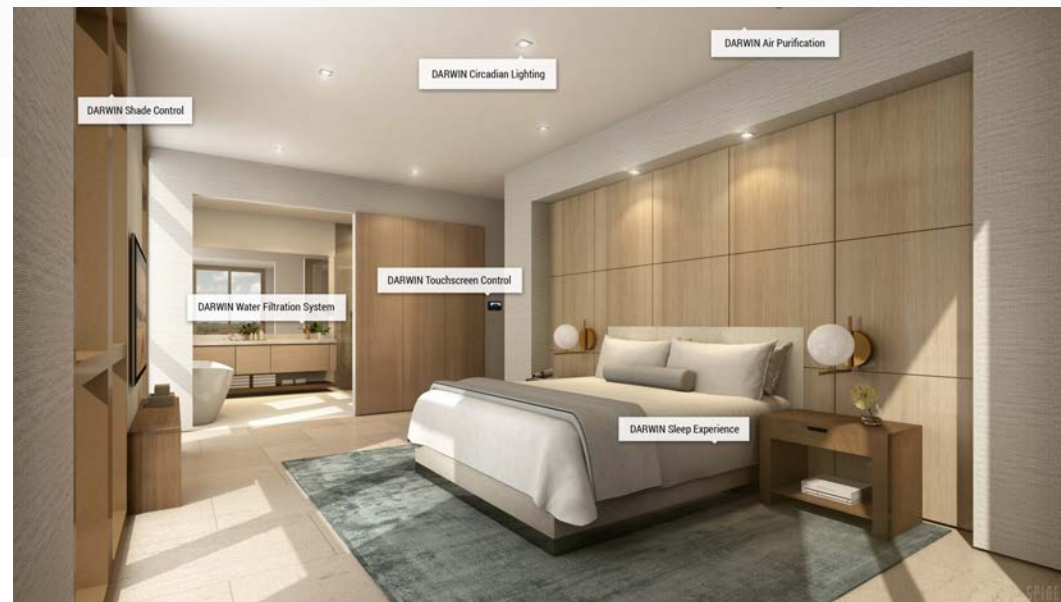
Delos believes that our environment, or our homes, are the places that contribute the most to our health--up to 70%, they claim.

Consumers are considering their health and the ways in which they can upgrade their homes with new technologies more than ever before, especially while many are self-quarantining due to the COVID-19 pandemic. One of the more popular and readily available automation devices is the Amazon Echo, which is a smart speaker that allows users to answer questions, play music, and control home devices. Amazon said in January of 2019 that more than 100 million "Alexa" devices had been sold, highlighting the demand that has risen towards these types of systems.

One Miami-based company that has been the catalyst that simplifies complex innovations in personalized solutions is the tech integration company HEDSouth, which has been installing wellness technology in homes and other spaces since 2018.

HEDSouth is now one of the first 50 accredited and approved dealers for DARWIN, and the only Miami installer for it. HEDSouth, which has expanded into Southern California, also carries electronics and luxury brands such as Lutron for lighting and custom motorized shades, Sonos for Music, Sony for premium video entertainment, and Crestron, Savant, and Josh.ai for complete and simple control.

Developers, real estate leaders, and design professionals alike are thinking ahead about the future of at-home wellness technology, with much of South Florida welcoming its first wellness residences. These include private single-family homes and Coral Gables's Villa Valencia, the first U.S. condominium development to debut DARWIN. Projects by HEDSouth with wellness elements are underway in Boca Raton, Weston, Fort Lauderdale, and Miami.



Delos believes that our environment, or our homes, are the places that contribute the most to our health--up to 70%, **they claim.**





Zero-VOC and Greenguard Gold  
Certified paints and finishes

Carpet we only install certified carpets and padding that don't absorb moisture, which helps prevent the growth of allergens and microbes. With no latex or harmful VOCs, your carpet is safe and odor-free

Common paints can have high VOCs and harmful chemicals like Xylene, Ethyl acetate, Methylene, Formaldehyde, Benzene, and more. Also Antimicrobial paints can cause hormonal and reproductive problems

Carpet can contain toxic coal fly ash, polyurethane backings, flame retardants and stain repellents; also known as PFAS. These are forever chemicals because they do not leave your body



Non certified flooring emits harmful VOCs, flame retardants and can contain formaldehyde or use toxic adhesives

Hardwood flooring is FloorScore certified  
Conforms to the CDPH/EHLB Standard  
Indoor Air Quality Certified



<5 g/L = zero VOC

<50 g/L = LOW VOC

**VOC VALUE <5g/L = zero VOC**

BEHR Premium Plus Interior  
BEHRPro i300 Interior  
Glidden Premium Interior  
Glidden Diamond Interior  
CIL Premium Interior (Canada)

**VOC VALUE <50 g/L = LOW VOC**

BEHR Premium Plus Exterior	Glidden Premium Exterior
BEHR Premium Plus Ultra Interior	Glidden Essentials Interior
BEHR Premium Plus Ultra Exterior	Glidden Ceiling Paint
BEHR MARQUEE Interior	Glidden Professional Speedwall
BEHR MARQUEE Exterior	Glidden Professional Ultra-Hide 220
BEHRPro i100 Interior	Glidden Professional Ultra-Hide 440
BEHR Premium Plus Ceiling Paint	Glidden Speed-Cote Exterior
BEHR Premium Plus Ultra Ceiling Paint	Glidden Vinyl Renew Exterior
BEHR MARQUEE Ceiling Paint	PPG Timeless Interior
CIL DUO Interior (Canada)	PPG Timeless Exterior

\*Colorants added to base paints may increase VOC level depending on color choice.

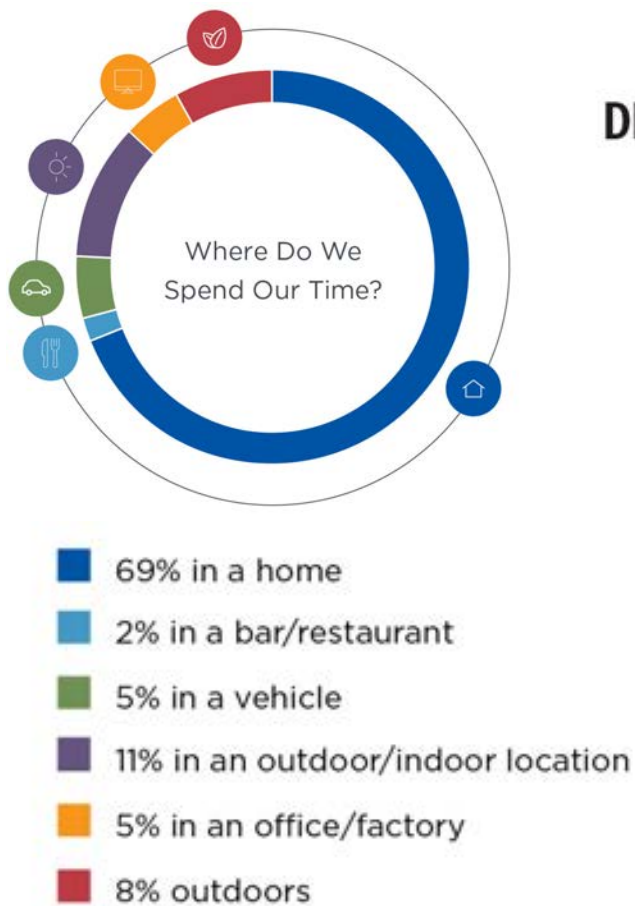
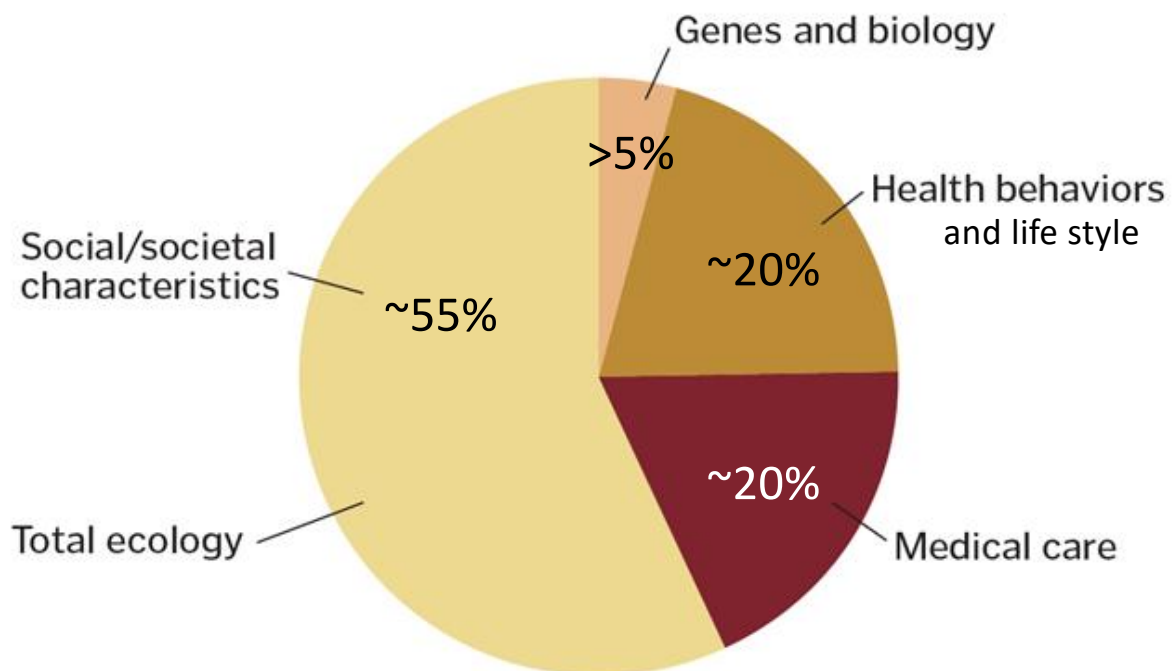


image source Delos

## DETERMINANTS OF POPULATION HEALTH



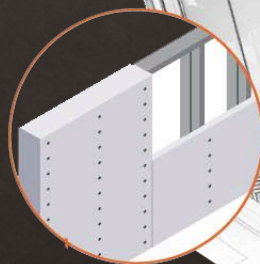
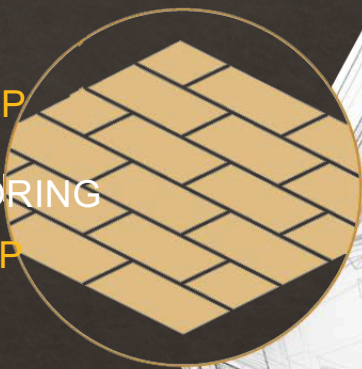
Source: Courtesy of CDC



# Chemicals in Building Materials - *phthalates*

## Flooring –

- PVC BACKED CARPETING DINP, DIDP
- VINYL TILE  
DINP, DIDP, DPHP
- RESILIENT FLOORING  
DINP, DIDP, DPHP

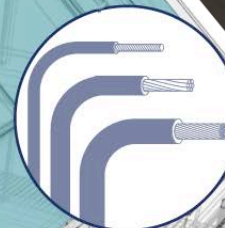


Wall Coverings —  
DINP, DIDP, DPHP

Window Shades — DINP

Electrical Wiring Coating

DIDP, DPHP, DTDP, L11P

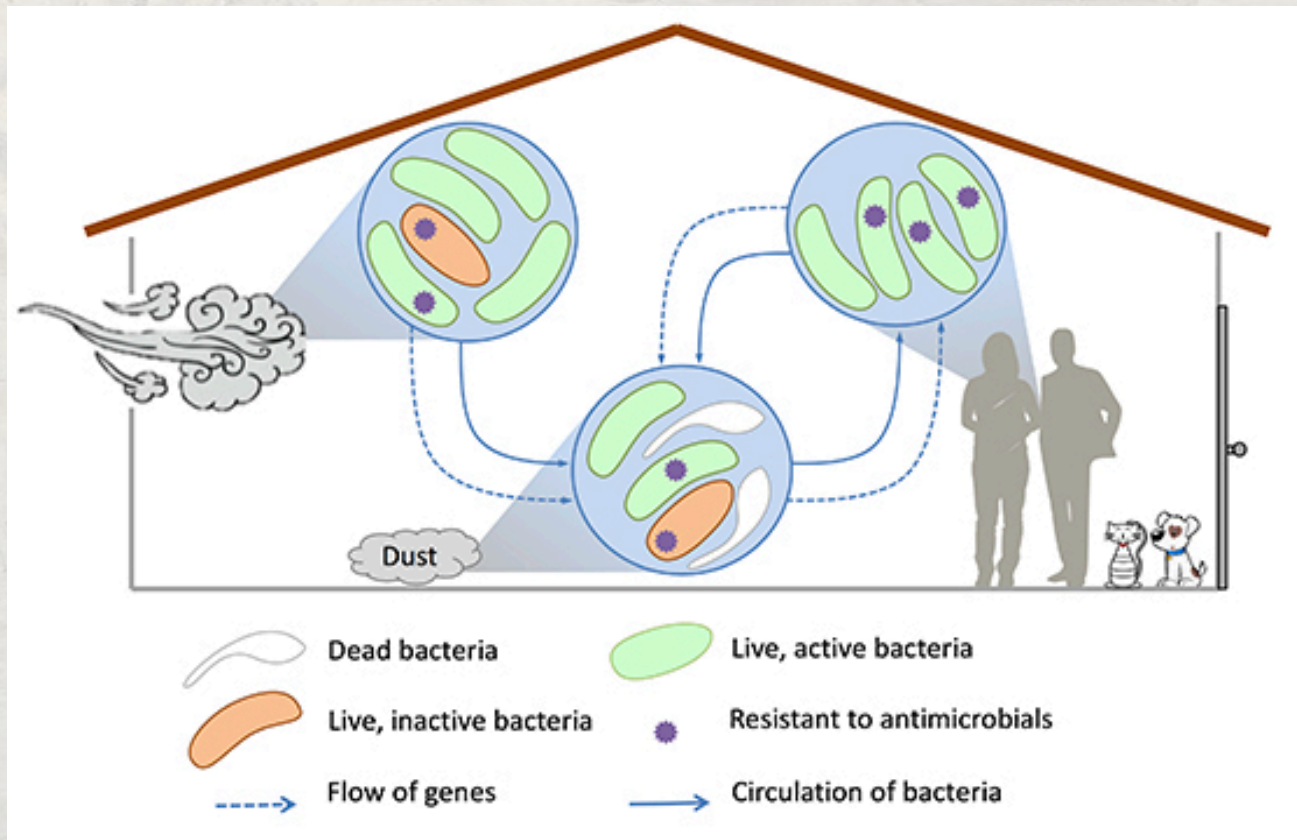


Adhesives and Sealants  
DINP, DIDP



# Stressed-out dust is sharing antibiotic resistance genes

First study to show indoor dust bacteria have transferrable antibiotic resistance genes



<https://news.northwestern.edu/stories/2020/01/stressed-out-dust-is-sharing-antibiotic-resistance-genes/>

# Hazardous Chemicals Found In Dust and Potential Impacts

Chemical	(and class)	Health hazards	Products containing this chemical
DEHP & DEHA	(phthalate)	Reproductive system and developmental toxicity, hormone disruption	Vinyl flooring, food contact materials
BBzP	(phthalate)	Reproductive system and developmental toxicity, hormone disruption	Vinyl flooring
DnBP & DiBP	(phthalate)	Reproductive system and developmental toxicity, hormone disruption	Nail polish, paints, Vinyl products, personal care and beauty products
HHCB	(fragrance)	Unknown	Scented products
TPHP & TDCIPP	(flame retardant)	Reproductive and nervous system toxicity, cancer	Treated furniture, baby products, carpet padding, electronics
HBCDD	(flame retardant)	Reproductive and nervous system toxicity, hormone disruption	Polystyrene building insulation
MeP	(phenol)	Reproductive system toxicity, hormone disruption	Cosmetics, lotions, deodorants



# Hazardous Chemicals Found In Dust and Potential Impacts

Chemical (and class)

DEHP & DEHA (phthalate)

BBzP (phthalate)

DnBP & DiBP (phthalate)

HHCB (fragrance)

TPHP & TDCIPP  
(flame retardant)

HBCDD  
(flame retardant)

MeP (phenol)

Health hazards

Products containing this chemical

Reproductive system toxicity, hormonal disruption

Reproductive system toxicity, hormonal disruption

Reproductive system toxicity, hormonal disruption

Reproductive system toxicity, hormonal disruption

Reproductive system toxicity, hormonal disruption

Reproductive system toxicity, hormonal disruption

Reproductive system toxicity, hormonal disruption

Exposure to chemicals in dust is linked to:

Behavioral Changes (children)

Skin and Respiratory Issues

Chronic Disease

Immune Dysfunction

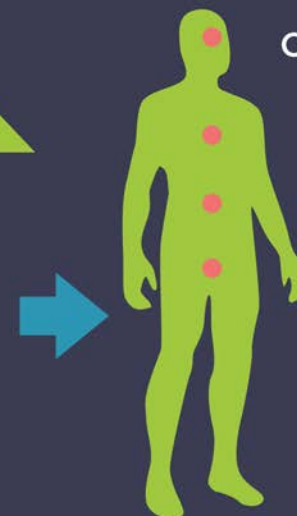
Asthma

Reproductive Toxicity

Cancer

Cognitive Impairment

CHEMICALS



HAZARDS

Source: Consumer Product Chemicals in Indoor Dust, 2016, <https://pubs.acs.org/doi/full/10.1021/acs.est.6b02023>

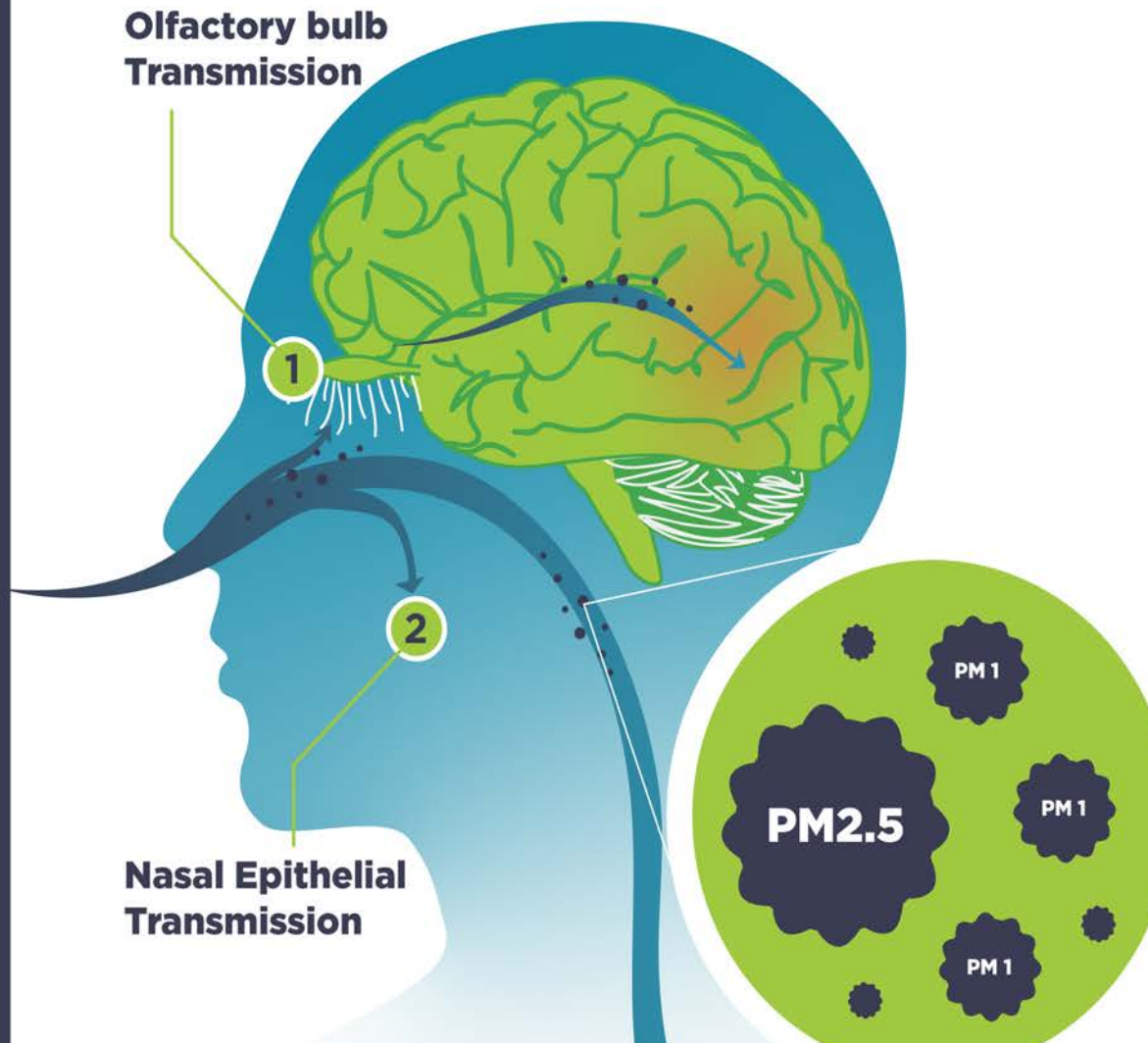


## Brain Awareness Week

### Did you know?

Long-term exposure to fine particle pollution may cause cognitive decline.

Learn more at  
[www.haywardscore.com](http://www.haywardscore.com)





# **CDA** Chicago Chapter meeting **C**hemical **D**ependency **A**nonymous



This content is not intended to mock the seriousness of drug addiction but bring light to the health impacts of the chemicals inherent in buildings.

# What are the top materials by volume



Est. by volume

- Drywall (gypsum & paper) . . . . . 40%
- Oriented Strand Board – OSB plywood . . . 23.25%
  - Exterior walls 12%, floors 14%, and OSB in the I-joist .5%
- Insulation (fiberglass) . . . . . 18%
  - 2x6 exterior walls, 12.5% 24in. in attic 8%
- 2x lumber (2 x 4, 6, 8, 10, 12...) . . . . . 12.8%
  - Walls only, floor was I-joist. 25% framing factor
- Carpet 3.14% / padding 3.14% . . . . . 5.5%
  - Majority of home was carpeted



# IKEA Home Kit – Just Don't Add Water!



# What are the top materials in our homes?

- Concrete
- Plywood (A-D grade)
- Tile / Granite / Marble
- Carpet / padding
- Laminate flooring
- Adhesives / Sealants / Mastic
- 2x lumber (2 x 4, 6, 8, 10, 12...)
- Drywall (gypsum & paper / taping compound)
- Oriented Strand Board – aka OSB plywood
- Insulation (fiberglass, cellulose, spray foam, others...)
- Glass
- Metal
- Paint
- PVC / Copper

Interior exposures



# What are the top chemicals in materials

## Carpets

Note: these lists are not all inclusive.

- Styrene-butadiene rubber latex backing
  - Styrene, 4-phenylcyclohexene (4-PCH, typically new carpet smell),
- Saturated C6-C12 aldehydes
- Nylon – caprolactam

## Wood Flooring

- Waxed and oiled parquet floor – acetaldehyde, methyl propanal, 3-methyl butanal, pentanal, hexanal, heptanal, alpha-pinene, 1-octen-3-one, beta-pinene, octanal, 1-nonen-3-one, nonanal, Z-2-nonenal, E-2 nonenal
- Varnished parquet floor – acetaldehyde, butanal, 3-methyl butanal, pentanal, hexanal, alpha-pinene, benzaldehyde, 1-octen-3-one, beta-pinene, acetophenone
- Linseed oil – acetaldehyde, 2-heptenal, 2,4-heptadienal, octanal, 2-octenal, nonanal, 2-nonenal, 2-decenal, benzaldehyde, 1-penten-3-one, 1-penten-3-ol, pentyl oxiran, acetic acid, propionic acid, butanoic acid, pentanoic acid, hexanoic acid, octanoic acid

# What are the top chemicals in foods

Note: these lists is all inclusive.



**Ingredients:** Enriched Corn Meal (Corn Meal, Ferrous Sulfate, Niacin, Thiamin Mononitrate, Riboflavin, and Folic Acid), Vegetable Oil (Contains One or More of the Following: Corn, Soybean, or Sunflower Oil), Whey, Salt, Cheddar Cheese (Cultured Milk, Salt, Enzymes), Partially Hydrogenated Soybean Oil, Maltodextrin, Disodium Phosphate, Sour Cream (Cultured Cream, Nonfat Milk), Artificial Flavor, Monosodium Glutamate, Lactic Acid, Artificial Colors (Including Yellow 6), and Citric Acid.  
**CONTAINS MILK INGREDIENTS.**

Nutrition Facts		
Serving Size 1 oz. (28g/About 21 pieces)		
Servings Per Container About 10		
Amount Per Serving		
<b>Calories 160</b>	Calories from Fat 90	
	% Daily Value*	
<b>Total Fat 10g</b>		<b>16%</b>
Saturated Fat 1.5g		<b>8%</b>
Trans Fat 0g		
<b>Cholesterol 0mg</b>		<b>0%</b>
<b>Sodium 290mg</b>		<b>12%</b>
<b>Total Carbohydrate 15g</b>		<b>5%</b>
Dietary Fiber less than 1g		<b>1%</b>
Sugars 1g		
<b>Protein 2g</b>		
Vitamin A 0%	•	Vitamin C 0%
Calcium 0%	•	Iron 4%
Vitamin E 6%	•	Thiamin 4%
Riboflavin 4%	•	Niacin 4%
<b>Phosphorus 2%</b>		
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:		
	Calories:	2,000 2,500
Total Fat	Less than	65g 80g
Sat Fat	Less than	20g 25g
Cholesterol	Less than	300mg 300mg
Sodium	Less than	2,400mg 2,400mg
Total Carbohydrate		300g 375g
Dietary Fiber		25g 30g
Calories per gram:		
Fat 9	•	Carbohydrate 4 • Protein 4

Nutrition Facts		
Serving Size 1/2 cup (30g)		
Servings Per Container about 15		
Amount Per Serving		
<b>Calories</b>	<b>Fiber</b>	<b>with 1/2 cup skim milk</b>
60	10	100
Calories from Fat 10		10
	% Daily Value**	
<b>Total Fat 1g*</b>	<b>1%</b>	<b>1%</b>
Saturated Fat 0g	<b>0%</b>	<b>0%</b>
Trans Fat 0g		
Polyunsaturated Fat 0.5g		
Monounsaturated Fat 0g		
<b>Cholesterol 0mg</b>	<b>0%</b>	<b>1%</b>
<b>Sodium 105mg</b>	<b>4%</b>	<b>7%</b>
<b>Potassium 100mg</b>	<b>3%</b>	<b>9%</b>
<b>Total Carbohydrate 25g</b>	<b>8%</b>	<b>10%</b>
Dietary Fiber 14g	<b>57%</b>	<b>57%</b>
Soluble Fiber 1g		
Sugars 0g		
Other Carbohydrate 11g		
<b>Protein 2g</b>		
Vitamin A	0%	4%
Vitamin C	10%	10%
Calcium	10%	25%
Iron	25%	25%
Vitamin D	0%	10%
Thiamin	25%	30%
Riboflavin	25%	35%
Niacin	25%	25%
Vitamin B <sub>6</sub>	25%	25%
Folic Acid	25%	25%
Vitamin B <sub>12</sub>	25%	35%
Phosphorus	6%	15%
Magnesium	4%	8%
Zinc	25%	30%

**Ingredients:** Whole Grain Wheat, Corn Bran, Modified Wheat Starch, Guar Gum, Color Added, Cellulose Gum, Salt, Baking Soda, Corn Oil, Aspartame\*.

**Vitamins and Minerals:** Calcium Carbonate, Zinc and Iron (mineral nutrients), Vitamin C (sodium ascorbate), A B Vitamin (niacinamide), Vitamin B<sub>6</sub> (pyridoxine hydrochloride), Vitamin B<sub>2</sub> (riboflavin), Vitamin B<sub>1</sub> (thiamin mononitrate), A B Vitamin (folic acid), Vitamin B<sub>12</sub>.

**\*PHENYLKETONURICS: CONTAINS PHENYLALANINE**

**CONTAINS WHEAT INGREDIENTS.**

DISTRIBUTED BY GENERAL MILLS SALES, INC., MINNEAPOLIS, MN 55448 USA

\* Amount in cereal. A serving of cereal plus skim milk provides 1g total fat, less than 5mg cholesterol, 170mg sodium, 300mg potassium, 31g total carbohydrate (14g sugars, and 1g protein).

\*\* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium	Less than	3,500mg	3,500mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

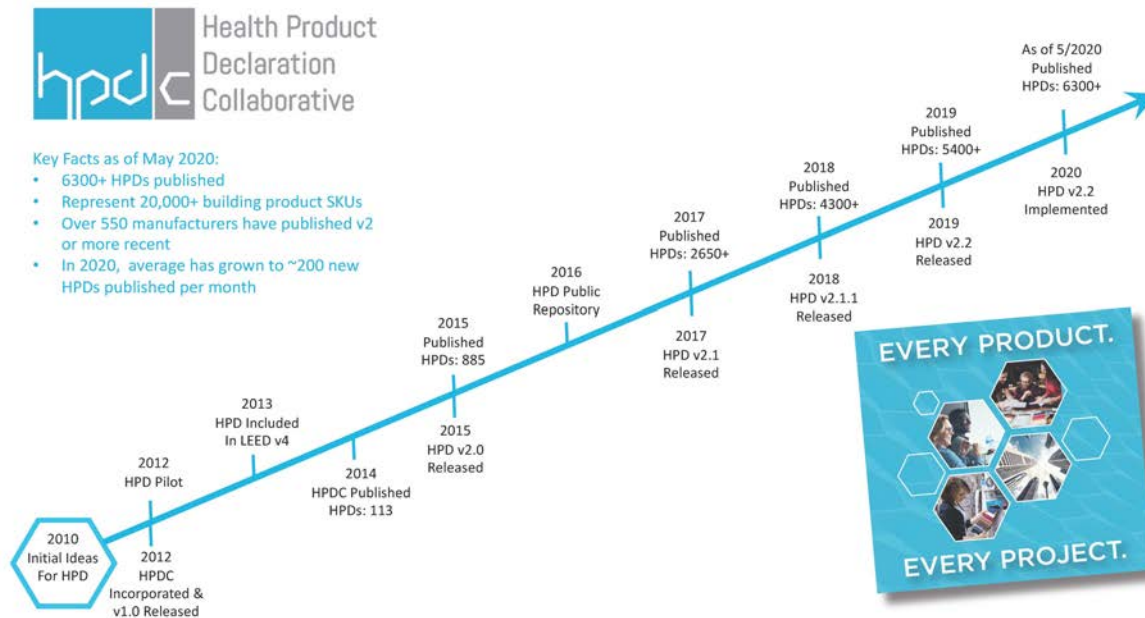
Even though I have the ingredients– doesn't mean I can make it



The HPD allows for **various** residual disclosure

- 100ppm (0.01%)
- 1,000ppm (0.1%)
- Reported on SDS

Health Product  
DECLARATION



The HPD allows for **various** residual disclosure

- 100ppm (0.01%)
- 1,000ppm (0.1%)
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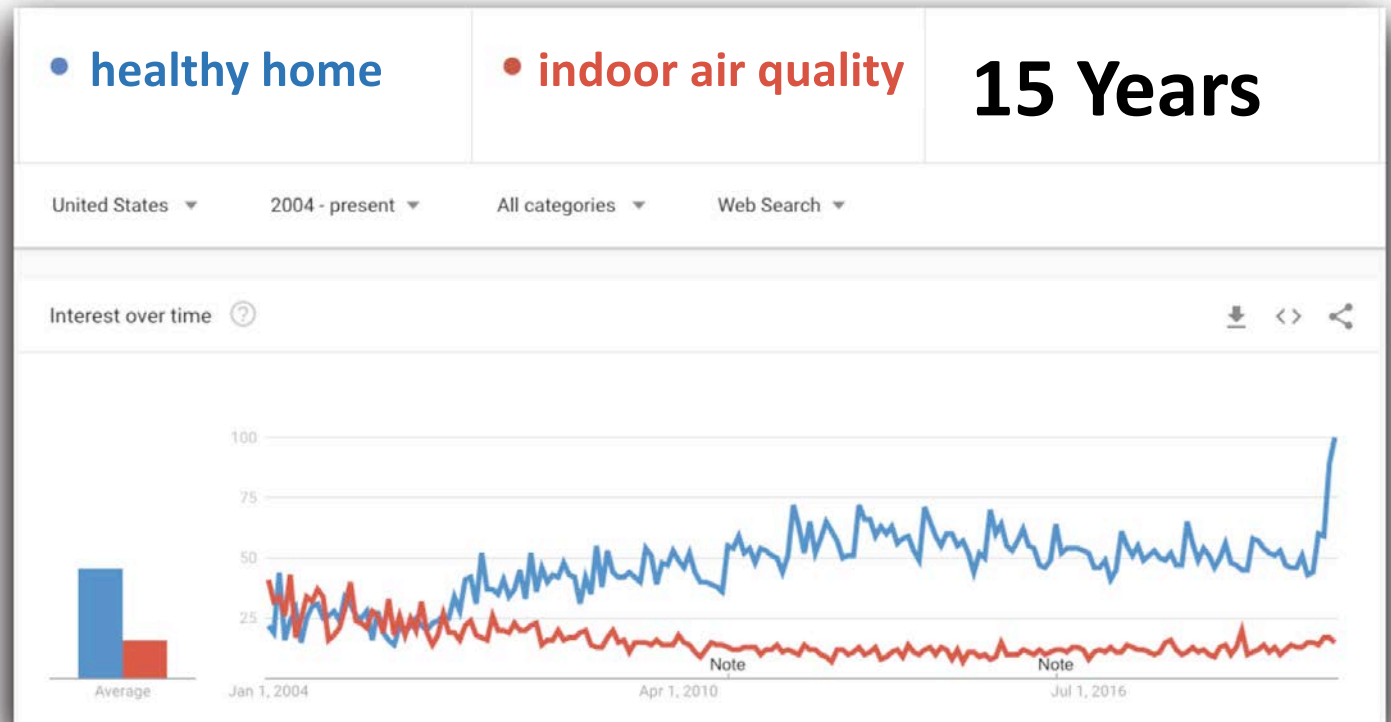
Health Product  
DECLARATION



A young girl with dark hair and bangs stands in the center of a dimly lit living room. She is wearing a light pink cardigan over a brown patterned dress. To her left is a black music stand with sheet music. Behind her is a wooden coffee table with books and a lamp. To her right is a wooden chair and another lamp. The room has a warm, cozy atmosphere with soft lighting.

IN 160 SECONDS YOU WILL DECIDE HOW THIS STORY ENDS

<https://youtu.be/ygHU0mQGuJU>



Google Trends, June 21, 2020

- **Healthy Home/Indoor Air Quality/Purification/Filtration**

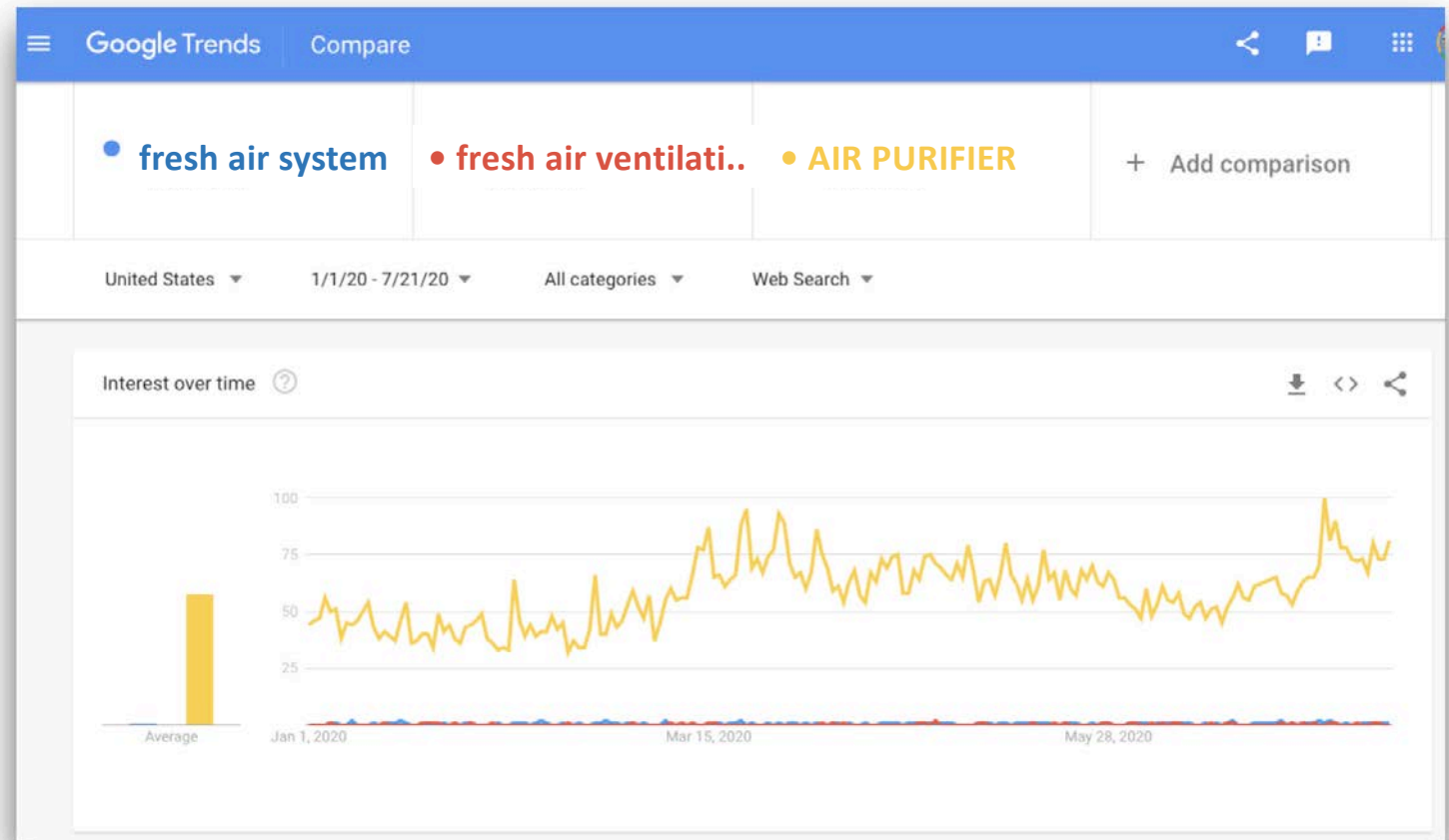
Testing terms down vs specific services & ventilation— jump to solution?

More volume, more competition, rising CPC's



- **Healthier Homes Focus**  
All in on Fresh Air Systems?

## 2020 Year to Date



Google Trends, July 21, 2020



Indoor Air  
Quality  
is now a in the  
public focus.

ENGLISH 中文 中文

The New York Times

## Airborne Coronavirus: What You Should Do Now

How to protect yourself from a virus that may be floating indoors? Better ventilation, for starters. And keep wearing those masks.



FiveThirtyEight

Politics Sports Science Podcasts Video

JUL. 20, 2020, AT 6:00 AM

## How To Make Indoor Air Safer





<b>Building Science Measure</b>	<b>New Building Science Terminology</b>
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
Dilution – Spot Ventilation	Odor and Moisture Exhaust Fans
Kitchen Exhaust Fan	Kitchen Odor and Moisture Control Fan
Bathroom Exhaust Fan	Bathroom Odor and Moisture Control Fan
Garage Ventilation Fan	Garage Exhaust Fan
Filtration	High-Capture Filtration Technology
High-MERV Filter	High Capture Filter
Proper Installation of Filter	Professionally-Installed Filtration

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

# Building America Building Science Translator

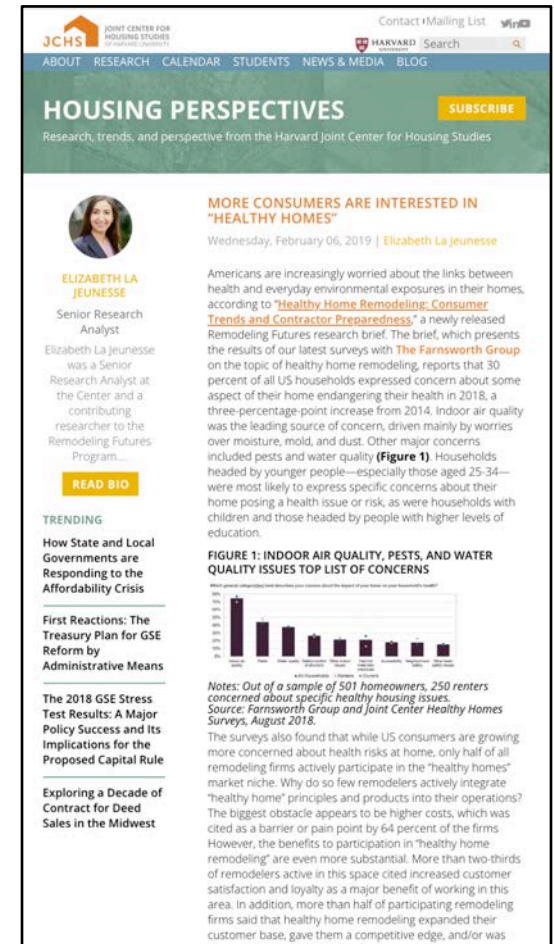
<b>Supply-Only Ventilation</b>	<b>Fresh Air Supply System</b>
<b>Exhaust-Only Ventilation</b>	<b>Fresh Air Exhaust System</b>
<b>Balanced Ventilation</b>	<b>Fresh Air Balanced System</b>
<b>Properly Installed Whole-House Ventilation</b>	<b>Professionally-Installed Fresh Air System</b>

# HOUSING PERSPECTIVES




Research, trends, and perspective from the Harvard Joint Center for Housing Studies

## MORE CONSUMERS ARE INTERESTED IN "HEALTHY HOMES"

Wednesday, February 06, 2019 | Elizabeth La Jeunesse




**JOINT CENTER FOR HOUSING STUDIES**  
OF HARVARD UNIVERSITY

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Research, trends, and perspective from the Harvard Joint Center for Housing Studies

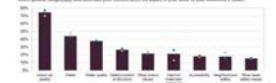
  
**ELIZABETH LA JEUNESSE**  
Senior Research Analyst  
Elizabeth La Jeunesse was a Senior Research Analyst at the Center and a contributing researcher to the Remodeling Futures Program...

[READ BIO](#)

**MORE CONSUMERS ARE INTERESTED IN "HEALTHY HOMES"**  
Wednesday, February 06, 2019 | Elizabeth La Jeunesse

Americans are increasingly worried about the links between health and everyday environmental exposures in their homes, according to "Healthy Home Remodeling: Consumer Trends and Contractor Preparedness," a newly released Remodeling Futures research brief. The brief, which presents the results of our latest surveys with The Farnsworth Group on the topic of healthy home remodeling, reports that 30 percent of all US households expressed concern about some aspect of their home endangering their health in 2018, a three-percentage-point increase from 2014. Indoor air quality was the leading source of concern, driven mainly by worries over moisture, mold, and dust. Other major concerns included pests and water quality (Figure 1). Households headed by younger people—especially those aged 25-34—were most likely to express specific concerns about their home posing a health issue or risk, as were households with children and those headed by people with higher levels of education.

**FIGURE 1: INDOOR AIR QUALITY, PESTS, AND WATER QUALITY ISSUES TOP LIST OF CONCERNS**



Notes: Out of a sample of 501 homeowners, 250 renters concerned about specific healthy housing issues. Source: Farnsworth Group and Joint Center Healthy Homes Surveys, August 2018.

The surveys also found that while US consumers are growing more concerned about health risks at home, only half of all remodeling firms actively participate in the "healthy homes" market niche. Why do so few remodelers actively integrate "healthy home" principles and products into their operations? The biggest obstacle appears to be higher costs, which was cited as a barrier or pain point by 64 percent of the firms. However, the benefits to participation in "healthy home remodeling" are even more substantial. More than two-thirds of remodelers active in this space cited increased customer satisfaction and loyalty as a major benefit of working in this area. In addition, more than half of participating remodeling firms said that healthy home remodeling expanded their customer base, gave them a competitive edge, and/or was

**TRENDING**

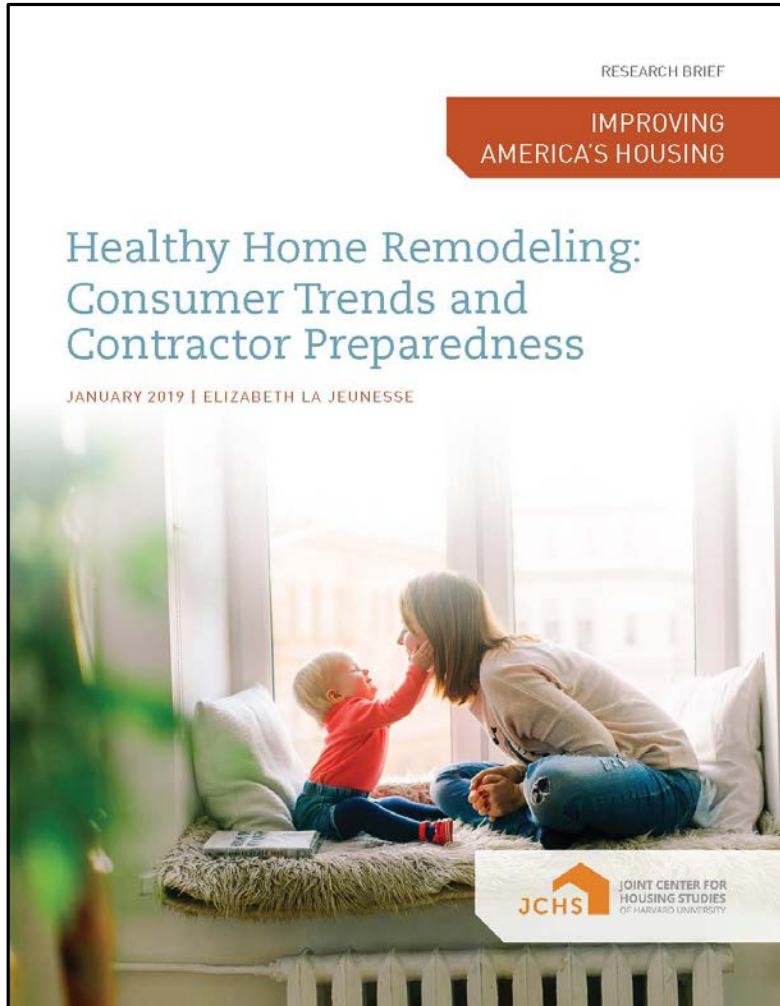
How State and Local Governments are Responding to the Affordability Crisis

First Reactions: The Treasury Plan for GSE Reform by Administrative Means

The 2018 GSE Stress Test Results: A Major Policy Success and Its Implications for the Proposed Capital Rule

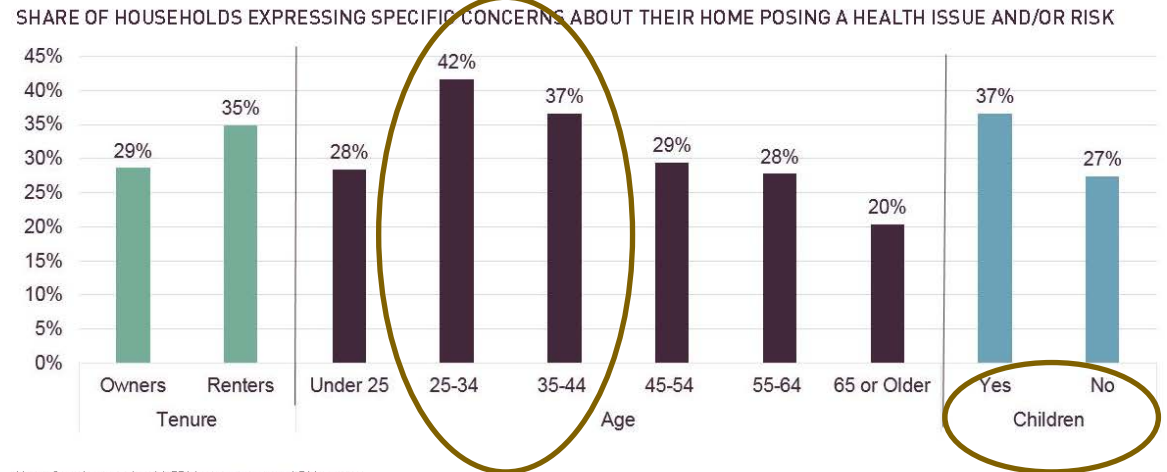
Exploring a Decade of Contract for Deed Sales in the Midwest

<https://www.jchs.harvard.edu/blog/more-consumers-are-interested-in-healthy-homes/>



## New report- Lots of households have healthy home concerns

FIGURE 2: HEALTHY HOUSING CONCERNS HIGHEST AMONG RENTERS, MILLENNIALS, FAMILIES WITH CHILDREN



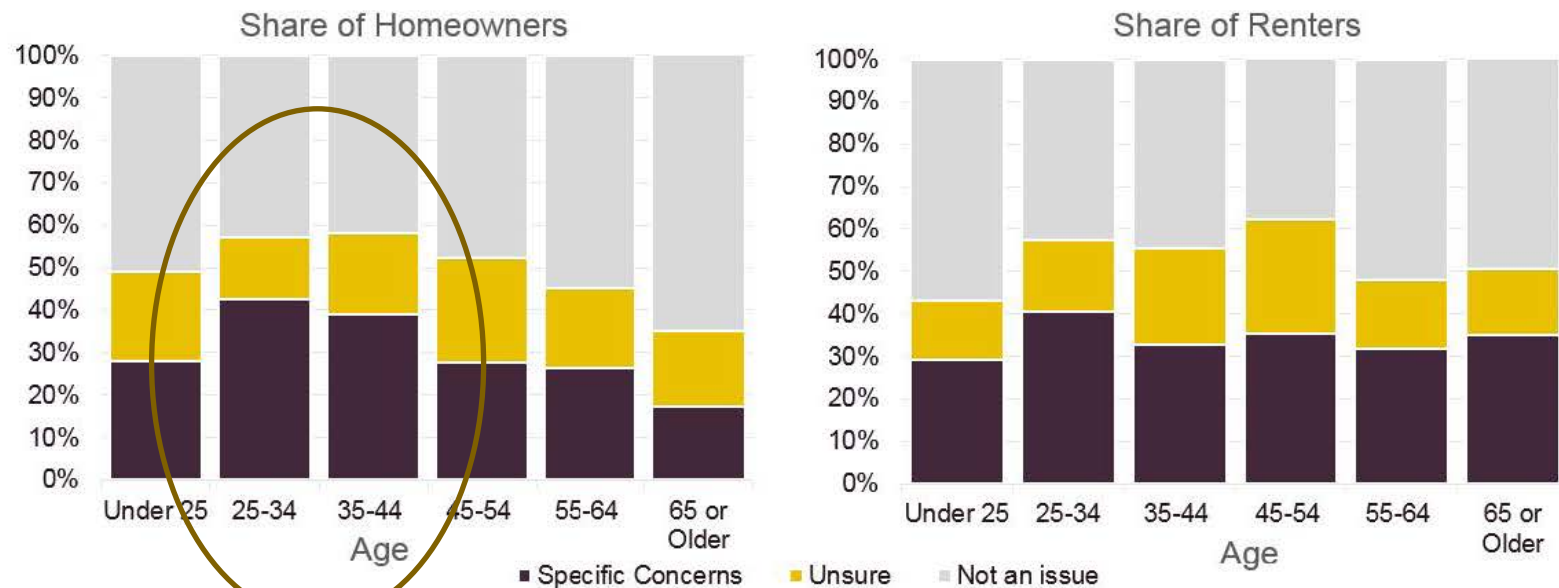
Note: Out of a sample of 1,751 homeowners and 718 renters.  
Source: Farnsworth Group and Joint Center Healthy Homes Surveys, August 2018.

Healthy Home Remodeling: Consumer Trends and Contractor Preparedness, 2019. Elizabeth La Jeunesse, Joint Center for Housing Studies of Harvard University

# New report- Lots of households have healthy home concerns, but especially younger homeowners

FIGURE 3: HEALTHY HOUSING CONCERNS ARE HIGHEST IN EARLY-MIDDLE AGES, ESPECIALLY AMONG OWNERS

IN THE PAST FEW YEARS, HOW CONCERNED HAVE YOU BEEN ABOUT YOUR CURRENT HOME NEGATIVELY AFFECTING YOUR OR ANOTHER OCCUPANT'S HEALTH?



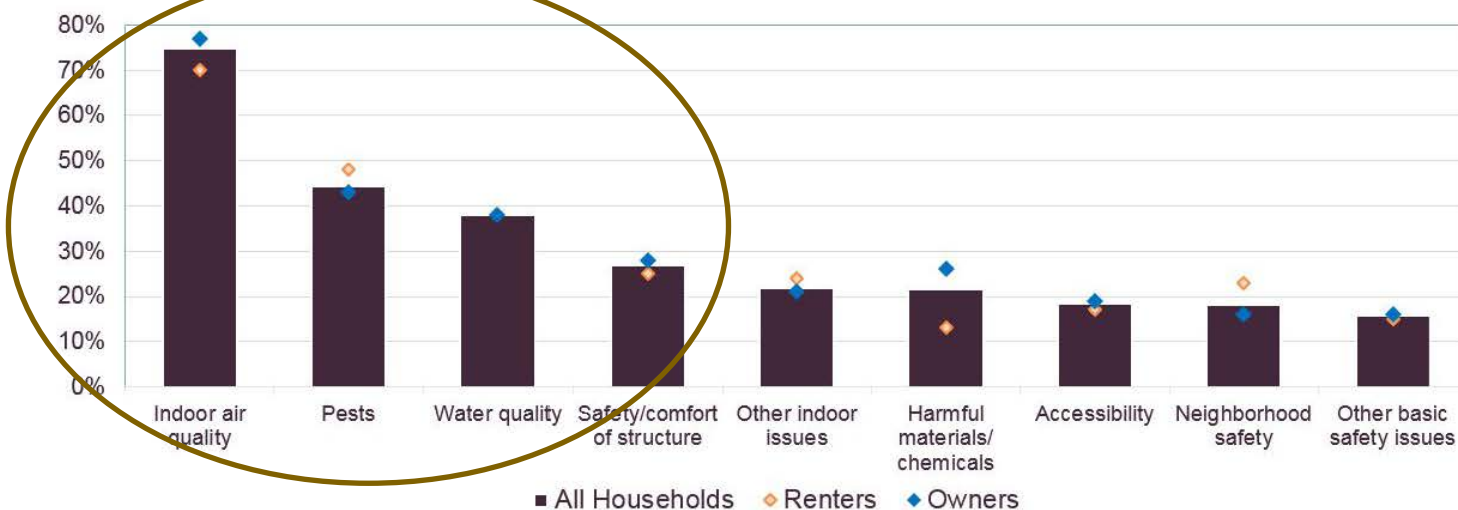
Healthy Home Remodeling: Consumer Trends and Contractor Preparedness, 2019.  
Elizabeth La Jeunesse, Joint Center for Housing Studies of Harvard University



# Indoor air quality, pests and safety are major concerns of those thinking about upgrading their home

FIGURE 4: INDOOR AIR QUALITY, PESTS, AND WATER QUALITY ISSUES TOP LIST OF CONCERNS ABOUT THE IMPACT OF HOME ON HEALTH

WHICH CATEGORY OR CATEGORIES BEST DESCRIBE YOUR CONCERN ABOUT THE IMPACT OF YOUR HOME ON YOUR HOUSEHOLD'S HEALTH?



Note: Out of a sample of 501 homeowners and 250 renters concerned about specific healthy housing issues.  
Source: Farnsworth Group and Joint Center Healthy Homes Surveys, August 2018.

Healthy Home Remodeling: Consumer Trends and Contractor Preparedness, 2019.  
Elizabeth La Jeunesse, Joint Center for Housing Studies of Harvard University



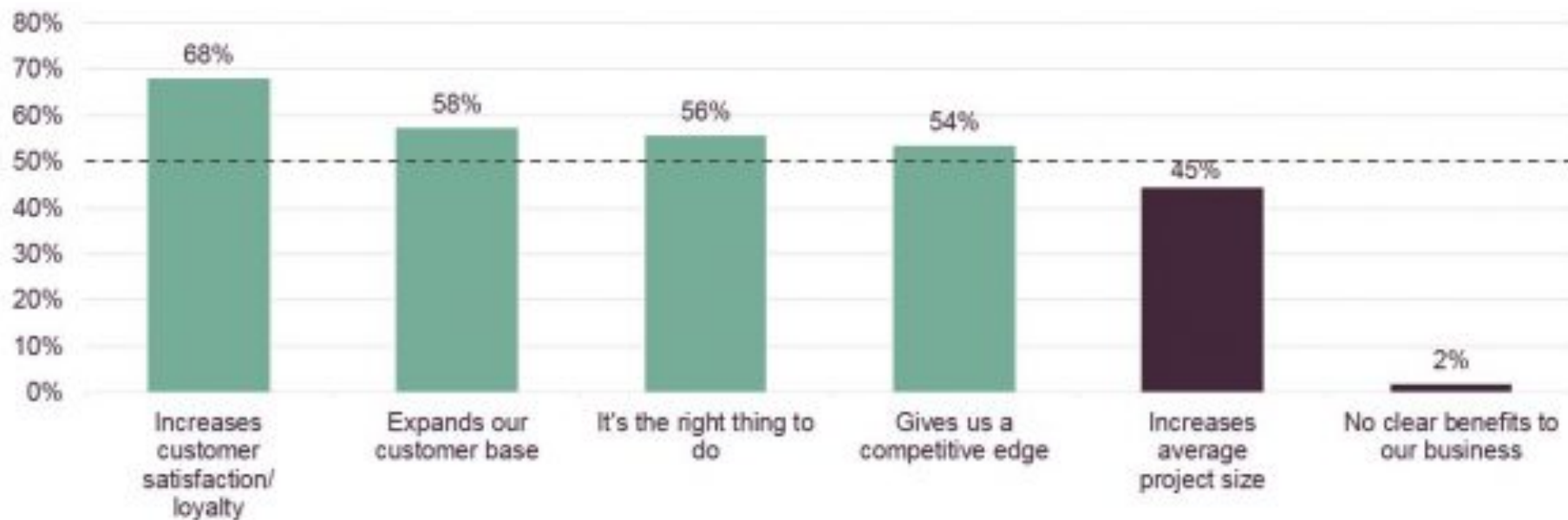
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## MORE CONSUMERS ARE INTERESTED IN "HEALTHY HOMES"

What are the main benefits to your business of offering healthy home products/projects?



<https://www.jchs.harvard.edu/blog/more-consumers-are-interested-in-healthy-homes/>



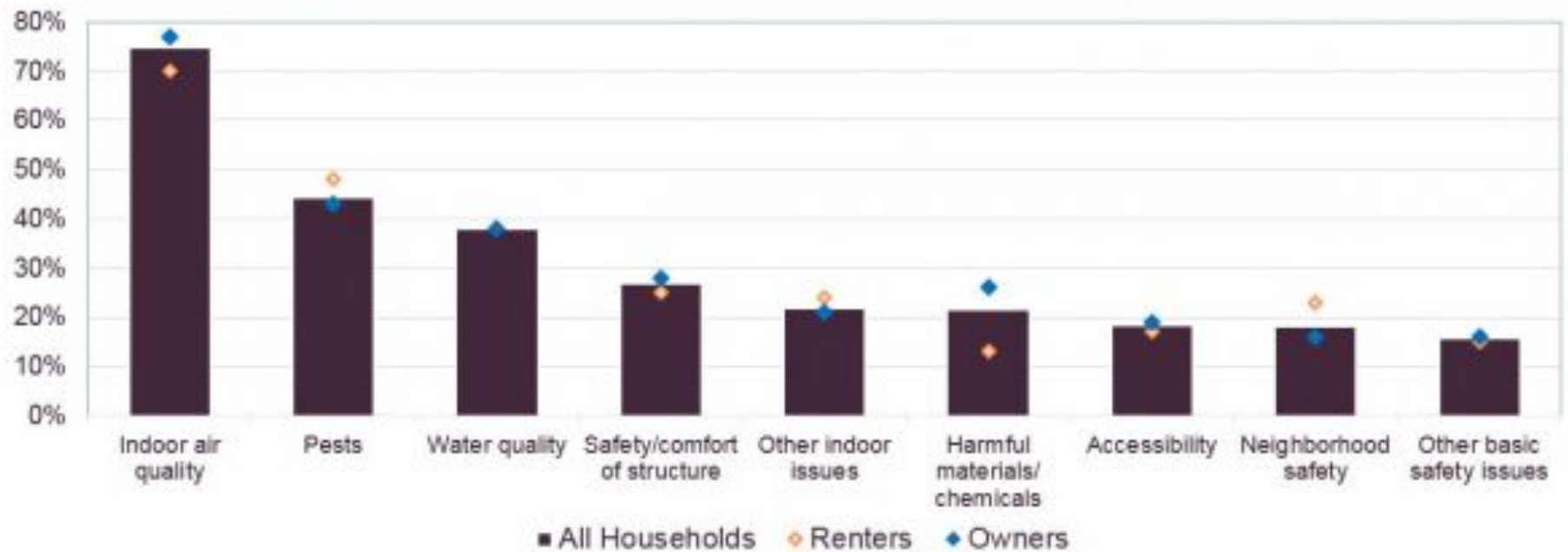
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## MORE CONSUMERS ARE INTERESTED IN "HEALTHY HOMES"

Which general category(ies) best describes your concern about the impact of your home on your household's health?



<https://www.jchs.harvard.edu/blog/more-consumers-are-interested-in-healthy-homes/>



**HARVARD T.H. CHAN**  
SCHOOL OF PUBLIC HEALTH

A May 6, 2019 New York Times article catalogued recent evidence suggesting that carbon dioxide, ... and volatile organic compounds (VOCs)... may affect abilities such as problem-solving and decision-making.

One study led by Joseph Allen, assistant professor of exposure assessment science at Harvard T.H. Chan School of Public Health, looked at office workers who were exposed to various concentrations of carbon dioxide and VOCs in a mock workplace.

When workers were exposed to higher levels, their cognitive functioning scores dropped, the study found.



**HARVARD T.H. CHAN**  
SCHOOL OF PUBLIC HEALTH

#### News

### Poor indoor air quality may dull cognitive abilities

Gases such as carbon dioxide and substances released from office furniture, carpets, and desks may be dulling our minds at work, according to experts.

A May 6, 2019 New York Times article catalogued recent evidence suggesting that carbon dioxide, a main ingredient in our exhalations, and volatile organic compounds (VOCs)—all commonly found in office buildings—may affect abilities such as problem-solving and decision-making.

One [study](#) cited by the Times, led by [Joseph Allen](#), assistant professor of exposure assessment science at Harvard T.H. Chan School of Public Health, looked at office workers who were exposed to various concentrations of carbon dioxide and VOCs in a mock workplace. When workers were exposed to higher levels, their cognitive functioning scores dropped, the study found.

“What we saw were these striking, really quite dramatic impacts on decision-making performance, when all we did was make a few minor adjustments to the air quality in the building,” Allen said. “Importantly, this was not a study of unique, exotic conditions. It was a study of conditions that could be obtained in most buildings, if not all.”

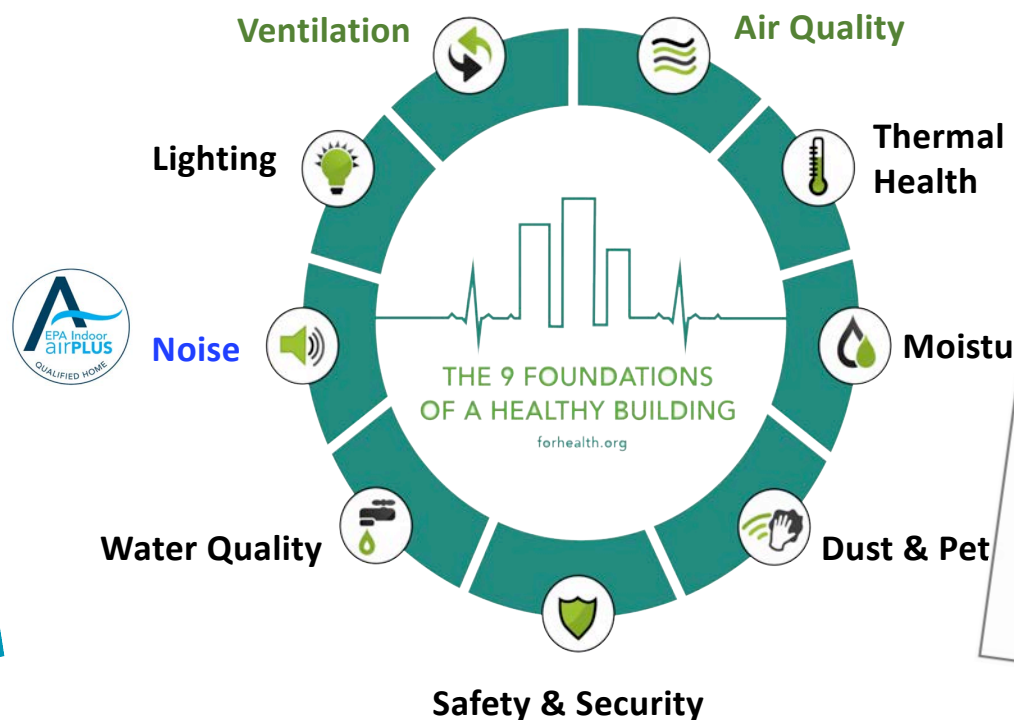
Read the New York Times article: [Is Conference Room Air Making You Dumber?](#)



# 9 FOUNDATIONS FOR HEALTH



**HARVARD  
T.H. CHAN**  
SCHOOL OF PUBLIC HEALTH



Joseph Allen - Healthy Buildings  
How Indoor Spaces Drive Performance  
EEBA

<https://9foundations.forhealth.org/>

<http://dx.doi.org/10.1289/ehp.1510037>

<https://news.harvard.edu/gazette/story/2018/02/your-building-might-be-making-you-sick-joe-allen-can-help/> 1/



# Cognitive Study

At the end of each day, we administered a cognitive function test while the subjects were still in their offices. This test was developed by Usha Satish and her colleagues at the State University of New York Upstate Medical Center and has been used on thousands of participants. It allowed us to quantify performance across nine cognitive function domains. We're pretty sure you'll agree that this is a list of performance skills that are relevant and valued in knowledge workers:

1. Basic activity level
2. Applied activity level
3. Focused activity level
4. Task orientation
5. Crisis response
6. Information seeking
7. Information usage
8. Breadth of approach
9. Strategy

Each person was compared with him- or herself—we didn't really care if John scored higher than Joe. We just cared how people scored against their own baselines. Importantly, this was what we call a double-blind study: the participants didn't know how we changed the air in the room each day, and the data analysts weren't aware, either.

So what did we change about the air each day? We tested the impact of three different factors on cognitive function performance: ventilation, volatile organic compounds (VOCs), and carbon dioxide. To be clear, we didn't test exotic conditions or weird VOCs—we tested levels of these three factors that are or can be encountered in nearly every building. For ventilation, we tested what would happen if we doubled the ventilation rate from the current standard.

When workers were in an optimized indoor environment ("green+" in this figure), meaning high ventilation rates, low VOCs, and low carbon dioxide, we found a dramatic improvement in higher-order cognitive function across all nine cognitive function domains.

Think about that for one second—simply increasing the amount of air brought into an office, something nearly every office can easily do, had a quantifiable benefit to higher-order cognitive function in knowledge workers.

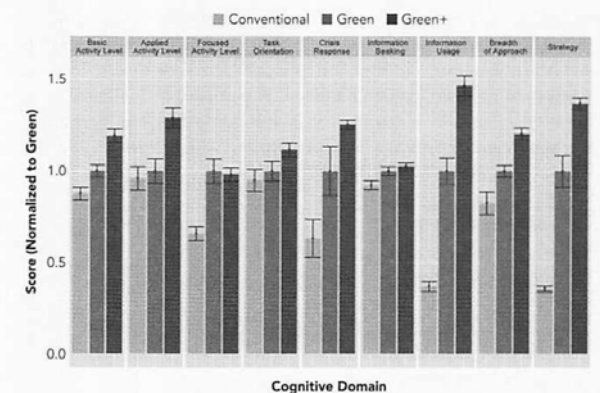
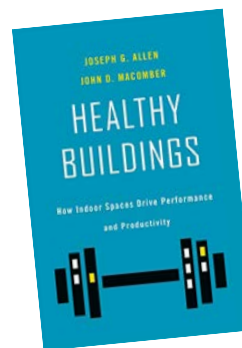
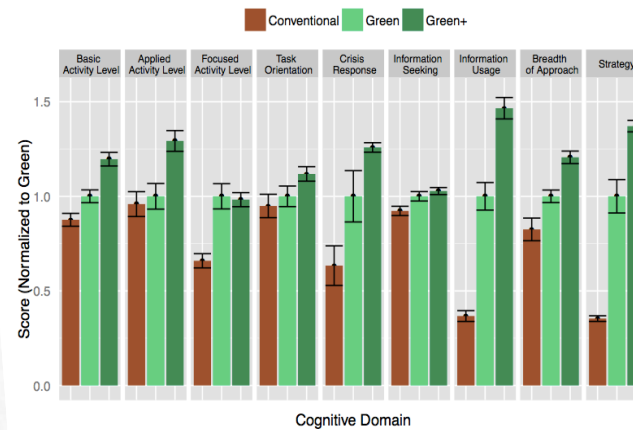


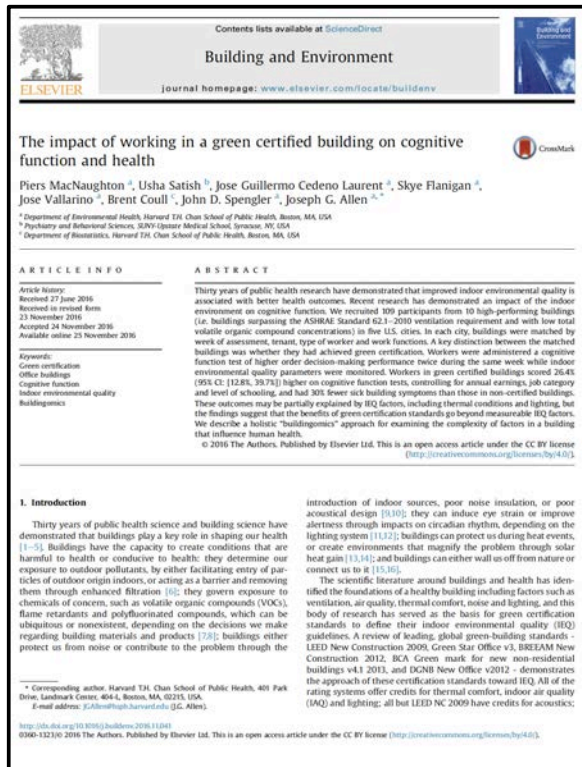
FIGURE 4.1 Cognitive function test scores for nine domains across three building conditions. Reformatted from Allen et al., "Associations of Cognitive Function Scores with Carbon Dioxide," *Environmental Health Perspectives* 124, no. 6 (2016): 805–812, figure 1.

When John Mandyck, the CEO of Urban Green Council, saw these results, he immediately grasped their economic significance. He recognized that, unlike rolling out a new enterprise-wide system to improve worker performance, where it can take a year or more to see results once everyone is trained, there was no learning curve for the COGfx Study—all you had to do was breathe. Even better, from a practical standpoint, VOCs and carbon dioxide can largely be controlled in a building through higher ventilation rates.

These results aren't really all that surprising. Just like Ben Franklin, we have all experienced a poorly performing indoor environment. Ever get on an airplane in the middle of the day only to fall asleep immediately, even though you're not tired? That's because most planes do not have their ventilation system on at the gate. Ever feel sleepy in a stuffy conference room? Many are underventilated. Your mind focuses on the lack of air, the odors, the temperature, and . . . the clock. When that door finally opens, you can feel the life breathe back into the room.

All we did in our study was quantify the impact of what we have all experienced. Sometimes we think we are really just academics in the field of

# Can building make you smarter? or less smart?



OCTOBER 7, 2016

## Green buildings improve occupant's cognitive function and health<sup>0</sup>

by Sara Bean • *Environment, Facilities management, News, Workplace design*

New evidence which supports the argument for the **Well building concept** as new research suggests that compared to people in high-performing buildings without a green certification, occupants of high-performing, certified green buildings had nearly a third (30 percent) fewer sick building symptoms, a 6.4 percent higher sleep quality score and a 26.4 percent higher cognitive function score. The new study from Harvard University and SUNY Upstate Medical University,

For information on Berkeley Lab's response to COVID-19 [click here](#).

NEWS CENTER

## Elevated Indoor Carbon Dioxide Impairs Decision-Making Performance

Feature Story Julie Chao (510) 486-6491 • October 17, 2012

Overturning decades of conventional wisdom, researchers at the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) have found that moderately high indoor concentrations of carbon dioxide (CO<sub>2</sub>) can significantly impair people's decision-making performance. The results were unexpected and may have particular implications for schools and other spaces with high occupant density.

"In our field we have always had a dogma that CO<sub>2</sub> itself, at the levels we find in buildings, is just not important and doesn't have any direct impacts on people," said Berkeley Lab scientist William Fisk, a co-author of the study, which was published in *Environmental Health Perspectives* online last month. "So these results, which were quite unambiguous, were surprising." The study was conducted with researchers from State University of New York (SUNY) Upstate Medical University.

On nine scales of decision-making performance, test subjects showed significant reductions on six of the scales at CO<sub>2</sub> levels of 1,000 parts per million (ppm) and large reductions on seven of the scales at 2,500 ppm. The most dramatic declines in performance, in which subjects were rated as "dysfunctional," were for taking initiative and thinking strategically. "Previous studies have looked at 10,000 ppm, 20,000 ppm; that's the level at which scientists thought effects started," said Berkeley Lab scientist Mark Mendell, also a co-author of the study. "That's why these findings are so startling."

**FEWER SICK BUILDING SYMPTOMS**  
IN HIGH-PERFORMING, GREEN-CERTIFIED BUILDINGS

WORKERS IN GREEN-CERTIFIED SPACES HAD FEWER COMPLAINTS ABOUT:

- TEMPERATURE
- AIR MOVEMENT
- AIR DRYNESS/HUMIDITY
- CHEMICAL, TOBACCO OR OTHER ODORS

**AND ALSO REPORTED GREATER SATISFACTION**  
WITH THE AMOUNT OF DAYLIGHT AND ELECTRICAL LIGHTING IN THEIR WORK SPACES

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5543984/pdf/nihms838667.pdf>

EEBA.


<https://workplaceinsight.net/green-buildings-improve-occupants-cognitive-function-and-health/>

<https://newscenter.lbl.gov/2012/10/17/elevated-indoor-carbon-dioxide-impairs-decision-making-performance/>



## Fresh air improves productivity and your bottom line

Email Share In Share Tweet Print Order Reprints



The better the air quality in your office, the better the cognitive performance of your employees.  
GETTY IMAGES (JACKSTAR)

By Michael Houlihan & Bonnie Harvey – Contributing Writers,  
Jul 10, 2019, 3:05am EDT

**IN THIS ARTICLE**  
Career & Workplace Industry

What your people to be more productive?  
Here's a novel idea: open the window.  
That's right. Give them some fresh air.

According to Joseph G. Allen, assistant professor and director of the Healthy Buildings program at the Harvard T.H. Chan School of Public Health, the air quality in your office affects your employees productivity. He is the principal investigator of the Cog Fx Study lead author of [9 Foundations of a Healthy Building](#).

These studies prove what we've known for years, there is a direct relationship between ventilation and a worker's ability to process information, make strategic decisions, and respond to crises.

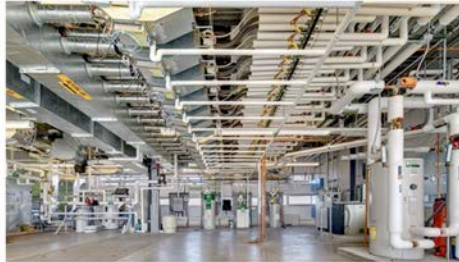
At Barefoot, we deliberately increased the amount of fresh air brought in from the outside. And why not? We started in a laundry room with a screen

**RECOMMENDED**  
SPORTS BU  
How lack of  
will impact Cincinnati  
bottom line  
CAREER &  
SVBJ anno  
honorees f  
2020's 40  
40 awards  
RETAILING  
Toilet paper  
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items have  
become ha  
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<https://www.bizjournals.com/bizjournals/how-to/human-resources/2019/07/fresh-air-improves-productivity-and-your.html>

**HARVARD T.H. CHAN**  
SCHOOL OF PUBLIC HEALTH

**News**  
Green office environments linked with higher cognitive function scores



Researchers controlled indoor environmental quality from a space underneath the testing environment to simulate conventional and green building conditions.

For immediate release: October 26, 2015

Boston, MA – People who work in well-ventilated offices with below-average levels of indoor pollutants and carbon dioxide (CO<sub>2</sub>) have significantly higher cognitive functioning scores—in crucial areas such as responding to a crisis or developing strategy—than those who work in offices with typical levels, according to a new study from the Harvard T.H. Chan School of Public Health's [Center for Health and the Global Environment](#), [SUNY Upstate Medical University](#), and [Syracuse University](#).

The researchers looked at people's experiences in "green" vs. "non-green" buildings in a double-blind study, in which both the participants and the analysts were blinded to test conditions to avoid biased results. The findings suggest that the indoor environments in which many people work daily could be adversely affecting cognitive function—and that,

<https://www.hsph.harvard.edu/news/press-releases/green-office-environments-linked-with-higher-cognitive-function-scores/#:~:text=Green%20office%20environments%20linked%20with%20higher%20cognitive%20function%20scores,-Researchers%20controlled%20indoor&text=The%20findings%20sugge st%20that%20the,cognitive%20function%20performance%20of%20w orkers.>

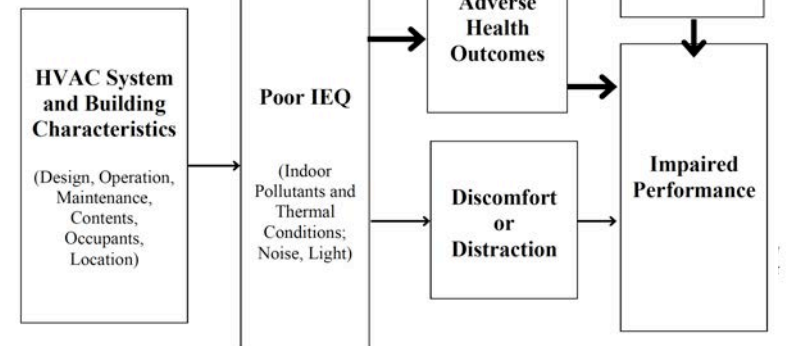
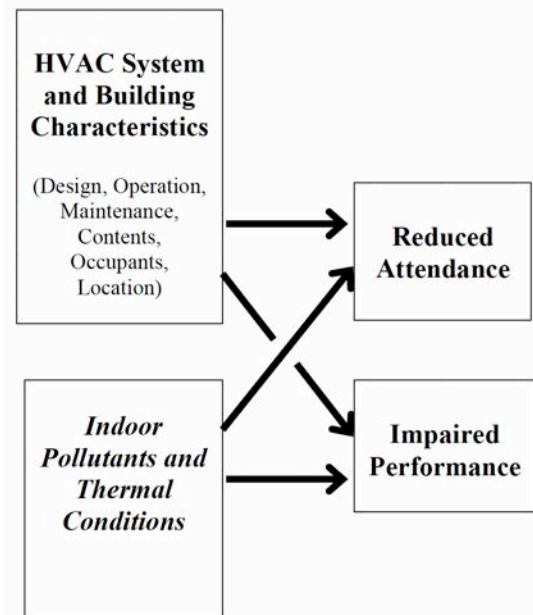


Published in Indoor Air Journal, vol. 15, pp. 27-32, 2005

# Do Indoor Pollutants and Thermal Conditions in Schools Influence Student Performance? A Critical Review of the Literature

Mark J. Mendell<sup>1\*</sup>  
Garvin A. Heath<sup>2</sup>

STUDY FEATURES	Setting
	Subject
HVAC AND BUILDING CHARACTERISTICS	Design
	Key confounders controlled
HVAC Characteristics	Peer reviewed?
	Lower ventilation rate
Building Characteristics	Airborne particle removal
	Operable windows
Building Characteristics	Air-conditioning systems
	Humidification systems
Building Characteristics	Personal thermal control
	Better condition / cleaning
Building Characteristics	Newer building
	Larger building
Building Characteristics	Carpet



Published in Indoor Air Journal, vol. 15, pp. 27-32, 2005  
Do Indoor Pollutants and Thermal Conditions in Schools Influence Student Performance? A Critical Review of the Literature  
Mark J. Mendell<sup>1\*</sup>  
Garvin A. Heath<sup>2</sup>

Summary Statement: Indoor air quality (IAQ) is a complex issue that involves many factors. This review of the literature focuses on the relationship between indoor air quality and student performance in schools. The review finds that poor indoor air quality (IEQ) is a common problem in schools and that it can have negative effects on student performance. The review also finds that there is evidence linking poor IEQ to reduced attendance and impaired performance. The review suggests that schools should take immediate actions to assess and improve IEQ in schools and that there is a need for focused research to guide IEQ improvements in schools.

<https://www.jchs.harvard.edu/blog/more-consume>



## High-Performance Home Staircase



Program	Created By	Style	Difficulty level	Description	# certified <sup>1</sup>
	US Environmental Protection Agency	Checklist	moderate	Focus on energy efficiency, with some provisions for indoor air quality and moisture durability. Energy Star Certified Homes use 15%-30% less energy than conventional new homes.	over 80,500 homes as of 2017
	US Environmental Protection Agency	Checklist	moderate	Focus on indoor air quality with requirements for moisture durability, HVAC systems, and material selections for low- and zero-VOC products throughout construction.	14,053 (2008-2018)
	Green Built Alliance (North Carolina)	Points	moderate	Developed and administered here in WNC. Requires green building practices in the categories of site opportunities water efficiency, building envelope, heating and cooling systems, appliances, lighting and renewables, indoor air quality, material sustainability, and homeowner/community education. (Note: Some other states have similar state-specific programs.)	1,563 homes in NC as of September 2018
	National Association of Homebuilders	Points	moderate	The only ANSI certified green building program. Requires green building practices in the categories of lot development, resource efficiency, energy efficiency, water efficiency, indoor environmental quality, and homeowner education.	Over 153,600 as of September 2018
	US Green Building Council	Points	moderate to difficult	Requires green building practices in the categories of integrative process, location and transportation, sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation.	1.6 million registered homes as of 2017 <sup>2</sup>
	US Department of Energy	Checklist	difficult	Requires Energy Star 3.0 and Indoor Air Plus, adds in requirements for extra building energy efficiency on top of Energy Star, efficient hot water distribution systems, all ductwork inside conditioned space and either a PV system or completion of a PV-Ready checklist.	several thousand <sup>3</sup>
	Passive House Institute US	Checklist + Performance Metrics	very difficult	Requires the finished home to meet a region-specific blower door air tightness test score, demonstrate heating and cooling bills below a certain threshold, and impose an upper limit on source energy and on design heating and cooling loads.	12,000 in US as of September 2018
	Living Future Institute	Checklist + Performance Metrics	extremely difficult	Aspirational standard that requires adherence to the most rigorous possible practices in the realms of Place, Water, Energy, Health + Happiness, Materials, Equity, and Beauty.	22 in the world, 2 single family residences <sup>4</sup> as of September 2018

<sup>1</sup> Unless otherwise noted, reported #s come from the organization's published information or were reported by organization staff upon inquiry.

<sup>2</sup> Source: USGBC published statistics of registered projects as of 2017. "Registered" does not distinguish between new construction vs renovation, and does not differentiate between registered projects and those that actually completed certification. <https://www.usgbc.org/articles/usgbc-statistics>

<sup>3</sup> Over 14,000 homes were certified under the program's pre-cursor, the DOE Builder's Challenge.

<sup>4</sup> This is the number of buildings in the world certified through the entire Living Building Challenge standard. Projects receiving individual "petal" certifications within the standard not counted here. Source: Living Future Institute

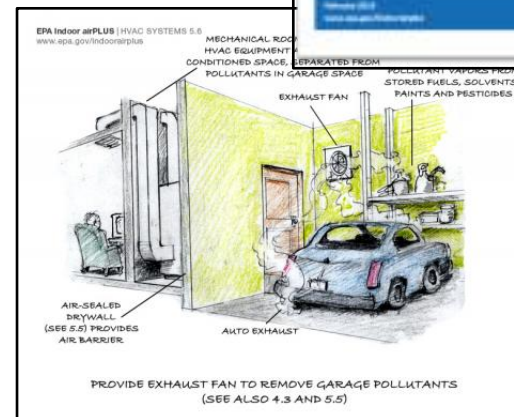
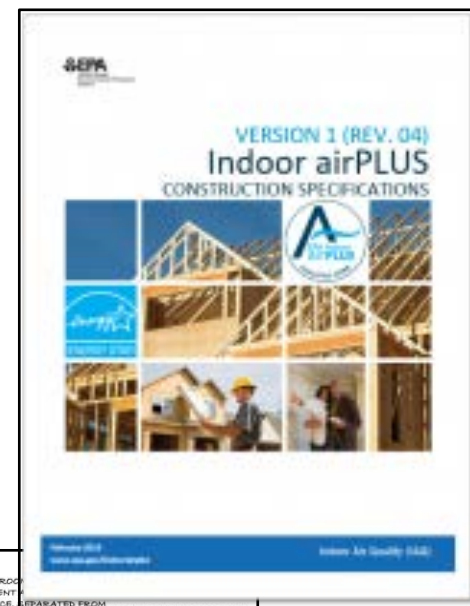




# EPA IndoorAIR PLUS



**2019 Indoor airPLUS  
Leader Award Winner**



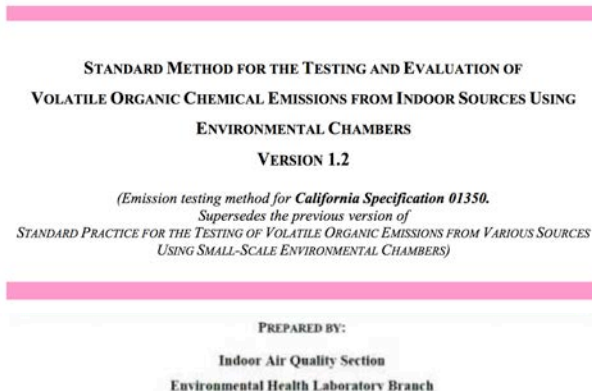




## Verified Products listings

### What is California Specification 01350?

- California Section 01350 for VOC Emissions (CDPH/EHLB Standard Method 1.1-2010)
- Widely used in numerous labeling and product verification programs
- Considered the current best practice for evaluating emissions from products



## Complete IAQ Made Easier

Plain Speak on How to Find, Evaluate, and Specify the Right Products

RESNET Building Performance Conference  
March 2, 2016



# GOLD

[http://conference2016.resnet.us/data/energymeetings/presentations/Complete%20IAQ%20Made%20Easier%20-%20Plain%20Speak%20on%20How%20to%20Find\\_Evaluate\\_and%20Specify%20the%20Right%20Products\\_2016%20RESNET%20Conf.pdf](http://conference2016.resnet.us/data/energymeetings/presentations/Complete%20IAQ%20Made%20Easier%20-%20Plain%20Speak%20on%20How%20to%20Find_Evaluate_and%20Specify%20the%20Right%20Products_2016%20RESNET%20Conf.pdf)

# The Boston Globe

By Jon Gorey Globe Correspondent, Updated 12/15, 2019

## Some building materials introduce dangerous chemicals into our homes. Here's a primer on making better choices



This may not come as a surprise if you're among the **1 in 4 Americans with some form of chemical sensitivity, or the 12.8 percent with multiple chemical sensitivities** — a diagnosis that's grown 300 percent more common in the past decade, according to a study by the Journal of Occupational and Environmental Medicine



<https://www.bostonglobe.com/lifestyle/real-estate/2019/12/15/some-building-materials-introduce-dangerous-chemicals-into-our-homes-here-primer-making-better-choices/f6XyXLMx8YxuWPTvP82AK/story.html>

**Bill Walsh:** *Spray foam insulation is another big concern, Walsh said. Even a small exposure to the isocyanates that mix with the blowing agents can give you asthma, he said. “You’re basically doing chemistry on the house; you’re mixing compounds.”*

*Carpet and upholstered furniture have historically been problematic because of flame retardants and stain repellents; the latter use a class of chemicals called PFAS,*

*Walsh recommends against vinyl flooring for several reasons — including the toxic production and waste cycles associated with polyvinyl chloride, but also the phthalate plasticizers typically added to make vinyl more supple*

*Products made from recycled vinyl, for instance, would seem a slightly better choice for the environment, but Walsh said such materials often contain toxic chemicals the industry has since phased out.*

*Walsh recommends buying hardwood floors prefinished, so the chemical-laden protective layer gets applied in a contained, controlled environment at the factory, not in your living room.*



<https://homefree.healthybuilding.net/>

# HomeFree

A national initiative  
supporting affordable  
housing leaders who are  
improving human health  
by using less toxic building  
materials.



## Related Resources

### HomeFree Paint Specifications

Drop-in specification language to help project teams incorporate HomeFree's healthier material recommendations into projects. This editable Word document is organized according to MasterFormat standard divisions and includes example products that meet the specifications. It also includes educational context to provide both the "what" and "why" of healthier materials.

### Manufacturer Information Request Email Template - Paint

An email template for use when working directly with the manufacturer or with your local product representative to find paint products that meet HomeFree content transparency and healthier material recommendations.

### Paint Standard and Certification Requirements

A comparison of VOC emissions, VOC content, and other content restrictions as addressed by different certification programs for paint. This may be helpful in understanding how these standards and certifications relate to the HomeFree recommendations.

## Paints by Type Hazard Spectrum

Individual paints can vary significantly in their chemical content, however some types of interior paints generally contain less hazardous materials than others. Below, HBN ranks different types of interior latex paints on the market on a simplified spectrum.[1] Products in the green categories are typically better options than those in the orange or red, and products in the yellow categories are generally less preferable than those at the top, but are better choices than those at the bottom.

[Read more...](#)

[GS-11 Certified, Very Low VOC Content, and Low VOC Emissions](#)

[APE-free, Low VOC Content, and Low VOC Emissions](#)

[Low VOC Content](#)

[Standard](#)

[Recycled Paints](#)

[Specialty Paints](#)

[Paints Advertised as "Antimicrobial"](#)

## Endnotes

[1] Unless otherwise noted, product content and health hazard information is based on research done by Healthy Building Network for Common Product profiles, reports, and blogs. Links to the appropriate resources are provided and these resources contain the original source information.

[2] Nonylphenol ethoxylates and their degradation products, nonylphenols, are on the EU Candidate List of Substances of Very High Concern due to endocrine disrupting properties. <https://echa.europa.eu/candidate-list-table>. Nonylphenol ethoxylates and octylphenol ethoxylates and their degradation products, nonylphenols and octylphenols, are on the ChemSec SIN List for endocrine disruption (<https://sinlist.chemsec.org/>) and on The Endocrine Disruption Exchange for





<https://homefree.healthybuilding.net/>

# HomeFree

A national initiative  
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## Related Resources

### HomeFree Flooring Specifications

Drop-in specification language to help project teams incorporate HomeFree's healthier material recommendations into projects. This editable Word document is organized according to MasterFormat standard divisions and includes example products that meet the specifications. It also includes educational context to provide both the "what" and "why" of healthier materials.

### Manufacturer Information Request Email Template - Carpet

An email template for use when working directly with the manufacturer or with your local product representative to find carpet products that meet HomeFree content transparency and healthier material recommendations.

### A Cheat Sheet for Decoding Vinyl Product Literature

A "cheat sheet" to help connect the dots between the HomeFree guidance on vinyl flooring and the technical literature produced by manufacturers. Have this sheet handy when a vinyl floor is necessary on your next project to help you make a better product choice.

### Case Study: Common Bond Communities Dublin Crossing

Case study for a 50-unit, 3-story affordable housing development for families and formerly homeless with one-, two-, and three-bedroom apartments. This case study recounts how the project team used HomeFree to assess the use of

## Flooring Products Hazard Spectrum

Individual products can vary significantly in their chemical content, however there are some types of flooring that generally contain less hazardous materials than others. HBN ranks types of flooring materials on a simplified spectrum below.[1] Products in the green categories are typically better options than those in the orange or red, and products in the yellow categories are generally less preferable than those at the top, but are better choices than those at the bottom.

[Read more...](#)

### Linoleum

Linoleum is a very good option for flooring to avoid toxic substances. Excluding the topcoat, it's typically made from bio-based and non-hazardous ingredients, and is free of the problematic additives used in vinyl products. However, all floors on the market contain a topcoat which may contain substances of concern, and which manufacturers often do not disclose. Since this is not unique to linoleum, it does not impact the rating - see the Read More section above for more information.

Be aware that some linoleum flooring has optional layers for acoustic insulation or floating floor installation which can add additional hazards. Floating floors do, however, avoid the use of a potentially hazardous adhesive, so are still a preferred flooring option. See the [Flooring Installation Hazard Spectrum](#) for more information.

Common Product: Linoleum Flooring

### Solid Wood Floors (pre-finished)

Pre-finished solid wood floors are a very good flooring option. Made from a single piece of wood, and purchased with a stain and topcoat already applied, this type of flooring allows for the chemically intensive finishing processes to take place in a factory where there are pollution controls and workers are protected.

If possible, find flooring that can be installed without an adhesive.

Common Product: Hardwood Flooring (prefinished)

### Ceramic Tiles (made in the USA/lead-free with no CRT content)

Ceramic tiles made without toxic glazes can be relatively low-impact materials for a flooring (or wall) installation. Tiles made in the USA are typically free of lead compounds in their glazes. Look for tile product literature that identifies where they've been made, and what they are made of, including frits, glazes, and pigments. Unglazed tiles are most preferred.

Avoid tiles with non-specific post-consumer recycled content. These contents may be old cathode ray tubes (CRTs) from TV sets and computer monitors. They contain high concentrations of lead. Tiles with CRT content are sometimes called CRT tiles.

For more information, read [Made in the USA: A Healthy Choice for Ceramic Tiles](#)



<https://homefree.healthybuilding.net/>

# HomeFree

A national initiative  
supporting affordable  
housing leaders who are  
improving human health  
by using less toxic building  
materials.



## Related Resources

### HomeFree Flooring Specifications

Drop-in specification language to help project teams incorporate HomeFree's healthier material recommendations into projects. This editable Word document is organized according to MasterFormat standard divisions and includes example products that meet the specifications. It also includes educational context to provide both the "what" and "why" of healthier materials.

### Manufacturer Information Request Email Template - Carpet

An email template for use when working directly with the manufacturer or with your local product representative to find carpet products that meet HomeFree content transparency and healthier material recommendations.

### A Cheat Sheet for Decoding Vinyl Product Literature

A "cheat sheet" to help connect the dots between the HomeFree guidance on vinyl flooring and the technical literature produced by manufacturers. Have this sheet handy when a vinyl floor is necessary on your next project to help you make a better product choice.

### Case Study: Common Bond Communities Dublin Crossing

Case study for a 50-unit, 3-story affordable housing development for families and formerly homeless with one-, two-, and three-bedroom apartments. This case study recounts how the project team used HomeFree to ensure the use of

## Flooring Products Hazard Spectrum

Individual products can vary significantly in their chemical content, however there are some types of flooring that generally contain less hazardous materials than others. HBN ranks types of flooring materials on a simplified spectrum below.[1] Products in the green categories are typically better options than those in the orange or red, and products in the yellow categories are generally less preferable than those at the top, but are better choices than those at the bottom.

[Read more...](#)

Linoleum

Solid Wood Floors (pre-finished)

Ceramic Tiles (made in the USA/lead-free with no CRT content)

PVC-free Resilient Flooring

Engineered Wood Floors (pre-finished)

Solid Wood Floors (site-finished)

Rubber or Rubber/Cork Floors (made without crumb rubber)

Laminate

Carpet (with no fly ash, no vinyl or polyurethane backing, and no PFAS)

Engineered Wood Floors (site-finished)

New Formulations of Vinyl Floors (phthalate-free)

Ceramic Tiles (not made in the USA/presence of lead is unknown/CRT tiles)

New Formulations of Vinyl Floors (with post-consumer recycled content)

Traditional Vinyl Floors



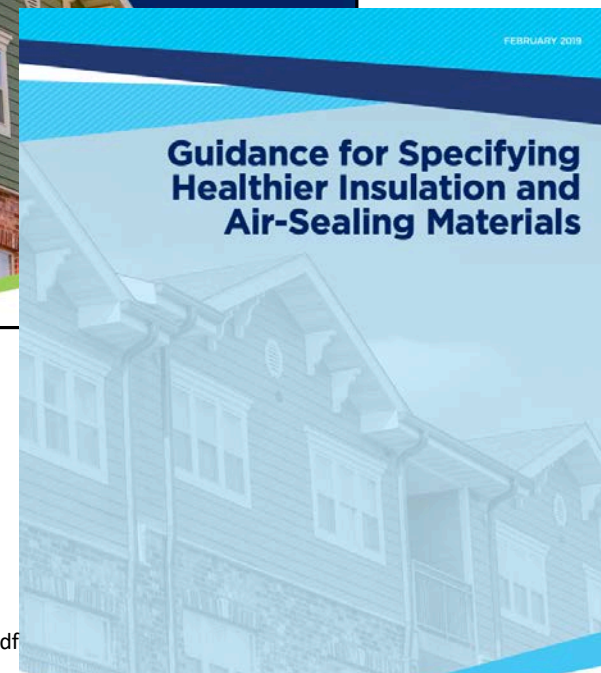
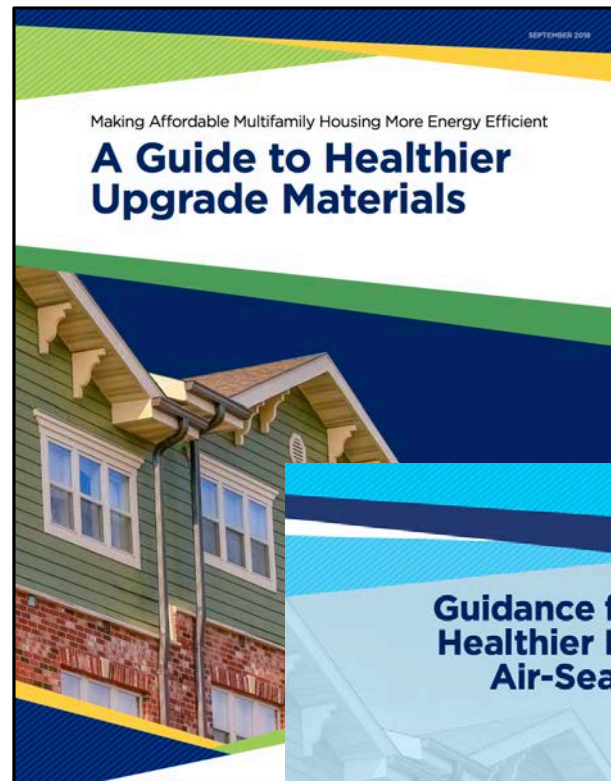
<https://healthybuilding.net>

Of roughly **85,000** chemicals available in the market, **few** are adequately tested for human health impacts. ...

Nearly 3,000 are high-production-volume chemicals

These chemicals migrate into our bodies, our children's bodies, and our pets and wildlife, costing us our **health**, the loss of millions of **IQ points**, and contributing to **climate change**.

Our **mission** is to advance human and environmental health by improving hazardous chemical transparency and inspiring product innovation.



EEBA

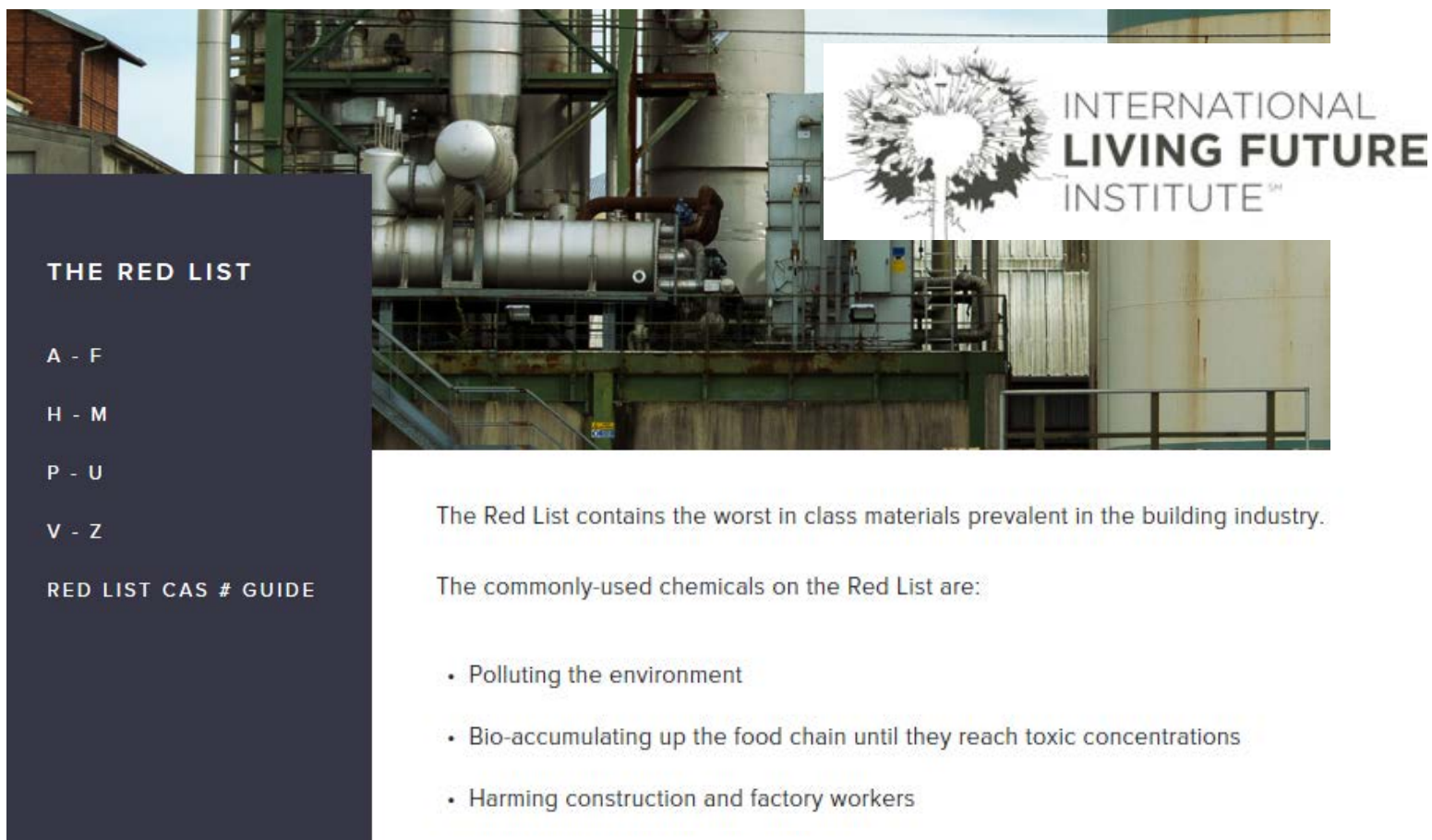
[https://s3.amazonaws.com/hbnweb.dev/uploads/files/Qj5q/NRDC-3084%20Guide%20to%20Healthier%20Retrofit\\_Final.pdf](https://s3.amazonaws.com/hbnweb.dev/uploads/files/Qj5q/NRDC-3084%20Guide%20to%20Healthier%20Retrofit_Final.pdf)

[https://s3.amazonaws.com/hbnweb.dev/uploads/files/vKbS\\_NRDC-3094%20Specifying%20Healthier%20Materials%20report\\_05.pdf](https://s3.amazonaws.com/hbnweb.dev/uploads/files/vKbS_NRDC-3094%20Specifying%20Healthier%20Materials%20report_05.pdf)



# Where is this information?

<https://living-future.org/declare/declare-about/red-list/>



**THE RED LIST**

A - F

H - M

P - U

V - Z

RED LIST CAS # GUIDE

INTERNATIONAL  
**LIVING FUTURE**  
INSTITUTE<sup>SM</sup>

The Red List contains the worst in class materials prevalent in the building industry.

The commonly-used chemicals on the Red List are:

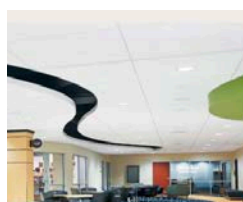
- Polluting the environment
- Bio-accumulating up the food chain until they reach toxic concentrations
- Harming construction and factory workers



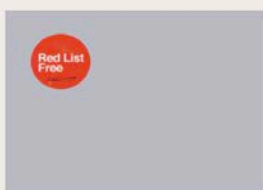


INTERNATIONAL  
**LIVING FUTURE**  
INSTITUTE™

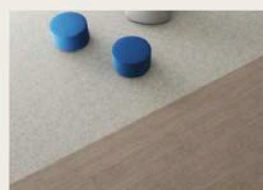
<https://living-future.org/declare/>



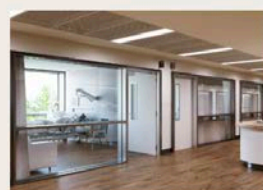
ARMSTRONG WORLD INDUSTRIES, INC.  
AXIOM® TRIMS & TRANSITIONS



MILLIKEN  
B2 MANAAKI  
BROADLOOM CARPET



SHAW INDUSTRIES GROUP, INC.  
BIOBASED PU RESILIENT  
BY PATCRAFT



SHAW INDUSTRIES GROUP, INC.  
BIOBASED PU RESILIENT  
BY SHAW CONTRACT



HENRY COMPANY  
BLUESKIN VP100



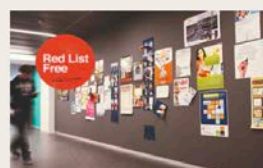
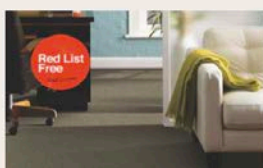
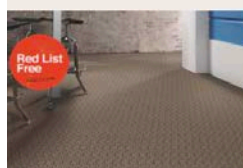
HENRY COMPANY  
BLUESKIN VP160



FREEDOM STRATEGIES LIMITED  
BRASS STEPMaster  
& GUIDEMaster



MILLIKEN  
BROADLOOM CARPET



**Red List Free**

CAPRI COLLECTIONS  
AND/OR

## Declare.

**And/Or  
Capri Cork**

Final Assembly: Delphos, OH, USA  
Life Expectancy: 15 Years  
End of Life Options: Recyclable (100%)

**Ingredients:**

EPDM Rubber; Cork Granules; Binder:  
Isocyanic Acid, Polymethylenepolyphenylene Ester, Polymer with .Alpha.-Hydro-.Omega.-Hydroxypolyoxy(Methyl-1,2-Ethanediyl),  
Diphenylmethane Diisocyanate, Polymethylene Polyphenyl Isocyanate

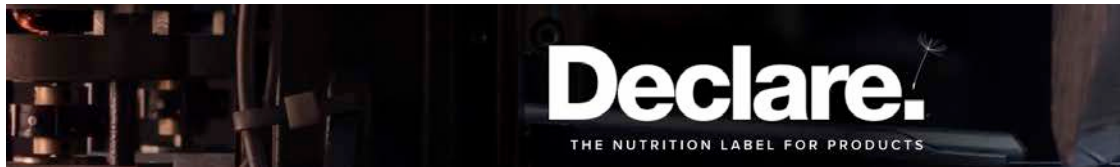
**Living Building Challenge Criteria:**

CPK-0004  
VOC Content: N/A  
Declaration Status

EXP: 01 NOV 2018  
VOC Emissions: CDPH Compliant  
LBC Red List Free  
LBC Compliant  
Declared

MANUFACTURER RESPONSIBLE FOR LABEL ACCURACY  
INTERNATIONAL LIVING FUTURE INSTITUTE™ declareproducts.com

INGREDIENT LIST			
COMPONENT	INGREDIENT NAME	CAS#	%
EPDM Rubber	EPDM	25038-	75-
		36-2	90%
Binder	Diphenylmethane diisocyanate	26447-	1-
		40-5	3.3%
	Isocyanic acid, polymethylenepolyphenylene ester, polymer with .alpha.-hydro-.omega.-hydroxypolyoxy(methyl-1,2-ethanediyl)	53862-	1-
		89-8	3.3%
Polymethylene polyphenyl isocyanate		9016-	1-
		87-9	3.3%
Cork Granules	Cork	61789-	1-5%
		98-8	



<https://living-future.org/declare/>

INGREDIENT LIST			
COMPONENT	INGREDIENT NAME	CAS#	%
Face Fiber	Poly[imino(1,6-dioxo-1,6-hexanedyl)imino-1,6-hexanedyl]	32131-17-2	40-55%
	DIHYDROGEN OXIDE	7732-18-5	5-
	Castor oil, ethoxylated, dioleate	110531-9	

DECLARE ID MHK-0029

LICENSE EXPIRATION 01 JUL 2020

**LIVING BUILDING CHALLENGE COMPLIANCE:**

I-13 RED LIST (DECLARATION STATUS): LBC RED LIST FREE

I-10 HEALTHY INTERIOR PERFORMANCE: CDPH STANDARD METHOD V1.1-2010

THIRD PARTY VERIFIED YES

ASSESSOR WAP SUSTAINABILITY

LIVING PRODUCT CHALLENGE (LPC) CERTIFIED YES

FINAL ASSEMBLY LOCATION  
GLASGOW, VA, USA

LIFE EXPECTANCY 15 YEAR(S)

END OF LIFE OPTIONS TAKE BACK PROGRAM

Amorphous silica	7631-86-
Fatty acids, C16-18 and C18-unsatd., branched and linear, ethoxylated	96349-7
Quartz	14808-60

### And/OR Capri Cork

Final Assembly: Delphos, OH, USA  
Life Expectancy: 15 Years  
End of Life Options: Recyclable (100%)

Ingredients:

EPDM Rubber; Cork Granules; Binder: Isocyanic Acid, Polymethylenepolyphenylene Ester, Polymer with .Alpha.-Hydro.-Omega.-Hydroxypolyoxy(Methyl-1,2-Ethanedyl), **Diphenylmethane Diisocyanate, Polymethylene Polyphenyl Isocyanate**

**Living Building Challenge Criteria:**

CPK-0004  
VOC Content: N/A

EXP. 01 NOV 2018  
VOC Emissions: CDPH Compliant

**Declaration Status**

- ☒ LBC Red List Free
- ☐ LBC Compliant
- ☐ Declared

MANUFACTURER RESPONSIBLE FOR LABEL ACCURACY  
INTERNATIONAL LIVING FUTURE INSTITUTE™ declareproducts.com

### Broadloom Carpet Milliken & Company

Final Assembly: LaGrange, GA, USA  
Life Expectancy: 15 Years  
End of Life Options: Recyclable (100%)

Ingredients:

Face Fiber: Poly[imino(1,6-Dioxo-1,6-Hexanedyl)imino-1,6-Hexanedyl], Dihydrogen Oxide, Lithium Dihydrogen 5-Sulphonatolosphthalate, Titanium Dioxide, Phosphoric Acid, Manganese(2++) Salt (2:1), Castor Oil, Ethoxylated, Dioleate, Potassium Hydroxide, Poly(Oxy-1,2-Ethanedyl), ...-Methyl-...-(2-Propenyl)-, Octenyl, 1,4-Butanedioic Acid, Dipotassium Salt in Water, Fatty Acids, Tall-Oil, Ethoxylated Propoxylated, Siloxanes and Silicones, Di-Me, 3-Hydroxypropyl Me, Ethers with Polyethylene Glycol Mono-Me Ether, Coconut Oil, Phosphoric Acid, Phenyl-; Backing: Calcium Carbonate, Polypropylene, Styrene-Butadiene Copolymers, Hexanedioic Acid, Polymer with Hexahydro-2H-Azepin-2-One and 1,6-Hexanediamine, Quartz, 1,2-Benzisothiazol-3(2H)-One, Fatty Acids, C16-18 And C18-Unsatd., Branched and Linear, Ethoxylated, Amorphous Silica, Distillates (Petroleum), Hydrotreated Middle, Poly(Oxy-1,2-Ethanedyl), Alpha-Phosphono-Omega-(Dodecyloxy)-, Compd. with 2,2'-iminobis[Ethanol], (EO 2-8 MOL), 2-Propenoic Acid, Ethyl Ester, Polymer with Sodium, 2-Propenoate, Benzene, 1,1'-Oxybis-, Tetrapropylene Derivs., Sulfonated, Sodium Salts, Sulfuric Acid, Mono-C10-16-Alkyl Esters, Ammonium Salts, Octadecanoic Acid, 2-Methylpropyl Ester, Zinc Pyrithione, Ethanol, Alcohols, C12-13, Ethoxylated; Various Additives, Proprietary Additives (<0.10%)

**Living Building Challenge Criteria:**

MPKN-0015  
VOC Content: N/A

EXP. 01 JAN 2019  
VOC Emissions: CDPH Compliant

**Declaration Status**

- ☒ LBC Red List Free
- ☐ LBC Compliant
- ☐ Declared

**Third Party Verified**

MANUFACTURER CLAIMS VERIFIED BY WAP Sustainability  
INTERNATIONAL LIVING FUTURE INSTITUTE™



LEED Living Building Challenge, Compliant



HAYWARD  
SCORE

64



<https://www.pharosproject.net/>



Building Products

Chemicals and Materials

Certifications

## Dashboard for [Your name here](#)

### Latest Industry Information

Healthy Building Network developed Pharos to be the most comprehensive independent database of chemicals, polymers, metals, and other substances available. The data in Pharos also forms the core of HBN's [Chemical Hazard Data Commons](#), a shared space designed to foster collaboration and peer learning for anyone seeking safer chemicals.

HBN works to bring our users timely industry information. When we know better, we can do better to reduce toxic hazards and improve the health of people and the planet. Find research, insights, event announcements, and more on the [Healthy Building Network blog](#).

### Search By Product Manufacturer

Blue Ridge Commercial Carpet

Find Products

### Search By Product Category

Foam Board Insulation

Find Products



65



Solvent-based Butyl Sealant Common Product

MasterFormat 07 92 00 Joint Sealants

This information reflects our best understanding of product composition in 2016.

Solvent-based butyl sealants are typically used for flashing and for sealing gutters and downspouts, chimneys, and aluminum and vinyl siding. They can also be used to seal around windows and doors, for sealing curtain wall joints and metal panel...

More about Solvent-based Butyl Sealant

## About Common Products

Free / Professional

Common Contents All Contents Process Chemistry Resources

## Nested View

NAME	% WT PART	% WT WHOLE	FUNCTION	GS SCORE
Limestone 1317-65-3	47.21%	47.21%	Filler	LT-1
Stoddard solvent 8052-41-3	20.00%	20.00%	Solvent	LT-1
Polybutene 9003-29-6	10.79%	10.79%	Plasticizer	LT-1
Kaolin 1332-58-7	8.39%	8.39%	Filler	LT-1
Butyl rubber 9010-85-9	5.43%	5.43%	Binder	LT-1
Talc 14807-96-6	5.25%	5.25%	Filler	LT-1
Titanium dioxide 13463-67-7	2.10%	2.10%	Pigment	LT-1
Quartz 14808-60-7	0.52%	0.52%	Impurity of limestone	LT-1
Ethylbenzene 100-41-4	0.31%	0.31%	Likely solvent impurity	BM-1

100-41-4  
Ethylbenzene  
ALSO CALLED alpha-Methyltoluene, 1-ethylbenzene, 2-Ethyl-2,5-cyclohexadiene-1,4-diylradical, 2-Phenylethane-1-yl,  
View all synonyms (38)

Share Profile

Hazards Properties Functional Uses Process Chemistry Resources

All Hazards View 

Show List Hazard Summary Show PubMed Results Add to Comparison

Group I Human Group II and II\* Human Ecotox Fate Physical Mut Non-GSLT

GS Score  
C M R D E AT ST N T N SnS SnR IrS IrE AA CA ATB P B Rx F Mult PBT GW O O

GreenScreen Assessment  
BM-1  
All Hazards  
LT-1

Hazard Lists

Download Lists

ENDPOINT	HAZARD LEVEL	GS SCORE	LIST NAME	HAZARD DESCRIPTION	OTHER LISTS
Carcinogenicity	H	LT-1	CA EPA - Prop 65	Carcinogen	+7
Reproductive Toxicity	H	LT-P1	GHS - Japan	Toxic to reproduction - Category 1A [H360]	+2
Developmental Toxicity incl. developmental neurotoxicity	M-L	LT-UNK	MAK	Pregnancy Risk Group C	
Endocrine Activity	H-M	LT-P1	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor	
Acute Mammalian Toxicity	M	LT-UNK	EU - GHS (H-Statements)	H302 - Harmful if inhaled	+9
Systemic Toxicity/Organ Effects-Single Exposure	PC	NoGS	EU - Manufacturer REACH hazard submissions	H335 - May cause respiratory irritation (unverified)	
Systemic Toxicity/Organ Effects-Repeated Exposure	M	LT-UNK	EU - GHS (H-Statements)	H373 - May cause damage to organs through prolonged or repeated exposure	

<https://pharosproject.net/tutorials>



# California's Proposition 65

It is intended to help Californians make informed decisions about protecting themselves from chemicals known to cause cancer, birth defects, or other reproductive harm.

**PROP. 65 WARNING**  
The State of California contains one or more chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

As part of the law, businesses selling products to people in California must provide “clear and reasonable warnings” before knowingly exposing people to any chemical on the list,

Only tell you that a product has something in it that **might cause cancer or affect reproduction**.

They **don't say what the substance** is, where it is in the product, how you might be exposed to it, **what the level of risk is**, or how to reduce your exposure.



Know your environment.  
Protect your health.

# EWG.org

## CONSUMER GUIDES

SHOW ME: TOXICS

CONSUMER PRODUCTS

ENERGY

FARMING

FOOD

WATER



### EWG'S NATIONAL TAP WATER DATABASE

*How safe is your drinking water?*



### EWG'S SHOPPER'S GUIDE TO PESTICIDES IN PRODUCE™

*See which produce has the least pesticides.*



### FIVE REASONS TO SKIP BOTTLED WATER



### DIRTY DOZEN ENDOCRINE DISRUPTORS



### EWG'S UPDATED WATER FILTER BUYING GUIDE

*Find the right filter for your water – and budget.*



### EWG'S GUIDE TO HEALTHY CLEANING

*Ranks 2,000 household cleaning products*

# GREENGUARD CERTIFICATION

## FROM UL ENVIRONMENT

### Healthier Indoor Air

- Poor indoor air quality (IAQ) can adversely affect occupant health and productivity and is a major issue facing building owners and developers.
- Good design, implementing smart construction processes and specifying low-emitting products are proactive methods builders and owners can employ to construct spaces with healthier indoor air.
- As the demand for sustainable, high-performance buildings continues to rise, the use of low-emitting GREENGUARD Certified products is an easy way for developers and building owners to demonstrate commitment to occupant health and sustainability.

### Address Moisture Intrusion

- Addressing moisture intrusion and mold contamination is a critical step in protecting a building from losses and promoting good indoor air quality.
- UL Environment offers a recognized American National Standards Institute (ANSI) standard: ANSI/GEI-MMS1001 that provides best practices to prevent and address mold and moisture issues in new construction. To receive an electronic copy or hard copy please click [here](#).

### Reduce VOC Emissions

- GREENGUARD Certification indicates products have been screened for over 10,000 chemicals. Certified products help create healthier indoor environments.
- Thousands of certified products in more than 28 product categories can be viewed in the [UL SPOT Database](#).
- Specification of GREENGUARD Certified products demonstrates a developer and building owner's commitment to the creation of healthy, high-quality interior spaces.



# Gold

<http://greenguard.org/>



Conforms to HazCom 2012/United States

## Safety Data Sheet Portland Cement

### Section 1. Identification

**GHS product identifier:** Portland Cement  
**Chemical name:** Calcium compounds, calcium silicate compounds, and other calcium and aluminum make up the majority of this product.  
**Other means of identification:** Cement, ASTM Type I, II, III, V, Portland Limestone Cement, Plain Cement, Oilwell Cement, Well Cement, Class G Cement, InterCement, GUL, MS, MH, MHL, HE, HEL, LH, LHL, HS  
**Relevant identified uses of the substance or mixture and uses advised against:** Building materials, construction, a basic ingredient in concrete.  
**Supplier's details:** 300 E. John Carpenter Freeway, Suite 1645  
 Irving, TX 75062  
 (972) 653-5500  
**Emergency telephone number (24 hours):** CHEMTREC: (800) 424-9300

### Section 2. Hazards Identification

Overexposure to portland cement can cause serious, potentially irreversible skin or eye damage in the form of third degree burns. The same serious injury can occur if wet or moist skin has prolonged contact exposure.

**OSHA/HCS status:** This material is considered hazardous by the OSHA Hazard Communication Standard.  
**Classification of the substance or mixture:** SKIN CORROSION/IRRITATION – Category 1  
 SERIOUS EYE DAMAGE/EYE IRRITATION – Category 1  
 SKIN SENSITIZATION – Category 1  
 CARCINOGENICITY/INHALATION – Category 1A  
 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) [Respiratory tract irritation] – Category 3

### GHS label elements

**Hazard pictograms:**



**Signal word:** Danger  
**Hazard statements:** Causes severe skin burns and eye damage.  
 May cause an allergic skin reaction.  
 May cause respiratory irritation.  
 May cause cancer.



Only with GREENGUARD Certified Products.

Gold

Designing a Space

Healthier Schools

New to GREENGUARD?





## FloorScore® Healthy indoor air quality



### Most important measure of air quality?

FloorScore measures the most important risk to indoor air quality: the emission level of specific volatile organic compounds (VOCs).

✓ Check

### Independent Certification?

The FloorScore seal tells you that the products have been independently tested and certified by Scientific Certification Systems (SCS)

✓ Check

### Stringent Standards?

FloorScore certified products meet the volatile organic compound emissions criteria of the California Section 01350 standard.

✓ Check



CERTIFIED BY  
SCS Global Services

7528 results

## FILTERS

[Clear all filters](#)

### + Product Categories

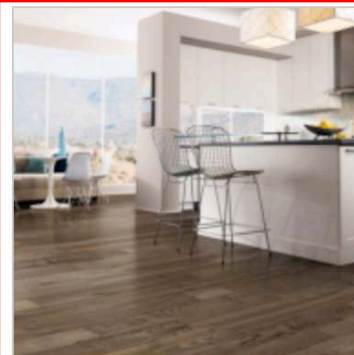
### - Certifications

- ☒ FloorScore® (7393)
  - ☐ FloorScore® - Adhesive (348)
- ☐ NSF/ANSI 332 (60)
- ☒ Environmental Product Declaration (EPD) (43)
- ☐ Indoor Advantage (10)
- ☒ Health Product Declaration (HPD): Flooring (10)
- ☐ Recycled Content (4)
- ☐ Assure Certified (2)

<https://rfci.com/floorscore/#>



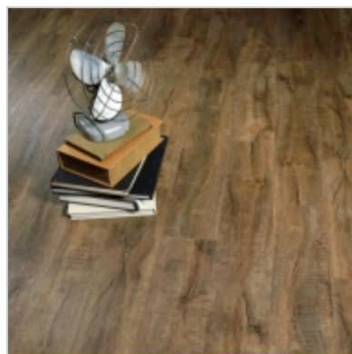
**Boulder**  
by Swiff-Train Company LLC



**Bruce® Engineered Har...**  
by AHF LLC dba AHF Products



**Bruce® Solid Hardwood...**  
by AHF LLC dba AHF Products



**Camden**  
by Swiff-Train Company LLC



**Capella® Engineered H...**  
by AHF LLC dba AHF Products



**Capella® Solid Hardwo...**  
by AHF LLC dba AHF Products





CERTIFIED BY  
SCS Global Services



## BRUCE® ENGINEERED HARDWOOD FLOORING MAXIMUM THICKNESS: ½”

By AHF LLC dba AHF Products

Engineered hardwood flooring has a layered construction. The top of each plank is 100% wood, available in a variety of species and on-trend styles. The core is 5 to 7 layers of plywood, crisscrossed and bonded together. On the bottom is another layer of wood.

This layered construction brings additional stability to engineered hardwood, making it less likely to expand and shift from environmental changes—and more appropriate for basements and other challenging installations.

FloorScore®  
SCS-FS-05600 | 2019.07.23 - 2021.07.31



CERTIFIED BY  
SCS Global Services

# AHF LLC dba AHF Products

3840 Hempland Road, P.O. Box 566, Mountville, PA, United States

For the following product(s):

## Engineered Hardwood:

All Armstrong Flooring®, Bruce®, Capella®, Hartco®, and Robbins®

Engineered Hardwood Flooring, *Maximum Thickness: 1/2"*

The product(s) meet(s) all of the necessary qualifications to be certified for the following claim(s):

## FloorScore®

Indoor Air Quality Certified to SCS EC1003-2014 v1.0

Conforms to the CDPH/EHLB Standard Method v1.2-2017 (California Section 01350), effective April 1, 2017, for the school classroom and private office parameters when modeled as Flooring.

Measured Concentration of Total Volatile Organic Compounds (TVOC): Less than/equal to  $0.5 \text{ mg/m}^3$  (in compliance with CDPH/EHLB Standard Method v1.2-2017)

Valid from: August 1, 2020 to July 31, 2021

SCS Global Services is currently the only certification body approved by the Resilient Floor Covering Institute (RFCI) to provide FloorScore® product certification; certified products are only listed on the SCS Green Products Guide, <http://www.scsglobalservices.com/certified-green->



CERTIFIED BY  
SCS Global Services

#0821

**SCS**global  
SERVICES

Stanley Mathuram, PE, Vice President  
SCS Global Services  
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA



<https://rfci.com/floorscore/#>

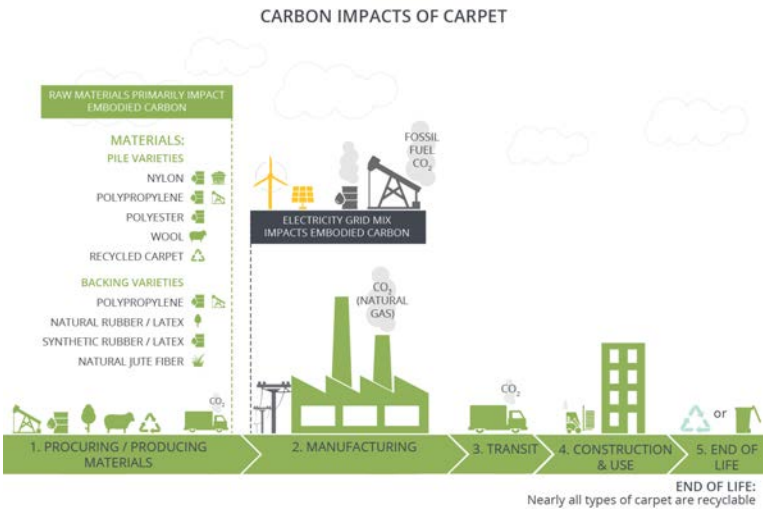






# GreenScreen Certified™ Products

[www.greenscreenchemicals.org](http://www.greenscreenchemicals.org)



## GreenScreen Certified™ Products

Company

Standard

Level

Any

Any

Any

Product	Company	Standard	Version	Level
Yellow GS	Garmon Kemin Textiles	Textile Finishing	v1.0	Bronze
Yellow B-GS	Garmon Kemin Textiles	Textile Finishing	v1.0	Bronze
VesZym Cell Max CM	Veskim Kimyevi Madde Ithalat Ihracat A.S.	Textile Finishing	v1.0	Bronze
VesPers Jean 977 New	Veskim Kimyevi Madde Ithalat Ihracat A.S.	Textile Finishing	v1.0	Bronze
VesPers Jean 1017	Veskim Kimyevi Madde Ithalat Ihracat A.S.	Textile Finishing	v1.0	Bronze
Universal F3 Green 3X3: Class B Foam Concentrate	National Foam, Inc.	Firefighting Foam	v1.0	Bronze
TLP NEUTRA-GREEN	TLP International	Textile Finishing	v1.0	Bronze
TLP Green & White	TLP International	Textile Finishing	v1.0	Bronze
TLP ENZYCLEAR	TLP International	Textile Finishing	v1.0	Bronze

In this section

- Greenscreen Certified™
- FAQ
- Get Certified
- Firefighting Foam
- Textiles
- Building Products
- Service Providers
- Certified Products
- Textile Finishing
- Firefighting Foam

Search

Search this site

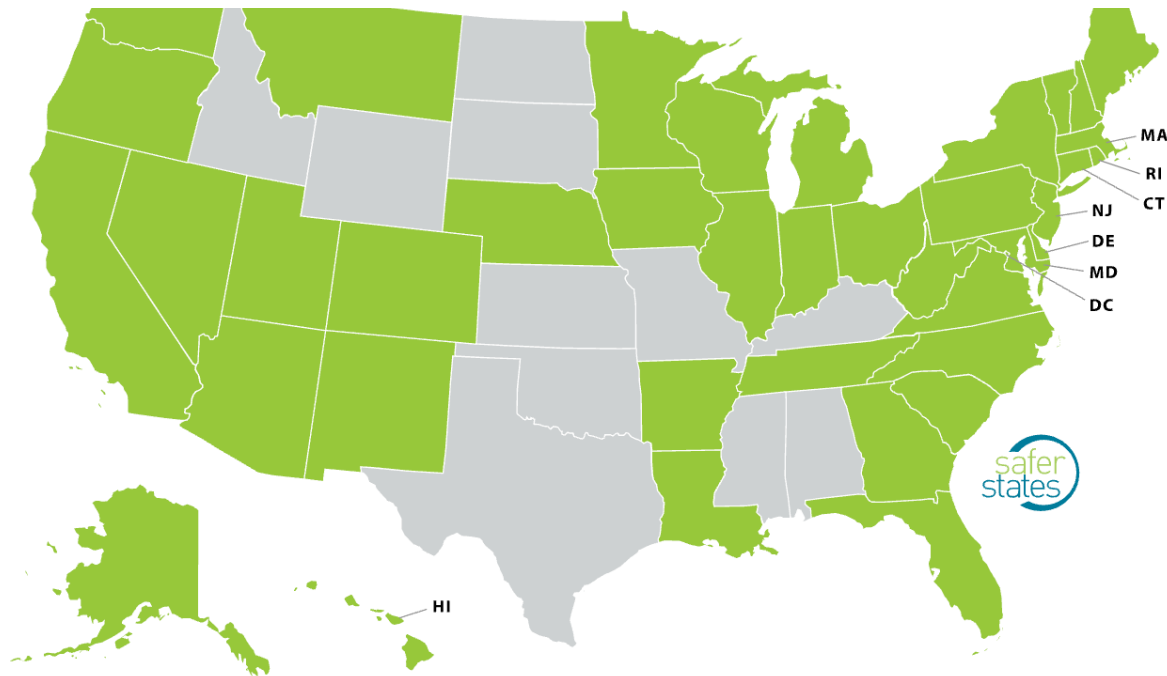
Q

SUBSCRIBE TO GREENSCREEN NEWS



## States are leading the way to safer chemicals

**33 states** are considering **247 policies** to protect people from toxic chemicals. **201 state policies** have been adopted in **35 states**.





www.greenseal.org

## GREEN SEAL-CERTIFIED PRODUCTS



CONSTRUCTION MATERIALS & BUILDING EQUIPMENT

Page: 1 of 1 (Results: 5)

← PREVI



Natura® Waterborne Interior Eggshell

**Company:** Benjamin Moore & Co

**Category:** Construction Materials & Building Equipment

**Standard:** GS-11



Natura® Waterborne Interior Flat

**Company:** Benjamin Moore & Co

**Category:** Construction Materials & Building Equipment

**Standard:** GS-11



Natura® Waterborne Interior Pearl

**Company:** Benjamin Moore & Co

**Category:** Construction Materials & Building Equipment

**Standard:** GS-11





c2ccertified.org



Search & Filters

Search by keywords

Q

Categories

MasterFormat

✓ Building Supply & Materials (154)

Fire Safety (4)

Flooring (1)

Architectural Glass (12)

Building Exteriors (8)

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Daylighting & Shades (11)

Doors (0)

Drywall (1)

Electrical (2)

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Floor Adhesives (40)

Garden & Landscape (2)

Heating, Cooling, & Ventilation (7)

Insulation (17)

Paint, Finishes, & Coatings (16)

Partition Walls (3)

Plumbing, Pipe, & Fixtures (6)

Roofing & Rainwater Management (4)

Specialties and Miscellaneous Applications (7)

Structural Building Materials (4)

Transportation Elements (0)

63 certifications

<div>Insulation</div> <div>Platinum</div> <div> </div> <div> <b>CALOSTAT®</b>  <b>EVONIK RESOURCE EFFICIENCY GMBH</b>            CALOSTAT® is a permeable, non-flammable and self-supporting heat insulating panel specially...  <a href="#">more info »</a> </div>	<div>CRADLE TO CRADLE PRODUCTS INNOVATION INSTITUTE</div> <div> <div>Platinum V3.1</div> <div> </div> <div> <b>CALOSTAT® Granules</b>  <b>EVONIK RESOURCE EFFICIENCY GMBH</b>            CALOSTAT® is available in a number of sheet types and as a granulate. It is designed to be...  <a href="#">more info »</a> </div> </div>	<div>Floor Adhesives</div> <div>Platinum V3.1</div> <div> </div> <div> <b>Forbo Sustain 1299</b>  <b>FORBO FLOORING SYSTEMS NORTH AMERICA</b>            Forbo Sustain 1299 is a dual acrylic polymer adhesive. It contains 25% recycled content and is...  <a href="#">more info »</a> </div>
<div>Floor Adhesives</div> <div>Platinum V3.1</div> <div> </div> <div> <b>Forbo sustain 885m and Forbo sustain 1195</b>  <b>FORBO FLOORING SYSTEMS NORTH AMERICA</b>            Forbo Sustain 885m and 1195 adhesives are a dual acrylic polymer adhesive. They contain...         </div>	<div>Insulation</div> <div>Platinum V3.1</div> <div> </div> <div> <b>HOIZ-Hobelspandämmung/ Wood Shavings Insulation</b>  <b>BAUFRTZ GMBH &amp; CO KG, SEIT 1896</b>            HOIZ is an insulation material produced from untreated spruce wood shavings. The wood shavings...         </div>	<div>Floor Adhesives</div> <div>Platinum V3.1</div> <div> </div> <div> <b>Mannington RV-500 NON PVC PSA Adhesive</b>  <b>MANNINGTON MILLS, INC.</b>            Mannington RV-500 Adhesive is a high strength, pressure sensitive adhesive designed for...         </div>



# CERTIFIED PRODUCTS: FLOORING



**CERTIFICATIONS**  
 C2C Silver  
 C2C Silver V3.1  
 Carpet and Rug Institute, Green  
**GREENGUARD Gold**  
 SCS Floor Score

**TYPE**  
 Bamboo  
**Carpet**  
 Ceramic  
 Engineered  
 Laminate

**TRANSPARENCY**  
 Declared  
 HPD  
 LBC Compliant - Declare  
 Red List Free - Declare  
 UL Product Lens

Company^	Brand Name / Model	Type	Certifications	Transparency
Bolon	Bolon Woven Sheet Flooring (Maximum thickness: 3.0mm)	Carpet	SCS Floor Score	
Bolon	Bolon Woven Tile Flooring (Maximum thickness: 3.5mm)	Carpet	SCS Floor Score	
Masland Contract	Assimilate	Carpet	GREENGUARD Gold	
Masland Contract	Concentric	Carpet	GREENGUARD Gold	
Masland Contract	Lines II	Carpet	GREENGUARD Gold	
Masland	Lumiere	Carpet	GREENGUARD	

## LEED Qualifications

All of The Dixie Group products pass the Carpet and Rug Institute's Green Label Plus Indoor Air Quality Testing Program for carpet.

This certification enables our contract products to qualify for a full point under the LEED Indoor Environmental Quality, Credit 4.3 Low Emitting Materials, Carpet. This is the only full point that any type of carpet provides.

The selection of our contract products can also contribute towards LEED Credits in Indoor Environmental Quality, Credit 4.1 Low Emitting Materials, Adhesive and Material and Resources, Credits 4.1 and 4.2 Recycled Content and Credit 6 Rapidly Renewable Resources.



<https://www.maslandcarpets.com/>

**Style: Bandala Jazzed - 9648**

**Color: Bamboo - 211**

Print friendly version

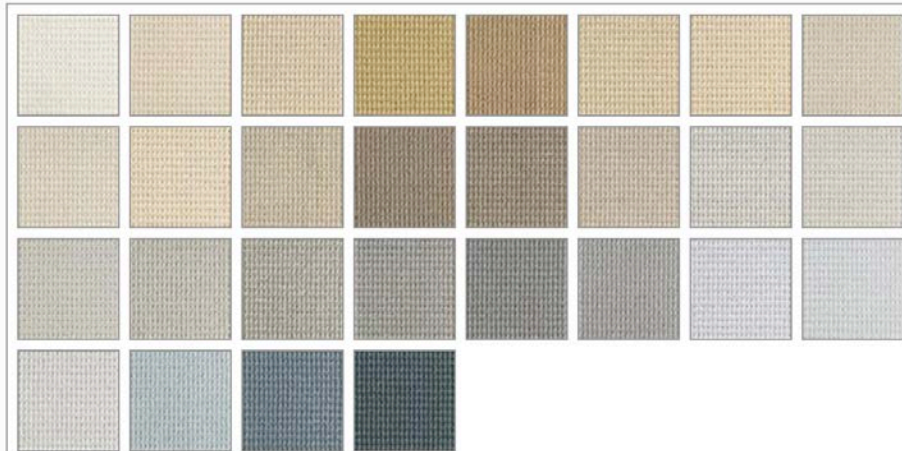
Like 0

Save

### PRODUCT DESCRIPTION

Over our 154 year history there are a few products that have reached iconic status. Bandala is a brand of its own with a long legacy of success. Our newest version features Envision 66 fiber which lends a subtle tonal element that enhances this structure even more. It's softer than ever – proving that Bandala Jazz will remain our sisal-like, wall-to-wall, area rug, and light commercial go to product into the next generation.

### AVAILABLE COLORS



### WARRANTY

Stain Resistance:	Lifetime Limited
Soil Resistance:	Lifetime Limited
Texture Warranty:	20 Year Limited
Abrasion Warranty:	20 Year Limited
Antistatic Warranty:	Limited Lifetime



Ranking retailers  
on toxic chemicals

[retailerreportcard.com](http://retailerreportcard.com)

## Toxic Chemicals in Our Homes

When we walk into a trusted store, we expect the products on the shelves to be safe. But toxic chemicals are hiding in everyday products and packaging all around us, from cleaning products and food packaging to baby toys and electronics.



### THE HOME DEPOT RESTRICTED SUBSTANCES LIST (RSL)

Installed Wall-to-Wall Indoor Carpet	Fiberglass Insulation	Household Cleaning Chemicals (Effective JAN 2022)	Laminate Flooring	Interior & Exterior Latex Paint	Paint Remover (Effective JAN 2019)	Vinyl Flooring
Perfluorooctanoic acid (PFOA) or perfluorooctane sulfonate (PFOS)	Brominated flame retardants	Propyl-paraben	0.0073 ppm or less of formaldehyde	Triclosan	Methylene chloride	Ortho-phthalates
Triclosan	Halogenated flame retardants	Butyl-paraben		Isocyanates	N-Methylpyrrolidone (NMP)	
Organotins	Antimony trioxide	Diethyl phthalates		Formaldehyde		
Ortho-phthalates	Formaldehyde	Dibutyl phthalates		Lead / Heavy Metals		
Vinyl Chloride	Added heavy metals	Formaldehyde		Alkylphenol ethoxylates and Nonylphenol ethoxylates (Effective DEC 2019)		
Nonylphenol ethoxylates (NPEs)		Nonylphenol ethoxylates (NPEs)				
Coal Fly Ash		Triclosan				
Formaldehyde		Toluene				
Added heavy metals		Trichloroethylene (TCE)				

### Summary of The Home Depot's Grade

2019	B+
2018	B-
2017	C+
2016	D+

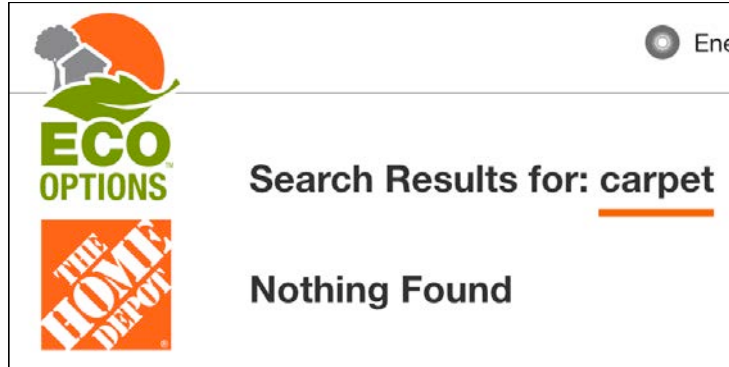
## Chemical Strategy

[https://corporate.homedepot.com/sites/default/files/image\\_gallery/PDFs/Chemical%20Strategy%2010\\_2017.pdf](https://corporate.homedepot.com/sites/default/files/image_gallery/PDFs/Chemical%20Strategy%2010_2017.pdf)





50% OF  
ILLNESS LINKED  
TO INDOOR  
POLLUTANTS  
ACCORDING  
TO EPA



# Staples™

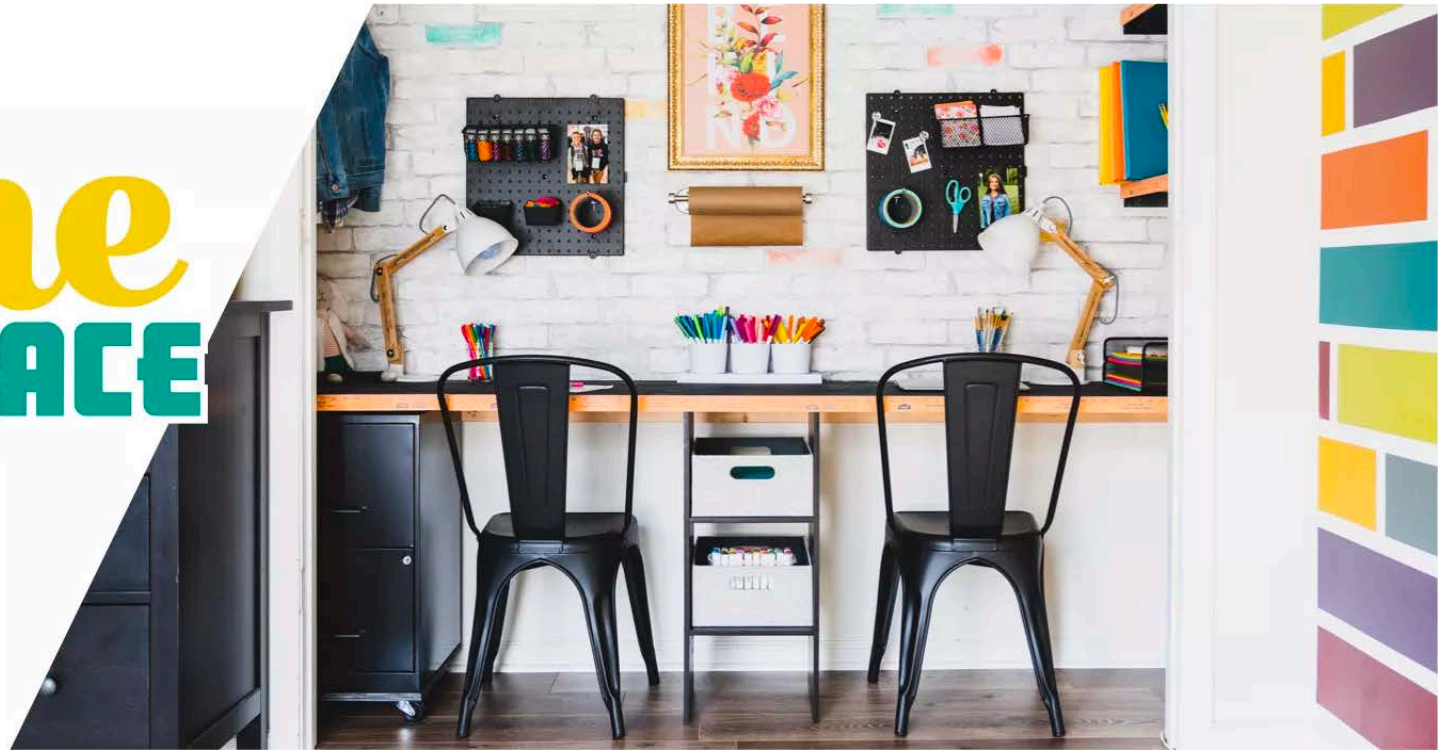
## Lessons from Managing Chemicals, Staples Inc.

1. Knowing is better than not knowing
2. Action is better than inaction
3. Eliminating chemical hazard is better than managing exposure.
4. Transparency/ disclosure is better than vagueness or obscurity
5. Orderly proactive transition is better than abrupt reaction



# Home WORKSPACE MAKEOVER

LEARN MORE



# Architects Can Be The Resource To Better Material Selection

## R) Sealants and Adhesives:



Phil Kaplan · 2nd

Principal at Kaplan Thompson Architects  
Portland, Maine Area · 500+ connections ·

- a. OSI or Tremco Spectrum1 Silicone Building Sealant or equal for exterior joints.
- b. **Tremflex** 834 Mildew Resistant Silicone Sealant or equal for interior joints.
- c. Tremco 511 Sealant if meets LEED-H or equal where a urethane sealant is required.
- d. Do not exceed allowable VOC limits as per LEED-H standards, and as referenced below:
  - 1. Wood Flooring Adhesives - 100
  - 2. Rubber Flooring Adhesives - 60
  - 3. Subfloor Adhesives - 50
  - 4. Ceramic Tile Adhesives - 65
  - 5. Drywall Adhesives - 50
  - 6. Multipurpose Construction Adhesives - 70
  - 7. Architectural Sealants - 250
  - 8. Non-membrane Roof Sealants - 300

S) Pan Flashing: Pan flash all doors and windows with 3M 8067 Flashing Tape or approved equal. Provide sloped Sill & End Dams by folding and adhering membrane to buck, per drawings.

T) Provide structural EPDM gaskets, Resource Conservation Technology at all 2x sill plate condition



# HAYWARD SCORE DATA

## Before 2010

Score	43.4
Symptom Count	5.0
Severe Symptoms	0.9
Feel Better Symptoms	1.3

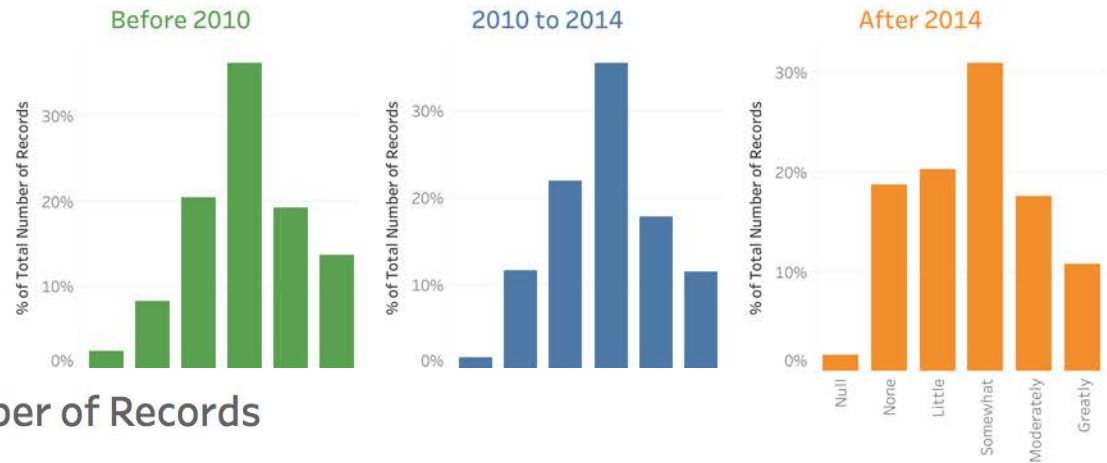
## 2010 to 2014

Score	60.7
Symptom Count	5.1
Severe Symptoms	0.9
Feel Better Symptoms	1.3

## After 2014

Score	70.2
Symptom Count	4.2
Severe Symptoms	0.9
Feel Better Symptoms	1.3

## Percent Reporting by Belief in Negative Impact



## Number of Records

## Before 2010

### Before 2010

Leaks	56%
Multiple Leaks	15%
Severe Leak	25%

30,305

Leaks	9%
Multiple Leaks	9%
Severe Leak	14%

1,091

### Before 2010

Odors	50%
Surface Dust	66%
Dirt on Sills	43%
Water Stains	31%
Visible Mold	24%
Think Mold	16%
Deferred Maintenance	17%

### 2010 to 2014

Odors	32%
Surface Dust	65%
Dirt on Sills	35%
Water Stains	17%
Visible Mold	12%
Think Mold	11%
Deferred Maintenance	3%

1,339

### After 2014

Odors	26%
Surface Dust	47%
Dirt on Sills	22%
Water Stains	8%
Visible Mold	6%
Think Mold	7%
Deferred Maintenance	1%

## Pests

### Before 2010

Roaches	15%
Mice	24%
Bats	2%
Termites	4%

### 2010 to 2014

Roaches	9%
Mice	10%
Bats	0%
Termites	1%

### After 2014

Roaches	6.9%
Mice	4.6%
Bats	0.2%
Termites	0.5%

Note: Homeowners only, new symptom data only.



	Before 2010	2010-2014	2014-2020
	n=30305	n=1091	n=1339
Score	43.4	60.7	70.2
<b>Symptom Count</b>	<b>5</b>	<b>5.1</b>	<b>4.2</b>
Asthma	22%	24%	21%
Allergies	37%	38%	33%
Chemical Sensitivity	11%	11%	10%
Other Respiratory	16%	13%	10%
<b>Odors</b>	<b>50%</b>	<b>32%</b>	<b>26%</b>
Surface Dust	66%	65%	47%
Dirt on Sills	43%	35%	22%
Water Stains	31%	17%	8%
Visible Mold	24%	12%	6%
Think Mold	16%	11%	7%
Deferred Maintenance	17%	3%	1%



Occupants have fewer Symptoms

Same as national average

New homes smell!

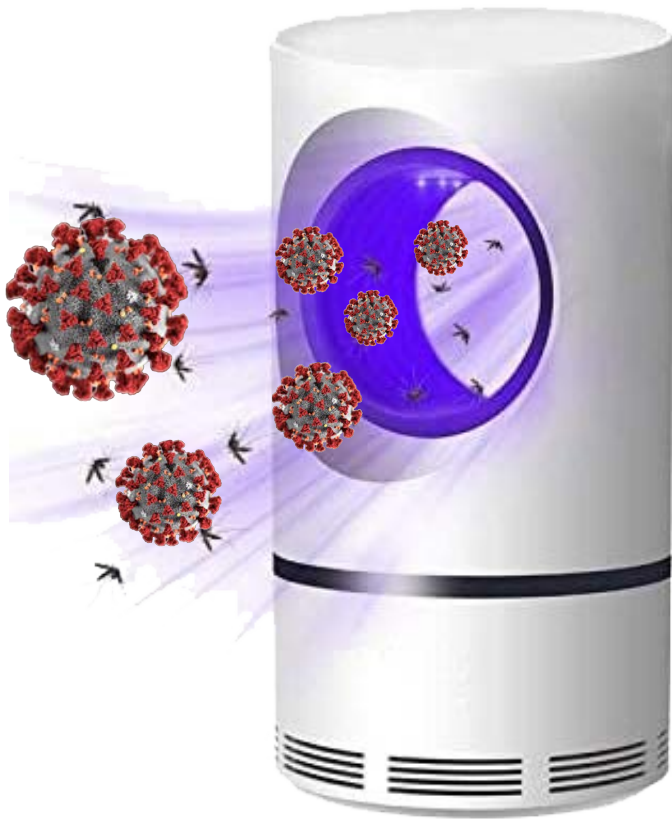
These should be lower

	Before 2010	2010-2014	2014-2020	
	n=30305	n=1091	n=1339	
Roaches	15%	9%	6.90%	Everyone has some roaches and rodents
Mice	24%	10%	4.60%	
% Smoke Indoors	16%	8%	7%	Fewer people smoking indoors
% Cook w Gas	38%	48%	56%	Newer homes have more gas stoves and use the kitchen exhaust
% Run Hood Fans	39%	49%	56%	
% Working Cook Fans	33%	40%	47%	
% Bath Exhausts Outdoors	45%	53%	62%	
Basement	41%	29%	26%	
Crawlspace	36%	27%	24%	
Slab	29%	41%	43%	
Carpet in House	31%	28%	19%	
Carpet in BR	31%	45%	48%	
<b>ERV/HRV</b>	<b>3%</b>	<b>5%</b>	<b>13%</b>	<b>ERV/HRVs have increased</b>



# COVID-19 Zappers

CAUTION



# Occupant is the IAQ Receptor





## A photograph of a wooden table covered with various smart home and IoT devices. The devices include several air purifiers (one with a digital display showing green bars), smart displays, sensors, and smart speakers. Some devices are in their original packaging, while others are out of the box. The background shows a cluttered desk with a yellow bag, a blue water bottle, and other miscellaneous items. The text "Trend Indicators" is overlaid in a large, black, sans-serif font across the center of the image.

Consumer IAQ Monitors

at that time

Trend Indicators

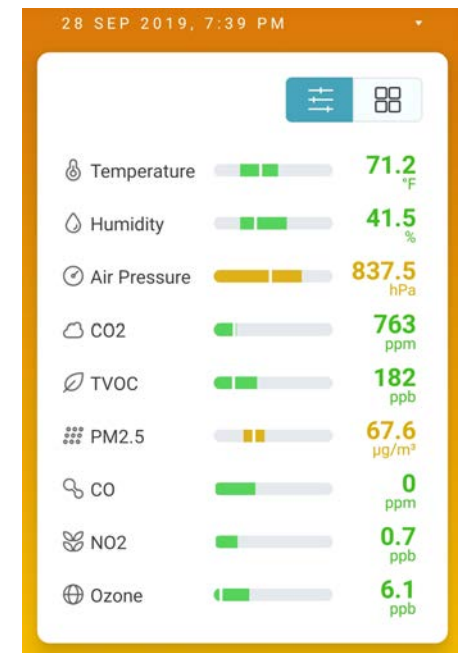
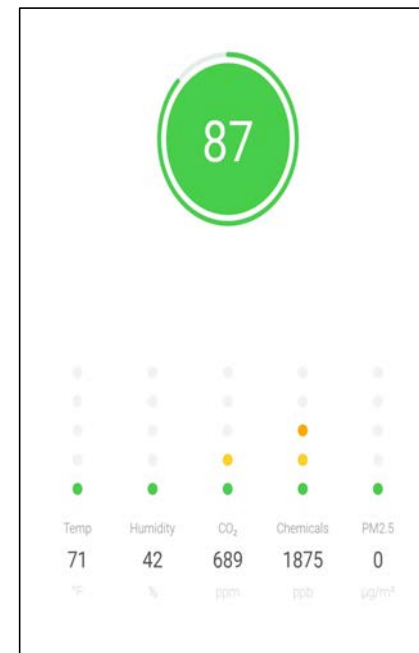
in that location

# Consumer IAQ Monitors

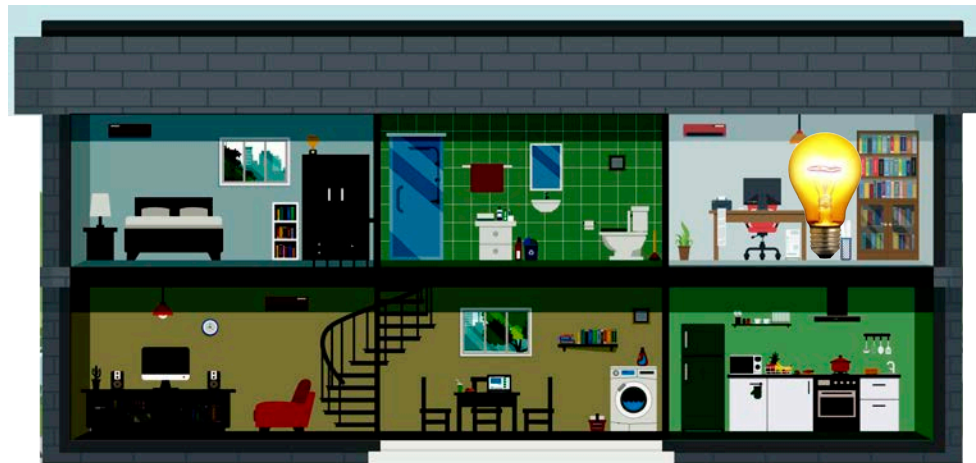
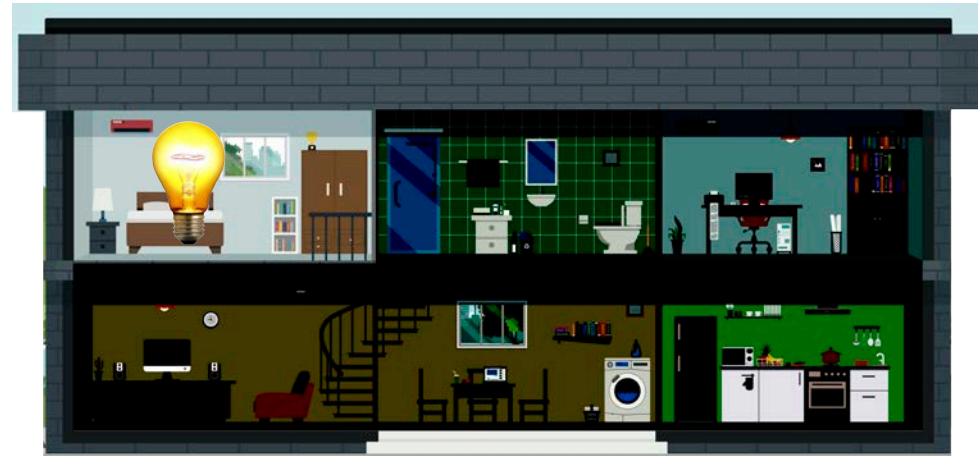
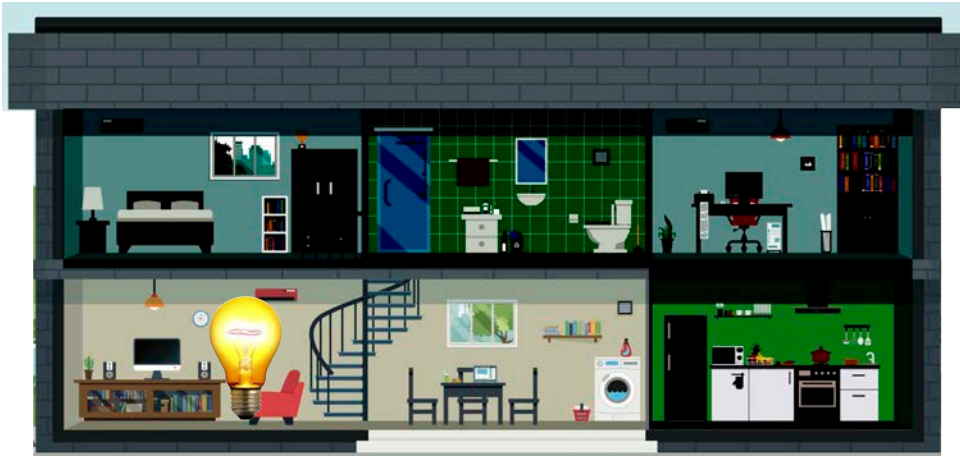
## Blood Test Results

Blood Test	Result	Normal Value
WBCs (billion/L)	8.00	3.5 to 10.5
Neutrophils (%)	62	40 to 70
Lymphocytes (%)	28	25 to 45
Monocytes (%)	10	2 to 8
Eosinophils (%)	1	1 to 5
Basophils (%)	0	0 to 1
RBCs (trillion/L)	3.84	4.3 to 5.7
Hb (g/dL)	11.7	13 to 17
Hematocrit (%)	37	37 to 52
Platelets (billion/L)	262	150 to 450

## IAQ Monitor Results



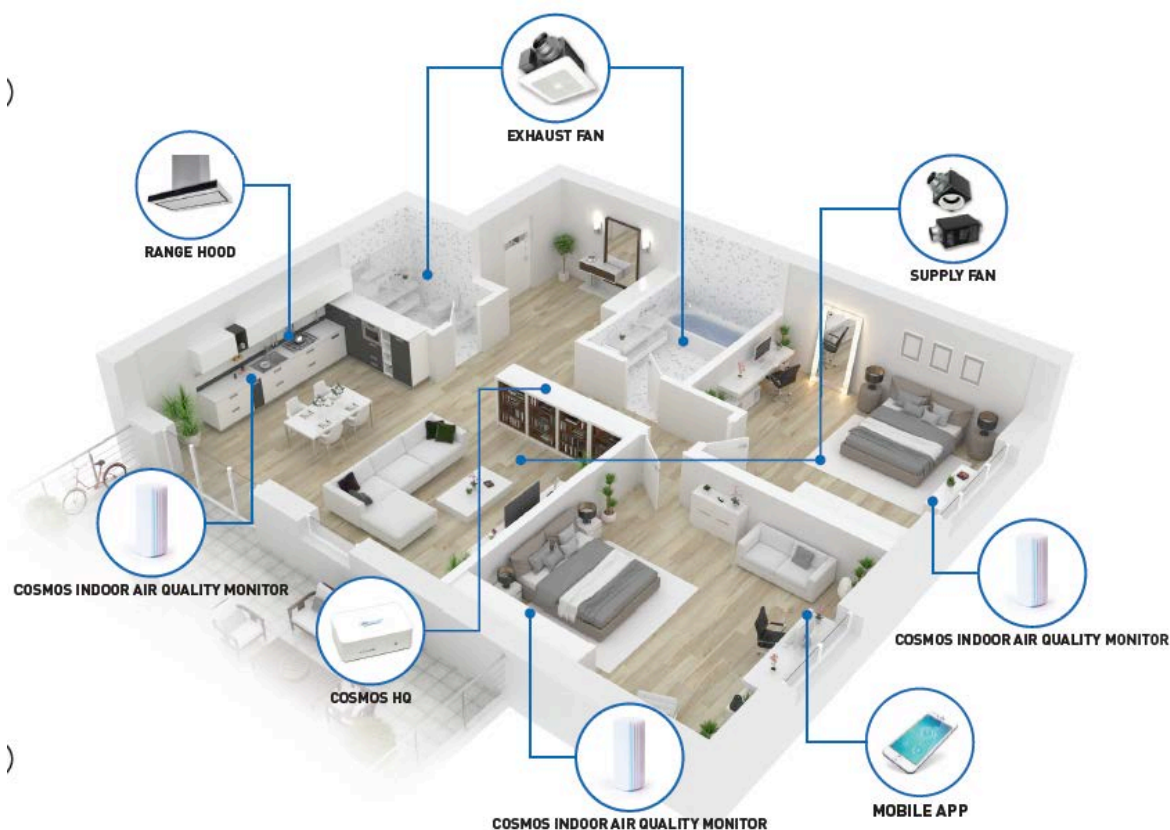
# Consumer IAQ Monitors =





# Sensor Integration

# Panasonic



Cosmos Command Center



Cosmos HQ

Monitors system operations in real-time, receives alerts and recommendations, and automates processes efficiently

Cosmos Indoor Air Quality Monitor

Constantly monitors indoor air quality levels to determine when outside the normal range. Color coded LED lights provide instant air quality reading



Cosmos Communication Modules

Provides communication for signal reliability among Cosmos components



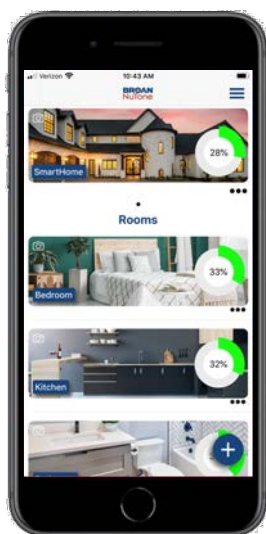
Mobile App

Provides data on your home's indoor air quality in an easy to read dashboard, you'll know when something is wrong, and how Cosmos resolves it, automatically.

# Sensor Integration OVERTURE CONNECTED IAQ SYSTEM

**BROAN**

**NuTone**



tVOC  
CO2  
Humidity  
Temperature



+ PM 2.5



# Sensor Integration

HAVEN™

## Central Air Monitor

by TZOA®

In-duct monitor integrates with any HVAC system to track indoor air quality



### CENTRAL AIR CONTROLLER

To control HVAC system fan during air quality events and ensure regular circulation

### OTHER EQUIPMENT

Automatically triggers ventilation or filtration during AQ events



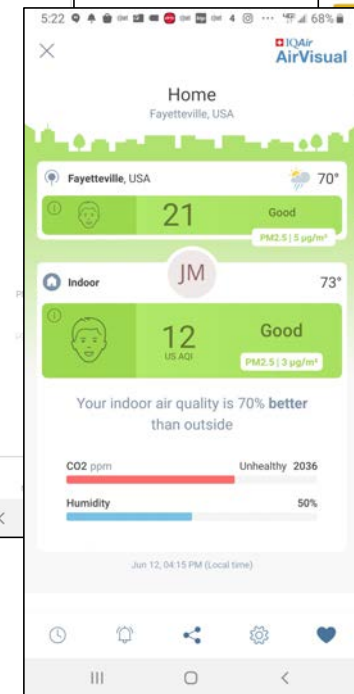
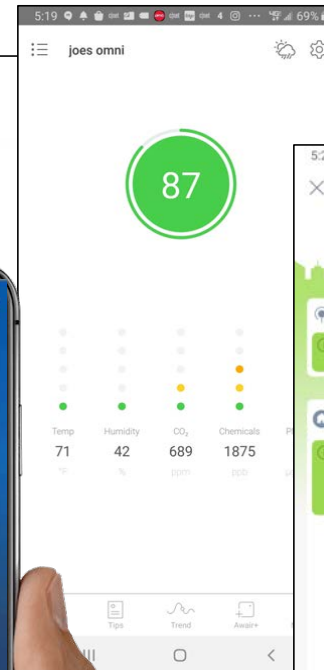
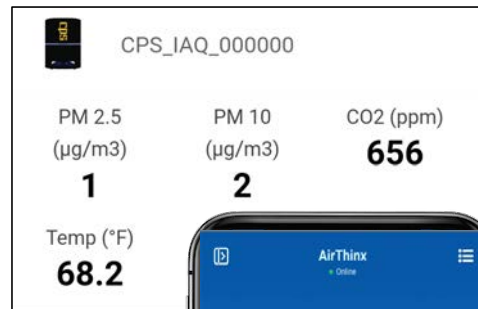
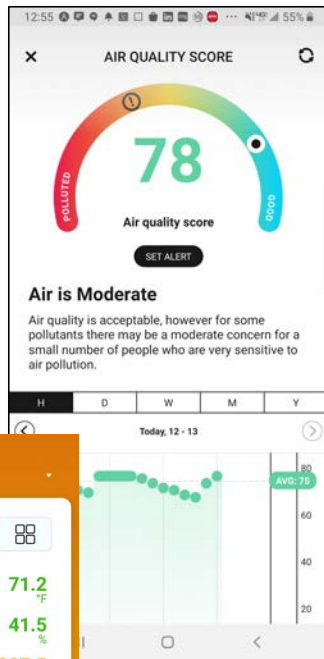
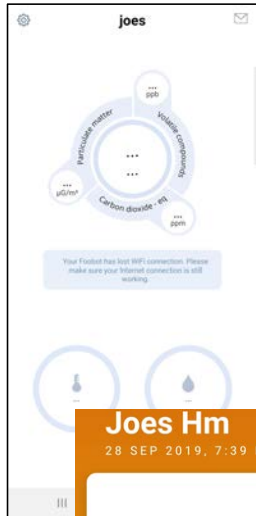
AH Control



Indoor Stand Alone Device



# Data – what do you get and how?





The following slides were  
not covered in the webinar

# Sensor Integration

## Air Purifiers



# Buils a New Healthy Home – Right!

## Every material was evaluated


Formldehyde  
Acetone

Only materios  
should be in  
the home

### Actual results

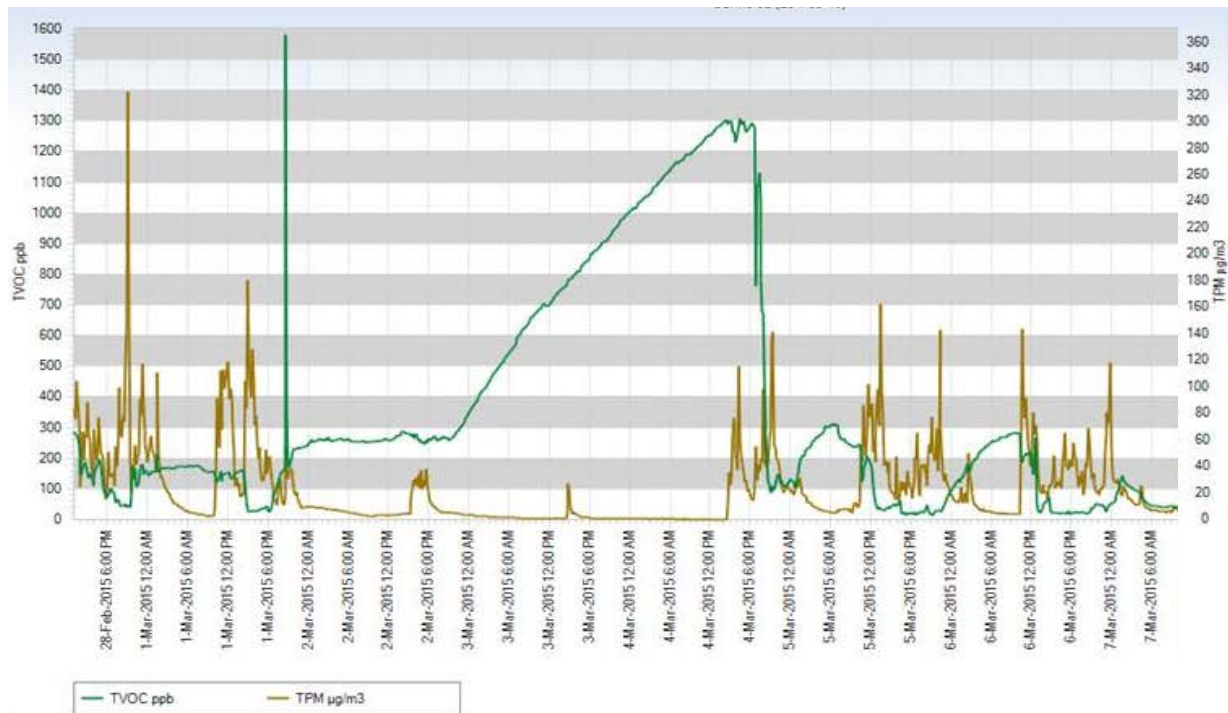
- Butoxyehtanol
- Pinene
- Hexanal
- Dichloroehtene
- Ethanol
- Xytene
- Butane
- Propylene Glycol

Compound	Basement ng/l	Living Room ng/l	Master Bedroom ng/l
Total VOC (TVOC)	13,000	9,500	10,000
Formldehyde	290	240	290
Acetone	1,400	980	990
2-Butoxyehtanol	2,300	750	500
a-Pinene	470	530	570
DEGEE	180	340	320
Hexanal	140	280	220
trans 1,2-Dichloroehtene	120	190	210
Ethanol	140	180	170
m,p-Xylene			
Butane (C 4)			
Propylene Glycol			
BDL = Below Detection Limit			
Highest of 3 Locations			
Lowest of 3 locations			
Middle value of 3 locations			



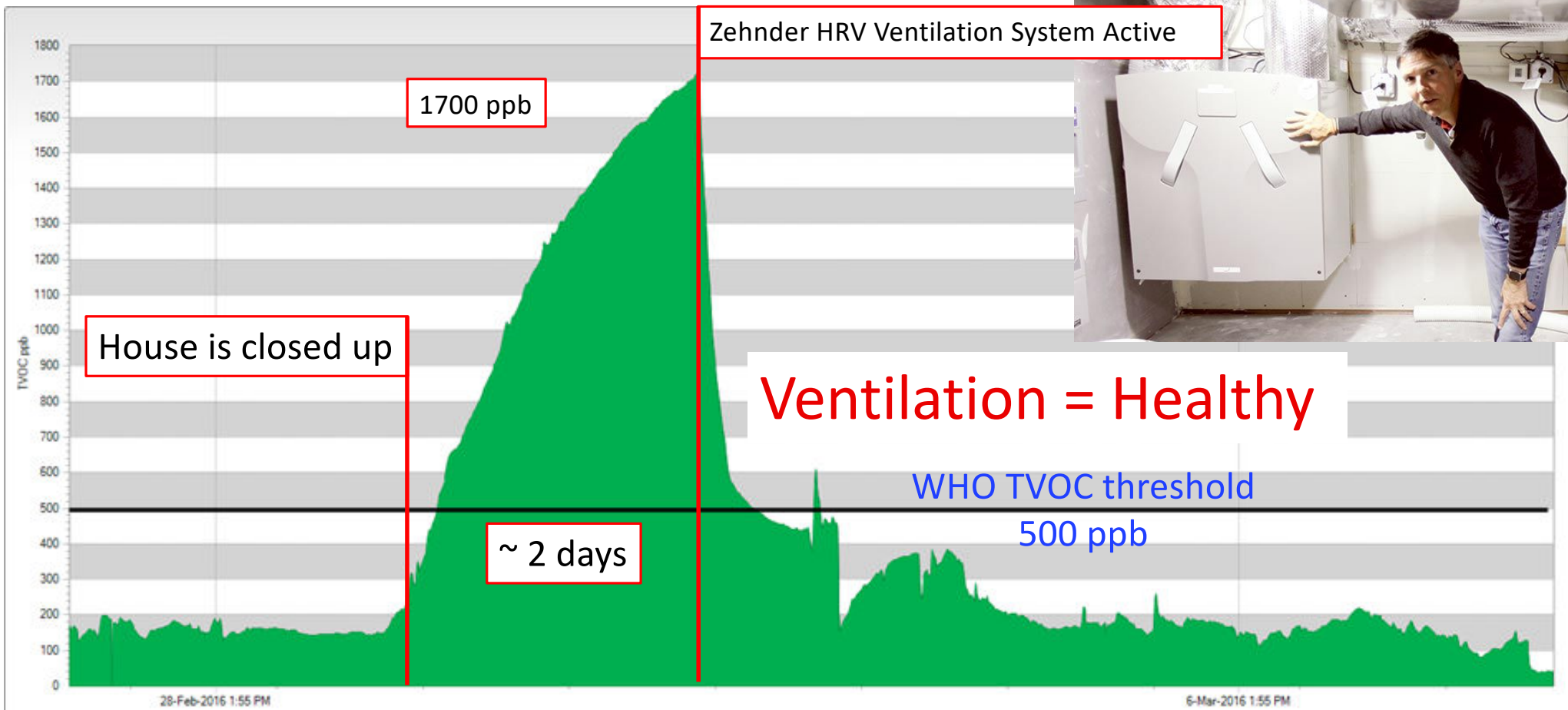

EEBA

# Ventilation makes a significant difference in TVOC levels

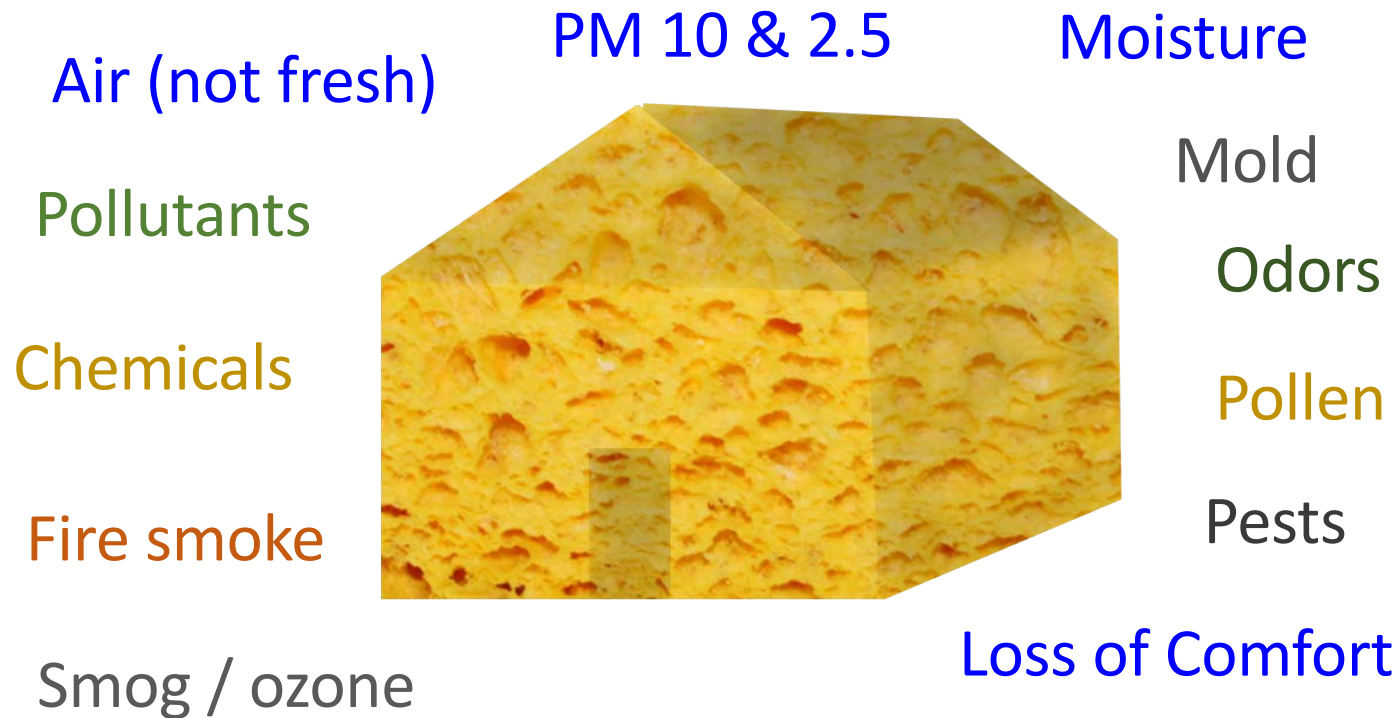




# Healthy Home – Right!



# Air Leakage = Contaminant Pathway



# Internal Sources – Worse Than Outside



Avg 1500-2000sqft home = ~2560  
cuft. of OSB plywood



OSB walls = 1183.7 cuft.

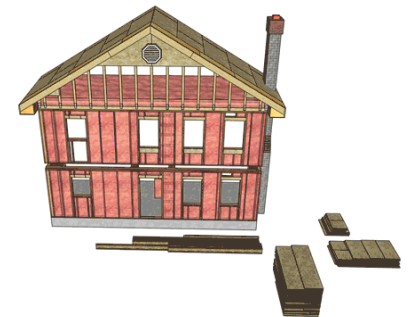
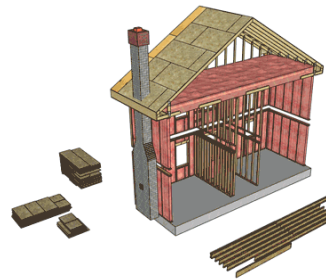
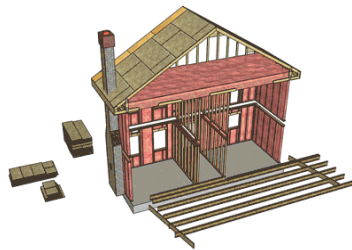
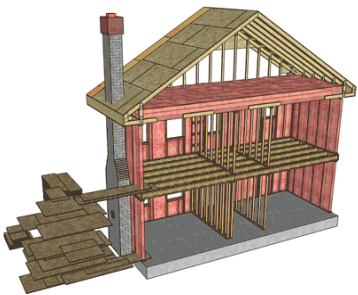
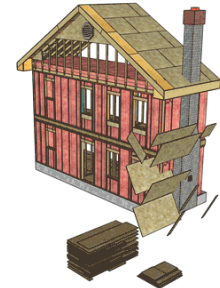
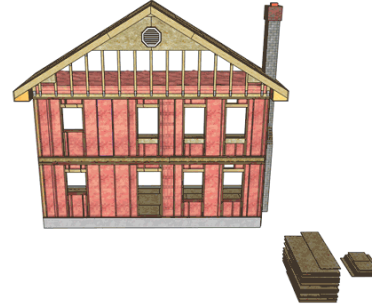
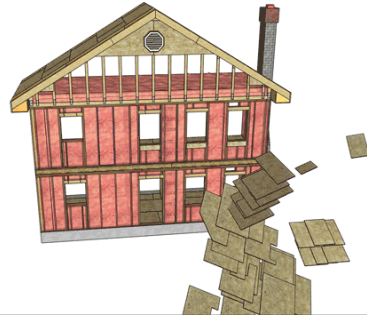
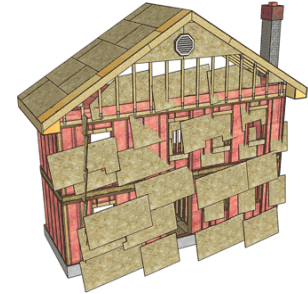
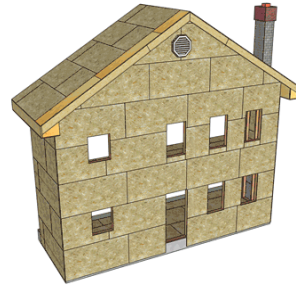
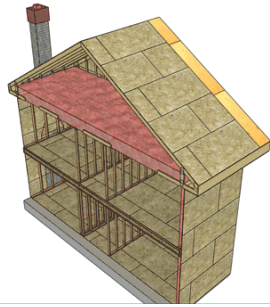
OSB floors = 1349.7 cuft

I-joist = 25.5 cuft.

Polymethylene Polyphenyl Isocyanate  
Phenol Formaldehyde Polymer







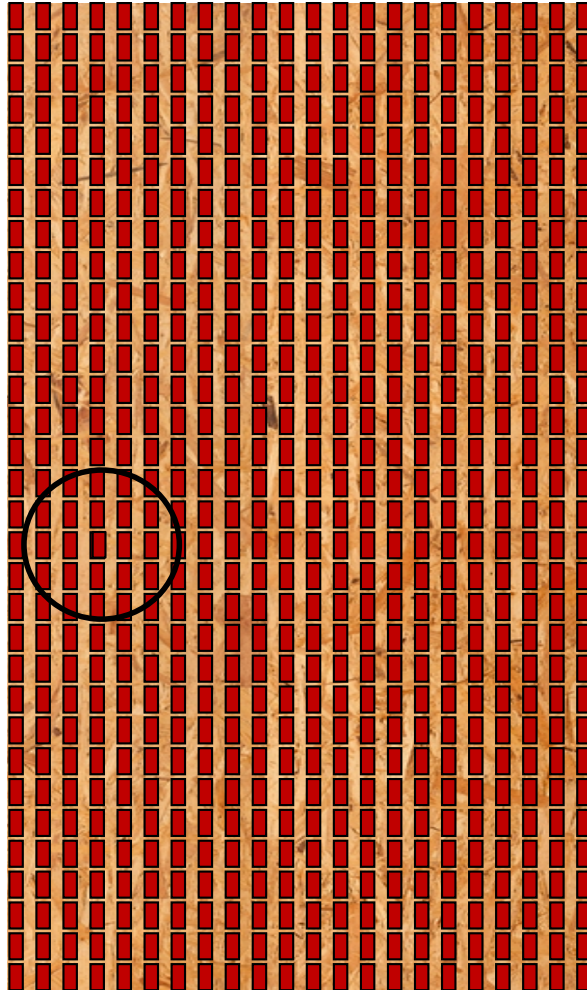
# To the Lab with real samples!

## 1 : 768

Sample is

2 7/8" (7.5 cm) x

7/16" (1.2 cm)



## Lab Summary

86° F (30° C) for 10 minutes

Sample	Aprox Age	Volume		Formaldehyde
"A" 19/32" (0.59 in.) OSB	5-10 years	2.96 g	Acetone, Ethanol, Hexanoic Acid	31 ng/g
"B" 17/32" (0.53 in.) OSB	1 year	2.64 g	Acetone, Ethanol, Hexanoic Acid	27 ng/g
"D" 25/32" (0.78 in.) T&G OSB	8 years	1.79 g	Acetone, Ethanol,	20 ng/g
"L" 25/32" (0.78 in.) T&G OSB	8 years	2.76 g	Acetone, Ethanol,	100 ng/g
"M" 31/64" (0.48 in.) OSB	4-6 years	1.55 g	Acetone, Ethanol,	49 ng/g
"K" 1/2" (0.75 in.) MDF	2 years	2.72 g	Acetone, Ethanol,	95 ng/g
"O" 7/16" (0.47 in.) New OSB	NEW	1.15 g	Acetone, <b>Biocide or Pesticides</b> , Acids – pentanoic, isobutyric, butyric and octanoic, hexanoic ( <b>smelly/irritating</b> ), <b>a-Pinene</b> (wood), Heptanol, Octanol	42 ng/g
"P" 19/32 (0.59 in.) New OSB	NEW	1.82 g	Acetone, Hexanoic Acid	38 ng/g



# Eliminate Toxic Materials

## European Chemical Ban, REACH

Registration, Evaluation and Authorization of Chemicals

Phthalates used in Flooring, Wall Covering,  
Upholstery and TOYS

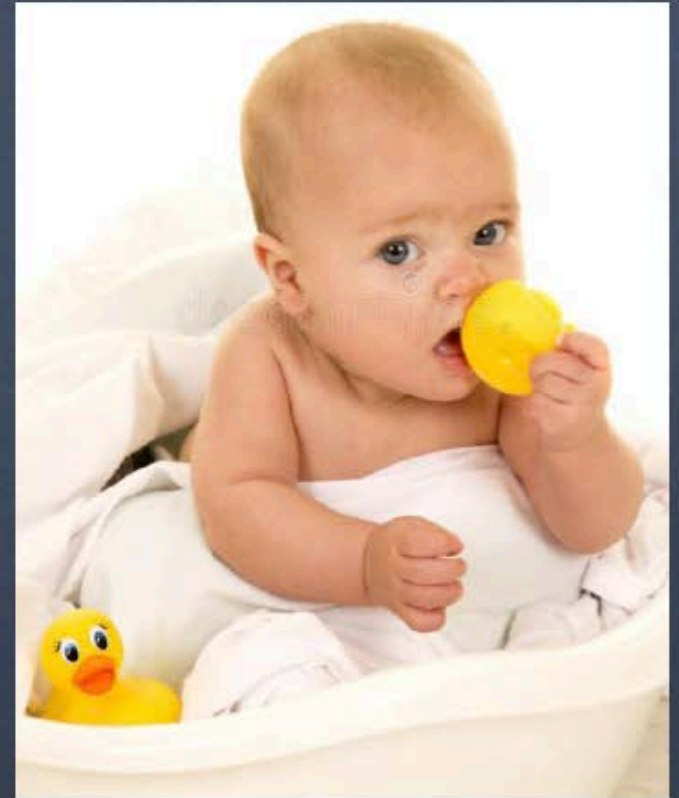
... banned in the EU in 2010

... But ok in the US until Oct. 2017

(the vote was 3 to 2 in favor of the restrictions)

source Terry Brennan

**IAQ & Energy** 2018





**BUILDER**

## DOES IT PAY A NEW HOME BUILDER TO STAND APART IN A COVID WORLD? MORE THAN EVER!

A clear take-away from our Builder 100 fastest-growing builder of 'The Next 100' is that differentiation can make a huge difference.

By **John McManus**



“Being able to buy a new home at almost half of what our rent was is amazing. We finally have a home with a yard for our daughter!”

**- Dustin and Lindsey, Cottage Collection Homeowners**

*Like as not--given the structural challenges to the demand side of the economy in the months and years ahead--the consumer universe of demand for homes is headed for a big disruption.*

# **Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990–2005): A Compilation of Statistics for Assessing Vapor Intrusion**

EPA 530-R-10-001

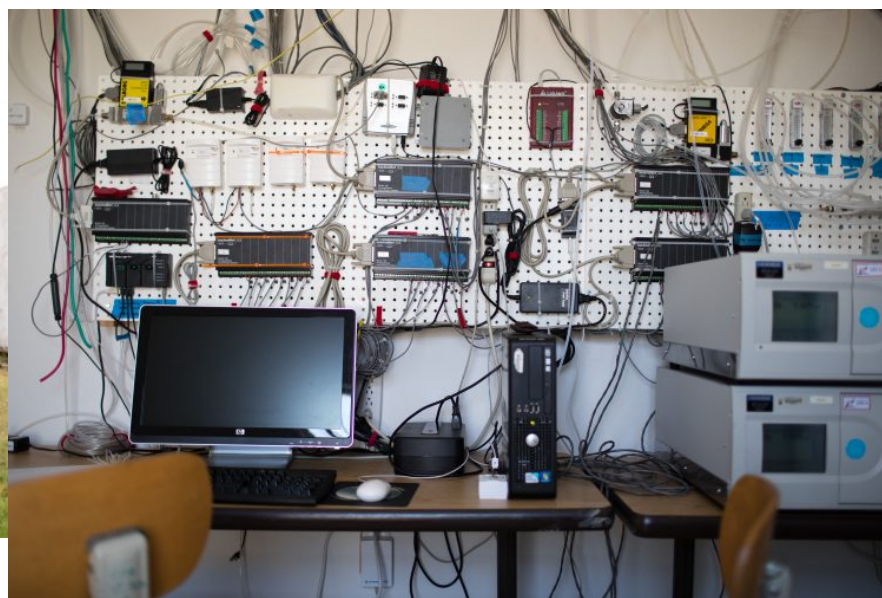
1990-2011

Conclusions: Time trends in concentrations reported in 18 indoor air studies evaluated for this compilation suggest that indoor air concentrations measured in North American residences starting in 1990 and later generally are lower than those measured earlier. ... Evaluation of the indoor air concentration statistics collected for this compilation suggests that background concentrations are highly variable. Additionally, the distributions appear log based, where most concentrations tend to be low ... the VOCs most commonly detected in indoor air due to background sources include benzene, toluene, ethylbenzene, and xylenes (BTEX), along with chlorinated solvents, such as chloroform, carbon tetrachloride, tetrachloroethylene (PCE), 1,1,1-trichloroethane (TCA), and trichloroethylene (TCE). In contrast, vinyl chloride, 1,1-dichloroethylene, cis-1,2-dichloroethylene, and 1,1-dichloroethane are rarely detected in background indoor air.

Sloan foundation – Home Chem



## HOMEChem: House Observations of Microbial and Environmental Chemistry





# Sloan foundation – Home Chem



HOME DIAGNOSIS + SEASON 1 SEASON 2 + EXTRAS + LEARN FIND A PRO



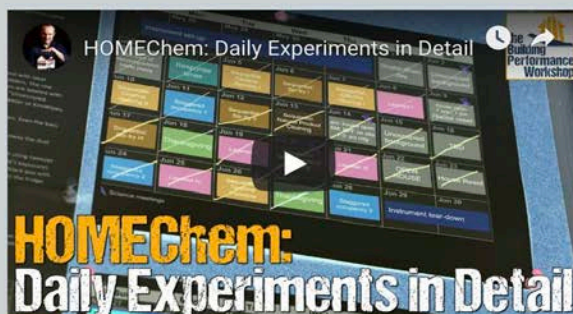
people spend about **90% of their time indoors (buildings and vehicles)**. Not only are we affected by the air we breathe and the surfaces we touch, but we ourselves constantly influence the indoor environment around us. Although many research studies have focused on measuring the presence and quantity of chemical air pollutants that affect the indoor air quality (IAQ), few comprehensive studies have attempted a deeper exploration into how indoor air chemical compounds interact and transform throughout a normal day of activities.

## The HOMEChem experiment

(House Observations of Microbial and Environmental Chemistry) will take place in the month of June 2018, incorporating measurements from over 15 research groups from 9 universities to identify the most important aspects of the chemistry that controls the indoor environment. The HOMEChem field study is expected to kick-start and energize the **Alfred P. Sloan Foundation's Chemistry of Indoor Environments community of scientists**, while also answering interesting preliminary science questions on the chemistry of indoor environments in a real-world experimental setting. This brings an excellent opportunity for outreach to the broader scientific community and other stakeholders, such as other funding agencies, the local and national media, and the public.



Think your home's air might be unhealthy? **SCORE it now for free** - and learn to improve it!





# Anyone want to discuss EMF Electromagnetic Fields? Neither do the Certifications



## HEALTH RISKS



- ANXIETY
- DEPRESSION
- STRESS/FATIGUE



- HEART PROBLEMS



- LEUKEMIA
- CANCER

## ELECTROMAGNETIC FIELDS

### EMF PROTECTION



### EMF SOURCES AT HOME



TELEVISION



MOBILE PHONE



COMPUTER



REMOTE CONTROL



RADIO



WI-FI



BABY MONITOR



MICROWAVE



LIGHTING



POWER LINE



SMART METER



ELECTRICAL WIRING



EEB...



HAYWARD  
SCORE

123

# UPGRADE TO A HEALTHIER HOME: NEW CONSTRUCTION



## UPGRADE TO A HEALTHIER HOME: NEW CONSTRUCTION

A healthier, high-performance home is possible. With minimal investment, you can reduce energy bills, increase durability, and add to resale value, while improving indoor air quality, reducing allergens, and decreasing health risks.

Upgrades to your home can deliver an indoor environment that is peacefully quiet, less prone to dust and allergens, and pollutants, and, most importantly, healthier for your family. A healthier home can improve sleep, productivity, and cognition. In addition, improving home performance will reduce short-term costs and add long-term value.

From the tables below, choose the upgrades that are right for your build and enjoy an improved lifestyle with healthier home construction.

### KEY OCCUPANT BENEFITS & ACTIONS<sup>1</sup>

- Health Savings (\$-\$\$\$)
- Peacefully Quiet
- Less Dust/Dirt
- Fewer Odors
- Energy Savings (\$-\$\$\$)
- Fewer Sick Days

- Better Sleep
- Improved Cognition
- Fewer Pests

Benefit	Affordable \$	Workforce \$\$	Market Rate \$\$\$	High End \$\$\$\$
Peacefully Quiet	• Air tightness of building envelope <2 ACH@50 Pascal		• Air tightness of building envelope <1 ACH@50 Pascal	• Air tightness of building envelope <0.6ACH@50 Pascal
Minimized Dust, Fewer Odors	• Mechanical Ventilation meets ASHRAE 62.2-10 • Continuous low sone integrated bath fan(s) and independent supply ventilation	• ERV / HRV Ventilation Rate of 0.4 ACH to 0.6 ACH Note: 0.4 ACH (air changes per hour) means the air in the house is exchanged every 135 to 90 min. The higher the number the more air is exchanged. • Independent ERV / HRV ventilation system not integrated with heating or cooling system.		
Healthy Indoor Air	• Cooking ventilation with low sone (quiet) and conditioned makeup air • Cooking ventilation has rated capture efficiency or is field-tested • 4" MERV 13 Air Handler (heating / cooling) Air Filters or equivalent. • HEPA Vacuum			

Action Category	Affordable \$	Workforce \$\$	Market Rate \$\$\$	High End \$\$\$\$
Clean Tap Water	• Test water to determine contaminants • Filtered water pitchers	• Under-sink filtration system		• Whole house and under-sink filtration
Exterior Wall Assembly and Moisture Management	• Rain screens (drainage plane) behind cladding (climate-specific) • Whole-house dehumidifier (in moderate and high humid climates) • Crawlspace: sealed with mechanical ventilation • Basement: insulation and exterior moisture barrier • Insulated slab and basement floor (minimum 4' perimeter)			
3rd Party Commissioning	• Code compliant • Energy Rating Index (ERI) of 57 to 62 <sup>4</sup>	• Certified EPA: EnergyStar, Indoor airPLUS and WaterSense • ERV / HRV commissioned (balanced and flows measured)		
Other Healthy Upgrades	• Manual "J" and "S" calculation on the heating and cooling equipment • Heating and cooling system is commissioned and balanced • Heating and cooling ducts must be in conditioned space • Return ducts in all bedrooms and rooms that can be separated by a door • Blower door testing and zonal pressure diagnostics • Smooth surface low VOC flooring • Passive Radon Mitigation System • Perform long term radon test (91+ days) • CO (carbon monoxide) detector that alarms at 6 ppm • Consumer IAQ Monitor with PM 2.5, TVOC, CO2, RH, temperature, NO2 and ozone • Off-gas appliances before installation • No panels or multiple electrical runs within 5 feet of beds, favorite chair, or desk (EMF) • Zonable WiFi and router that can be turned off at night • Smart Meter EMF shield/cover for EMF mitigation • No WiFi transmitter within 10 feet of beds, favorite chair, or desk • Security door(s) with screens for natural ventilation • Homeowner education and user manual and maintenance reminders			

### INCREMENTAL COSTS & HAYWARD SCORE ESTIMATE FOR NEW BUILD

(Calculated using California construction costs on 2,000 sq ft home)

	Affordable \$	Workforce \$\$	Market Rate \$\$\$	High End \$\$\$\$
Net Cost	\$13K	\$22K <sup>5</sup>	\$30K <sup>5</sup>	\$40K <sup>5</sup>
HAYWARD SCORE	75	85	90	95



# Wait How Do I Do That? – New Construction Technical Specifications

Minimized Dust, Fewer Odors	<p><b>Ventilation Rate Whole House ASHRAE 62.2 - 2010</b></p> <ul style="list-style-type: none"> <li>Option 1- Exhaust fan(s) and Supply fan. The system is a continuous low flow exhaust fan(s) in the bathroom(s) or central whole house mechanical fan or kitchen that is operated in conjunction with a supply air fan that is independent of the heating and cooling ducts and brings in the same amount of air from outside as <u>all the the</u> exhaust fan(s). The total air being exhausted and supplied = the calculated ventilation rate.</li> </ul>	
	<p><b>Continuous Low Sone Integrated Bath Fan(s) and Independent Supply Ventilation</b></p> <ul style="list-style-type: none"> <li>Bathroom fans set to continuous low flow also have a boost timer feature to be used when showering or for odor control. Based on the size of the fans and the required CFM these can set on timers to operate part of the hour or part of the day as long as the required ventilation is exchanged each day.</li> <li>This ventilation rate determines how much air should be exchanged from outdoor and indoors using exhaust fans and or supply air fans. This is the air for the occupants and is intended to make sure carbon dioxide and other contaminants are diluted with outside air. This exchange rate is calculated using ASHRAE Standard 62.2 - 2010</li> <li>The ASHRAE 62.2 calculation is <math>[0.01 \times \text{square footage of conditioned area} + \text{number of bedrooms} \times 1 \times 7.5 \text{ cfm}]</math> Example 2000 sqft home with 2 bedrooms = <math>(2000 \times 0.01 = 60) + (3 \times 7.5 = 22.5) = 82.8 \text{ CFM}</math> of continuous air exchange. NOTE: There are newer ASHRAE calculations 62.2 - 2013 or 2016. This <u>is higher</u> rate and allows exhaust only ventilation which requires a higher rate. The method recommended above provides exhaust and supply and based on Building Science Corporation principles can be the 62.2 - 2010 rate.</li> <li>This installation does not have integrated filtration. The air handler should be setup on a timer to operate on high speed mode for 15min every hour so the MERV 13 filter can capture contaminants from the air. The limitation of this installation is filtration. The exhaust fan(s) do not provide filtration and the supply fan filter need to be accessible to the occupant. ERV / HRVs (see below) offer better filtration some even offer HEPA filters (most effective filtration available)</li> <li>In humid climates the supply air fan should have an integrated dehumidifier to reduce the humidity being brought into the home.</li> </ul>	
	<p><b>ERV or HRV Energy Recovery Ventilator or</b></p> <p><b>The Top Hayward Score Healthy Installation Recommendation!</b></p> <p>Option 2- ERV or HRV (Energy Recovery Ventilator or Heat Recovery Ventilator) These systems exchange the same air in and out. This is the ventilation rate for a ERV / HRV</p>	

	<p><b>HEPA Vacuum - (provided by builder)</b></p>	<p>Genuine HEPA vacuum is a filter that must state "removes 99.97% of particles with a diameter is greater than or equal to 0.3 microns." To clarify Genuine HEPA is NOT HEPA Like or True HEPA or 99.95% or particles As Small As 0.3 micron 99.99% of dust and allergens, these are misleading and not HEPA. Some vacuums may have an <u>HEPA</u> filter but it is an upgrade. Be an educated buyer.</p>
Healthy Indoor Air	<p><b>Sealed Combustion or Electric Appliances</b></p>	<p>Combustion appliances can give off carbon monoxide, nitrogen dioxide and other harmful chemicals that have documented impacts on health. <b>NEED REFERENCE HERE</b></p>
	<p><b>Construction Dust Removal Protocol 2.0</b></p>	<p>This construction dust protocol was developed by Bill Hayward when he built it home and realized that construction techniques created many unhealthy conditions that can remain hidden behind the drywall and other finishes for the life of the home. These simple techniques will improve the air quality for the life of the house. This is <u>an simple</u> protocol intended for all contractors and trades. <a href="#">Link here</a></p>
	<p><b>Clothes Dryer</b></p>	<p>Clothes dryer has pressure relief damper <b>NEEDS EXPLANATION</b></p> <ul style="list-style-type: none"> <li>Or is a ventless dryer <b>NEEDS EXPLANATION</b></li> </ul> <p>NOTE: Ventless dryers must be coupled with good whole house ventilation rates and should be operated with <u>he ventilations</u> system running.</p>
	<p><b>Attached Garage 100% Air Sealed With Exhaust Ventilation</b></p>	<p>Areas that adjacent or above the garage should be tested to make sure they are completely air sealed, separated from the indoor conditioned space. The test method to confirm the attached garage is air sealed occurs at the same time as the blower door test for air tightness.</p> <ul style="list-style-type: none"> <li>Test method- the overhead garage door should be closed. The blower door is operating with a pressure difference of 50 Pa from the outdoors to the indoors of the</li> </ul>

# July is Healthy DIY Project Month

## Hayward score Construction Dust Protocol



### CONSTRUCTION DUST PROTOCOL

#### Healthy homes minimize dust.

Whether it is an addition to an existing home, kitchen remodels, or completely new build – home construction creates a lot of dust. That “dust” is comprised of visible and microscopic pieces of most of the building materials that go into your home, many of which are laden with chemicals. It also includes mold, bacteria, outdoor dirt, and other allergens and irritants that can be introduced during construction or existing and now become airborne.

Exposure to construction dust can have health impacts both during and after construction. Secondly, dust provides nutrition to micro-organisms when sufficient moisture is present that can lead to long-term issues with mold and corresponding health consequences.

To minimize dust most effectively follow the Hayward Healthy Home Dust Protocol:

- I. Minimize dust creation during construction
- II. Remove or isolate dust after construction and before soft goods are installed
- III. Verify cleanliness

#### I. Minimize dust creation during construction

1. **PREVENT** - Seal the areas where dust and debris can enter heating and cooling ducts, ventilation ducts or other mechanical openings.
2. **REDUCE** - The most effective way to reduce the amount of dust we breathe inside houses is to not create dust. During remodeling and construction, this means not sawing, cutting, or sanding wood and sheetrock inside the house.
3. **CLEAN BEFORE ENCLOSING** - Because there are exceptions and “debris happens” it’s especially important to HEPA vacuum the areas that are not able to be cleaned later, like wall stud cavities and ceiling and floor joist bays before they are enclosed with sheetrock or other material.

#### II. Remove or isolate dust after construction is completed

The following steps are usually sufficient especially if the surface will be painted. Pay special attention to the tops of doors, inside all drawer cavities and cabinets, and pocket doors, which are hard to clean, but need to be addressed.

#### II. Remove or isolate dust after construction is completed

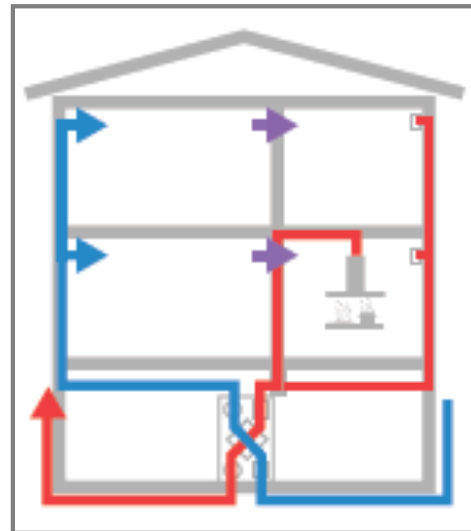
The following steps are usually sufficient especially if the surface will be painted. Pay special attention to the tops of doors, inside all drawer cavities and cabinets, and pocket doors, which are hard to clean, but need to be addressed.

1. **DISLodge** - Blow all surfaces with electric blowers to dislodge particles. Disturbing the surfaces with a leaf blower while running air scrubbers will improve the results and reduce re-entrainment and cross-contamination of dust from the dirty area back onto the cleaned surfaces. High air flow also helps to accelerate off-gassing of Volatile Organic Compounds (VOCs) before occupancy.
2. **VACUUM** - Use HEPA vacuums on all surfaces including floors, walls, ceiling, tops of cabinetry, beams, and other hard to reach spaces.



# Why is this

# such an obstacle?



Balanced Ventilation



Heating and Air Conditioning Supply, Inc.



# Heating   Ventilation   Air   Conditioning

- Exhaust fan bathroom/kitchen only
  - Mechanical contaminate removal
- Supply ventilation-w/ w/o dehumidification- fan brings in outside air
  - Good ventilation
- Ventilation is balanced- air out = air in
  - Better ventilation
- Ventilation is balanced- and separate from Heating and AC system
  - Best ventilation
- Ventilation is Smart- accommodates indoor and outdoor conditions
  - Ultimate ventilation



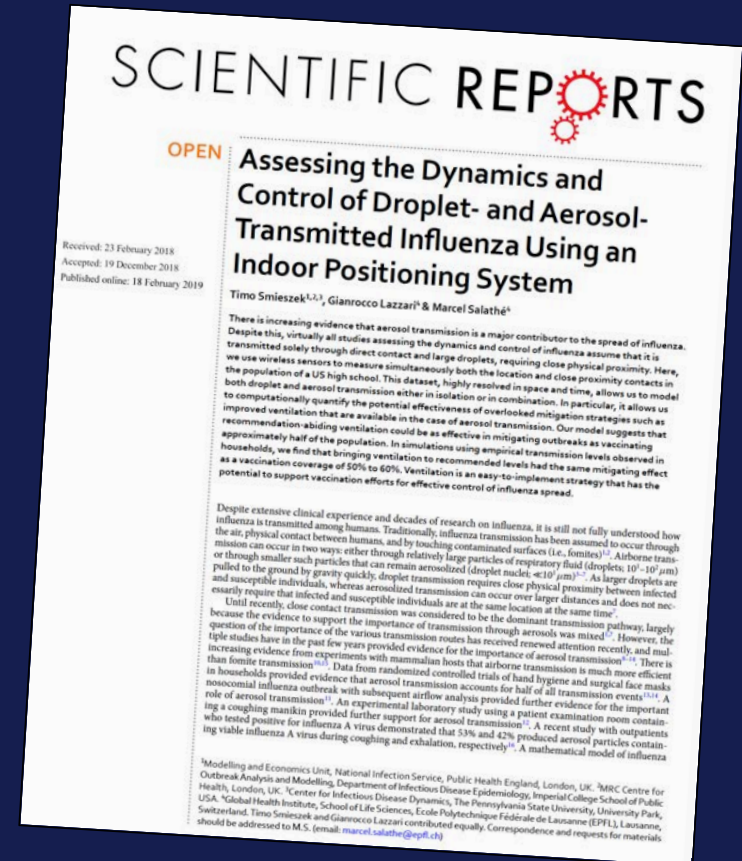
# Ventilation as a Preventive Strategy

There is increasing evidence that aerosol transmission is a major contributor to the spread of influenza. ... assume that it is transmitted solely through direct contact and large droplets, requiring close physical proximity.

...Our model suggests that recommendation-abiding **ventilation could be as effective in mitigating outbreaks as vaccinating approximately half of the population.**

In simulations using empirical transmission levels observed in households, we find that **bringing ventilation to recommended levels had the same mitigating effect as a vaccination coverage of 50% to 60%.**

Ventilation is an easy-to-implement strategy that has the potential to support vaccination efforts for effective control of influenza spread.



# Ventilation as a Preventive Strategy

New data are presented showing an association between indoor humidity above 40 percent and reduced healthcare-associated infections.

## Is low indoor humidity a driver for healthcare-associated infections?

Stephanie Taylor, MD, M Arch, CIC, FRSPH(UK), CABC<sup>1\*</sup>, Walter Hugentobler, MD<sup>2</sup>

<sup>1</sup>Harvard Medical School, Boston, Massachusetts, United States

<sup>2</sup>Institut für Hausarztmedizin, Universität und Universitätsspital Zürich, Switzerland

\*Corresponding email: [staylorvt@gmail.com](mailto:staylorvt@gmail.com)

### SUMMARY

The essential and preventive role of indoor climate management for infection control in hospitals will be discussed with special emphasis on relative humidity. Each year in the US and worldwide, healthcare-associated infections kill more people than do automobile accidents (Reed and Kennerly, 2009; Anderson, 2013). New data are presented showing an association between indoor humidity above 40 percent and reduced healthcare-associated infections. Current infection prevention strategies are discussed with consideration of this new insight.

### PRACTICAL IMPLICATIONS

Managing indoor air relative humidity in hospitals could prevent a significant percentage of healthcare-associated infections. This prevention strategy is equally applicable to office and residential buildings.

### KEYWORDS

Healthcare-associated infections (HAIs), Indoor Air Quality (IAQ), Relative Humidity (RH), built environment microbiome, control of airborne microbes

### 1 INTRODUCTION

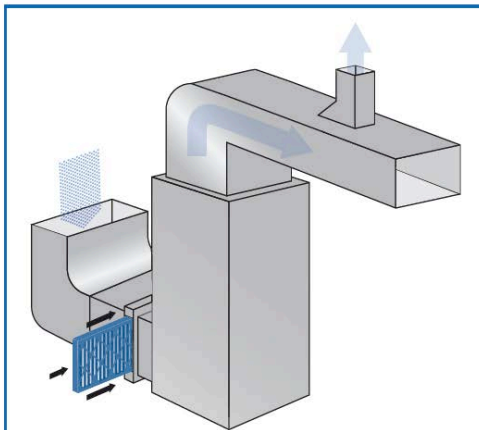
In the US and Europe, errors during in-patient medical care is a leading cause of death (James, 2013). A significant portion of this staggering statistic are deaths due to new infections, called nosocomial or healthcare-associated infections (HAIs), that patients acquire while in the hospital. At least 10% of all patients who enter an inpatient healthcare facility for treatment will develop a HAI (Classen et al. 2011). Tragically, in the US alone, the number of deaths from these infections is over 100,000 annually. What are the factors behind this situation and what more can we do to control the epidemic?

HAIs occur in an environment of biological extremes coexisting within limited physical space. Vulnerable patients often have decreased immune defenses from illnesses, medications, or loss of skin integrity from surgery, indwelling medication lines or injuries. In contrast to the patients, bacteria, viruses and fungi which originate from the patient's own micro-flora, other people in the hospital, or reservoirs in the build-environment can be more virulent than pathogens found outside the hospital. This virulence, manifested as increased infectivity, results from anti-microbial medications and housekeeping disinfectants attempting to eradicate all pathogens. Microorganisms that survive these powerful selection pressures (survival of the fittest) rapidly reproduce and repopulate the environment with communities of decreased diversity yet increased virulence through medication resistant genes and transmission modes keenly adapted to the indoor



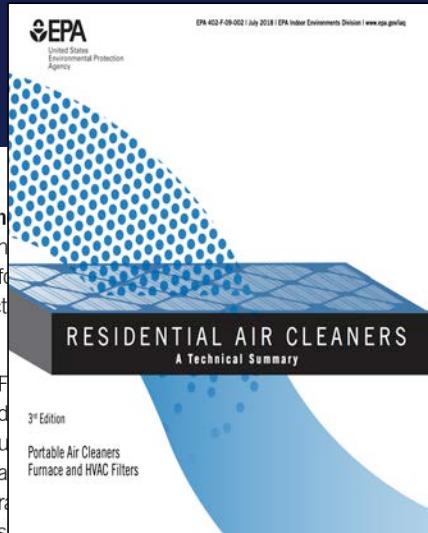
## FURNACE AND HVAC SYSTEM FILTERS

Furnace and HVAC filters work to filter the air only when the system runs only when heating or cooling is needed (usually less than 10 hours per week). In order to get more filtration, the system would have to run for longer periods of time, which is not practical in many cases since longer run times increase electricity costs and wear on the system.



Furnace Filter

Furnace or HVAC filter—Select a filter rated at least MERV 13 or as high as your system will accommodate.



Other devices that do not have filters may also remove particles and gases. They usually fit inside the HVAC ductwork and are more common in large and commercial buildings. See the EPA technical document, Residential Air Cleaners, 3rd edition, for more information: [www.epa.gov/indoor-air-quality-iaq/residential-air-cleaners-second-edition-summary-available-information](http://www.epa.gov/indoor-air-quality-iaq/residential-air-cleaners-second-edition-summary-available-information).

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EPA does not certify or recommend specific brands or models of air filters or portable air cleaners.



## Air Handler Intervention



16x25x1 MERV 12



20x25x4 MERV 13

CASE STUDY: Indoor Air Quality Interventions  
Chris Guignon, evolveEA

Source: Linda Wigington 

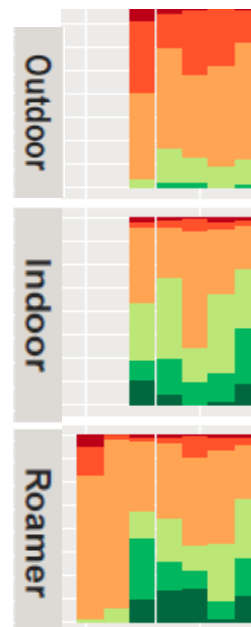
## 24/7 Air Handler w High MERV Filter

1) Using existing 1" pleated filter

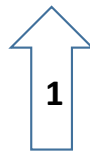
2) Return drop modification  
w/ turning vanes  
4", 20"x 25" MERV 13 filter

Dylos particles  $\geq 0.5 \mu\text{m}$

CASE STUDY: Indoor Air Quality Interventions  
Chris Guignon, evolveEA



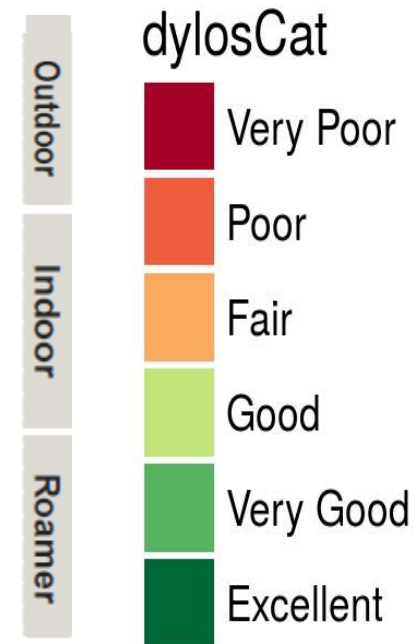
Before



After

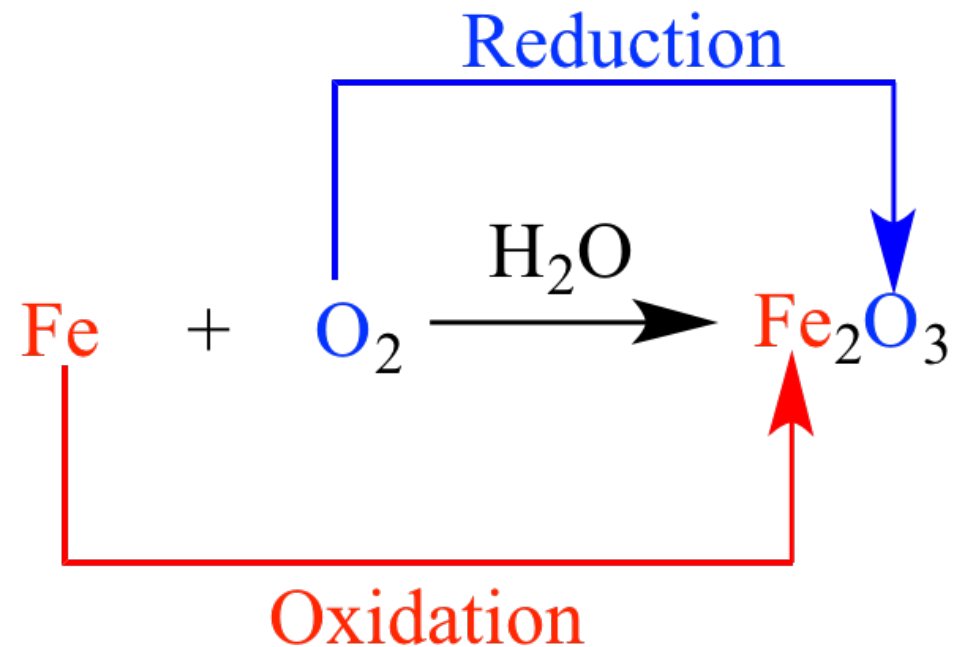
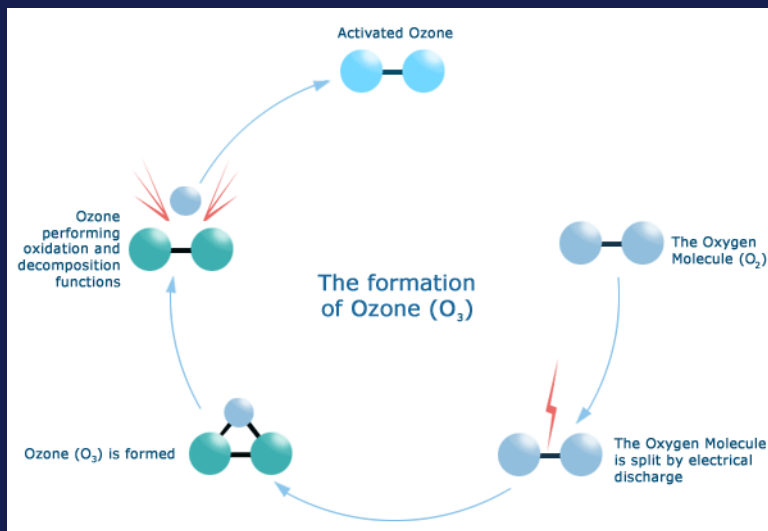


Date  
(by periods of 3 weeks)



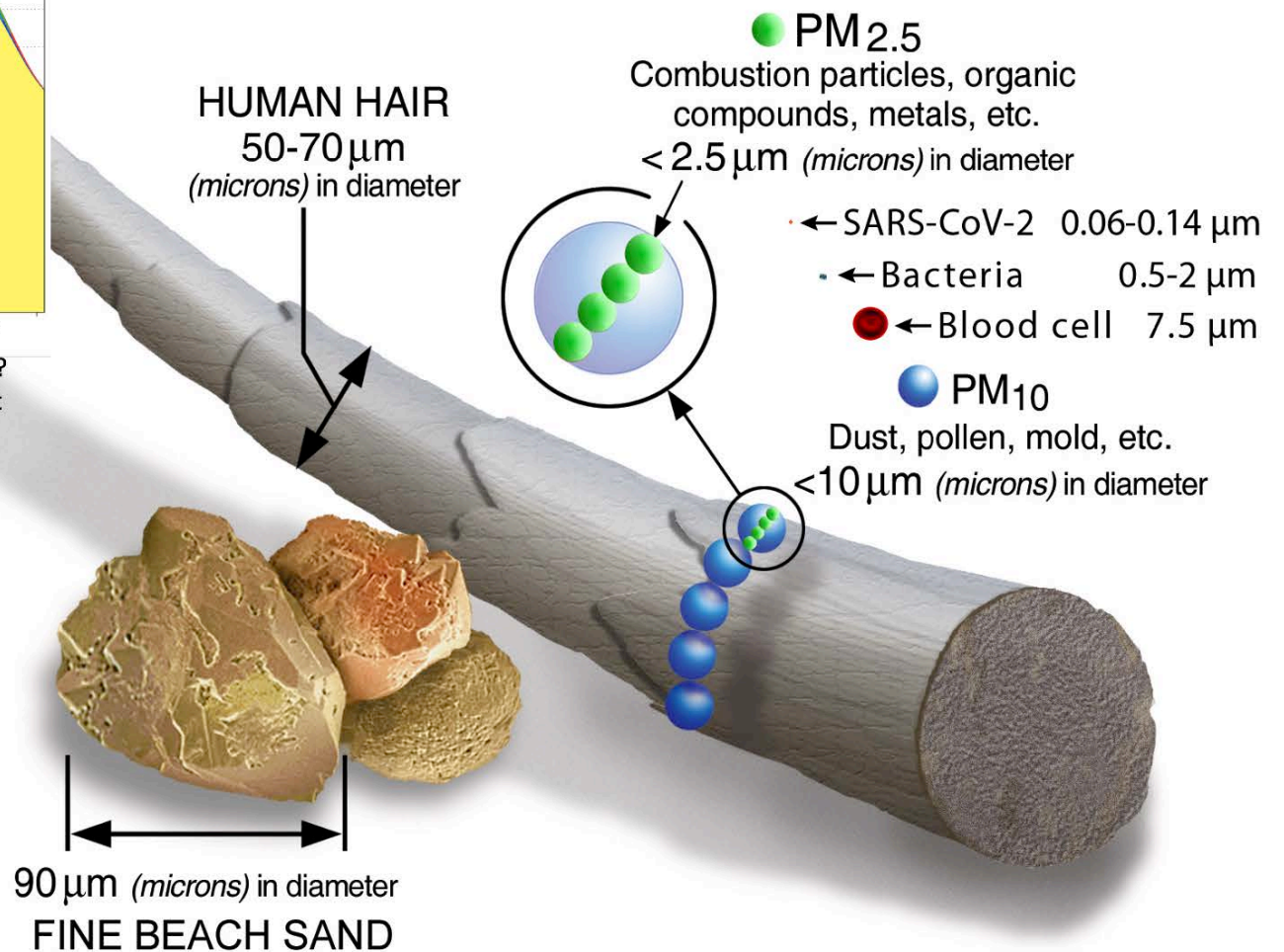
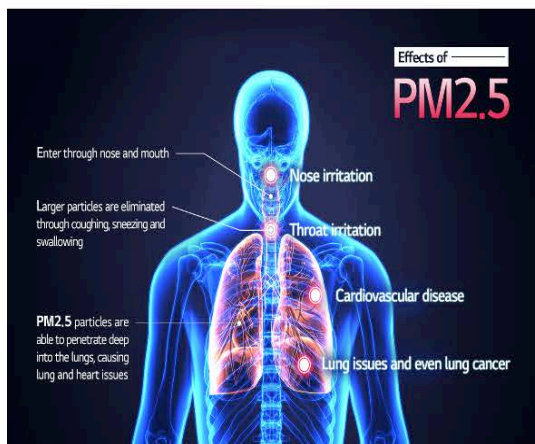
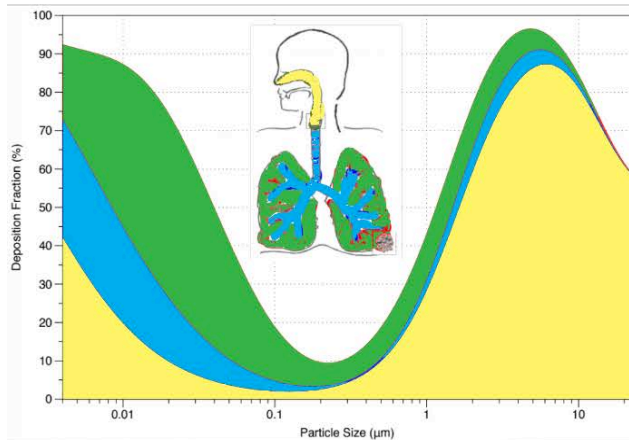
Source: Linda Wigington

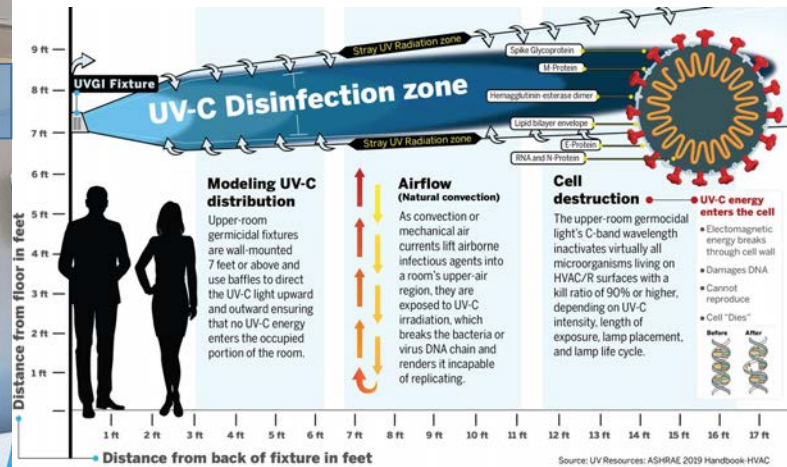




<https://www.hvacrschool.com/oxidizing-and-what-it-has-to-do-with-covid-19/>

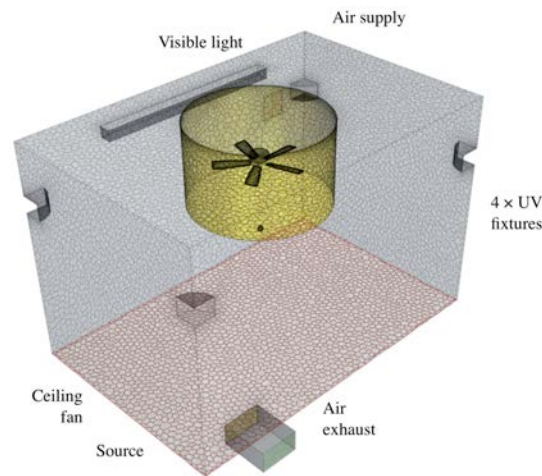






<https://www.bostonglobe.com/2020/07/26/metro/could-century-old-technology-zap-coronavirus-schools-offices/>

UV-C  
Some require air mixing  
Some do not



<https://www.nytimes.com/2020/05/07/science/ultraviolet-light-coronavirus.html>

<https://nyti.ms/2Wcp811>

5/19/2020  
 Scientists Consider Indoor Ultraviolet Light to Zap Coronavirus in the Air - The New York Times  
 The New York Times | <https://nyti.ms/2Wcp811>

### Scientists Consider Indoor Ultraviolet Light to Zap Coronavirus in the Air

Some researchers hope a decades-old technology might get its moment and be deployed in stores, restaurants and schools.

By Kenneth Chang  
 May 7, 2020

As society tries to rebound from the coronavirus pandemic, some scientists hope a decades-old technology could zap pathogens out of the air in stores, restaurants and classrooms, potentially playing a key role in containing further spread of the infection.

It has the ungainly name of upper-room ultraviolet germicidal irradiation, and it is something like bringing the power of sunlight indoors.

"We have struggled in the past to see this highly effective, very safe technology fully implemented for airborne infections," said Dr. Edward A. Nardell, a professor of global health and social medicine at Harvard Medical School. "We've done the studies. We know it works."

Sunlight disinfects, and the UV part of its spectrum is particularly effective at knocking out airborne pathogens.

This is not what President Trump incomprehensibly described in April when he suggested irradiating the insides of Covid-19 patients with ultraviolet light. Portable ultraviolet units are already being used to sterilize surfaces in hospital rooms and subway cars, but these can be used only when those spaces are unoccupied.

In the approach scientists like Dr. Nardell describe, fixtures mounted on walls or ceilings, similar to fluorescent lights used today, shine ultraviolet light across the top of an interior space, well above people's heads. Ceiling fans are sometimes installed to draw air upward so that floating bacteria, viruses and fungi are zapped more quickly. A different frequency of ultraviolet might be even safer, even when it shines directly on people, which would also allow disinfection of surfaces.

Ultraviolet light mangles the genetic material in pathogens — DNA in bacteria and fungi, RNA in viruses — preventing them from reproducing. "You've killed it essentially," said William P. Bahnfleth, a professor of architectural engineering at Pennsylvania State University.

Four ultraviolet fixtures, placed in the corners of a room with a ceiling fan to draw air upward, could effectively remove floating bacteria, viruses and fungi. University of Maryland

Dr. Nardell estimated that installing commercially available fixtures for an intermediate-size warehouse-type store like Walmart would cost about \$100,000, which might be too expensive for some smaller businesses.

The systems also add to electricity bills and require cleaning and maintenance. "They're not plug in and walk away forever," Dr. Nardell said.



Keeping the coil and drain pan clean is something UV lamps are good at. Zapping germs out of the air inside a residential HVAC system, however, is generally not as effective. **The main reason for that is that the UV lamp won't have the intensity needed to provide a high enough dose to kill the various germs. The air moves through most air handlers and duct systems at 500 to 900 feet per minute.** The faster it moves, the more power you need in your UV lamps to zap the speedy little germs.

So for UV lamps integrated into the HVAC system, the main benefit is to keep stuff from growing on the surfaces, especially the coil and drain pan. It's not going to kill much coronavirus or other baddies that get pulled into the ducts.

In addition, you have to make sure the materials that will be exposed to the UV irradiation can take the heat. As we all know, some materials break down from UV exposure, a process called photodegradation.



<https://www.energyvanguard.com/blog/do-uv-lamps-really-improve-indoor-air-quality>

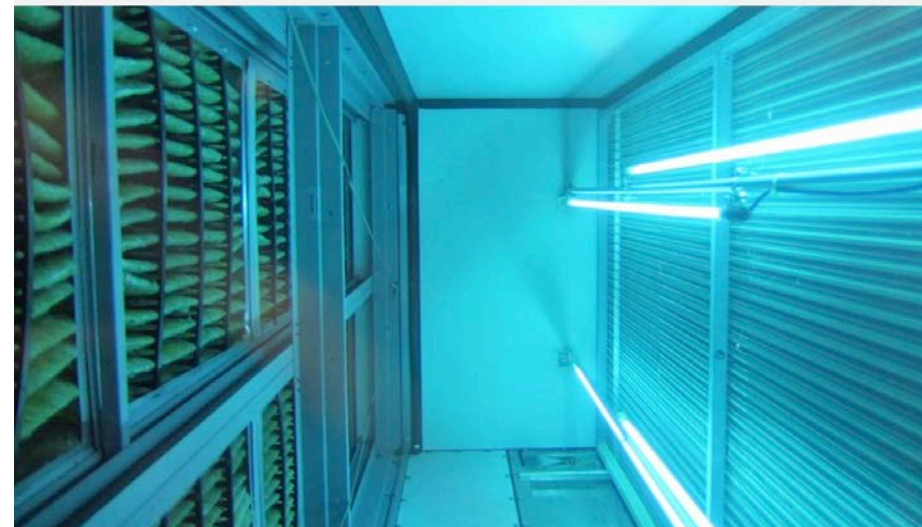


## Do UV Lamps Really Improve Indoor Air Quality?

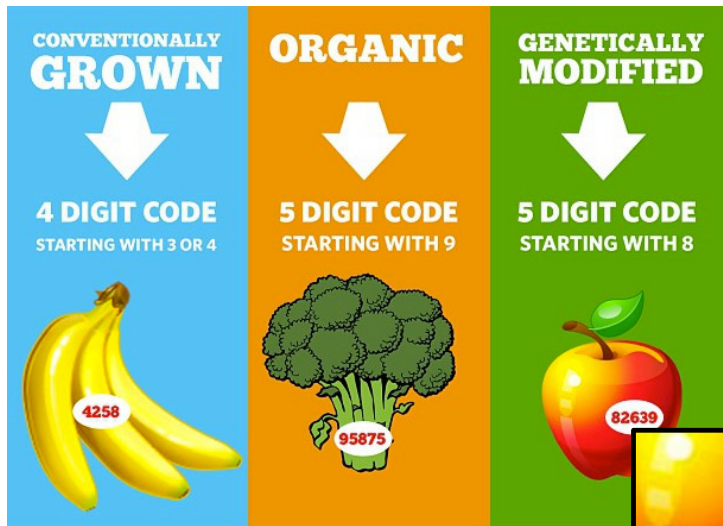
Posted by Allison Bailes on April 23, 2020

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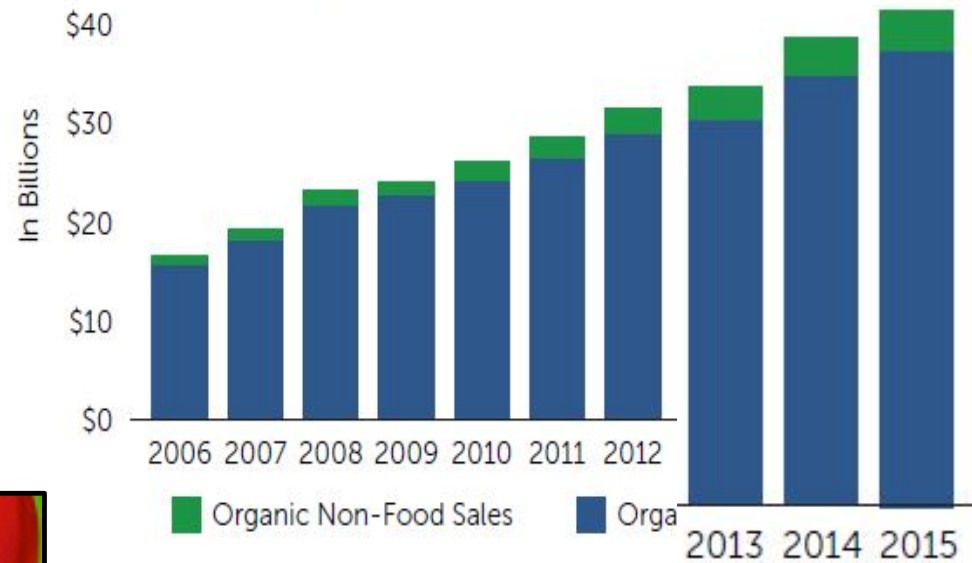


# Healthy Home Building Materials and Personal Belongings Need to be as common as Organic foods



## HIGH GROWTH ORGANIC MARKET

Total U.S. Organic Sales and Growth, 2006–2015



\$~40 Billion



### Is that new sofa making you sick?

It's not just that TV viewing that could be harmful to couch potatoes' health - it could be the couch as well. Emissions from some substances used to build furniture provide immediate, acute reactions in some people with chemical sensitivities, but even emissions that go unnoted can present chronic risks from long-term exposure. Here's a sample.

**The upholstery**  
Might have been treated for stain and water resistance with a finish containing formaldehyde and also perfluorooctanoic acid, considered by the Environmental Protection Agency to be a likely human carcinogen.

**The upholstery dye**  
Might contain chemicals including benzidine, a known carcinogen, or hydrazine, a probable carcinogen with a range of adverse health effects.

**The couch cushions**  
Might be filled with polyurethane foam made before 2008 that contains flame retardant polybrominated diphenyl ethers, which are now banned in California for their potential health effects.

**The couch legs or arms**  
Could be finished in a lacquer that releases volatile organic compounds, or VOCs, that the American Lung Association reports can irritate eyes, skin and lungs and cause headaches, nausea and even liver and kidney damage. Or, could be painted with a substance containing benzene, a carcinogen that can emit kick-out fumes.

**The couch frame**  
Could be made of pressed wood emitting formaldehyde fumes. These can cause cancer "and other adverse health effects," according to the California Air Resources Board.

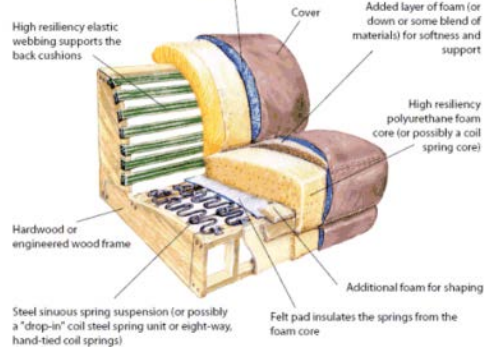
**Corners of the couch**  
Could be glued with a product containing ethylene oxide, a probable carcinogen that can also cause brain and nerve malfunctions.



### THE INSIDE STORY: UPHOLSTERY

Construction features vary depending on furniture design and price

Cushioning may be inserted in a polyester or cotton casing to separate cover fabric from core materials



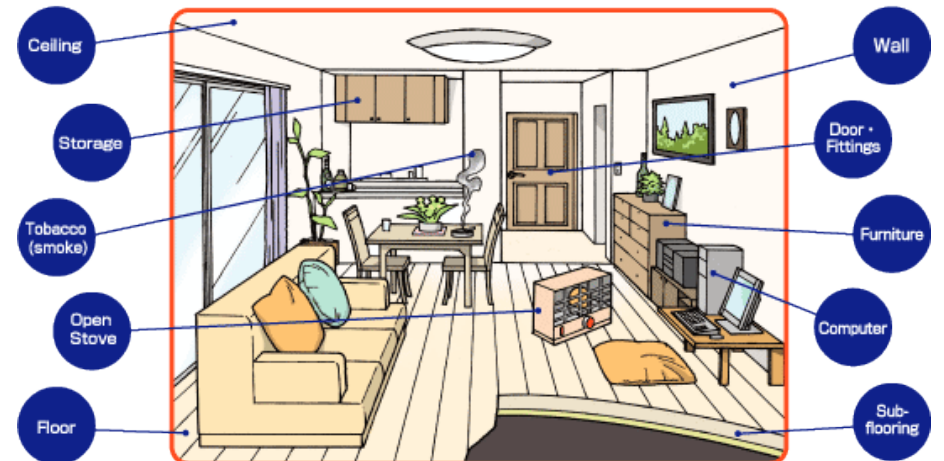
Source: American Furniture Manufacturers Association

## Identify Unhealthy Installations & Items



### 10 Dangerous Chemicals to Ban from Your Home

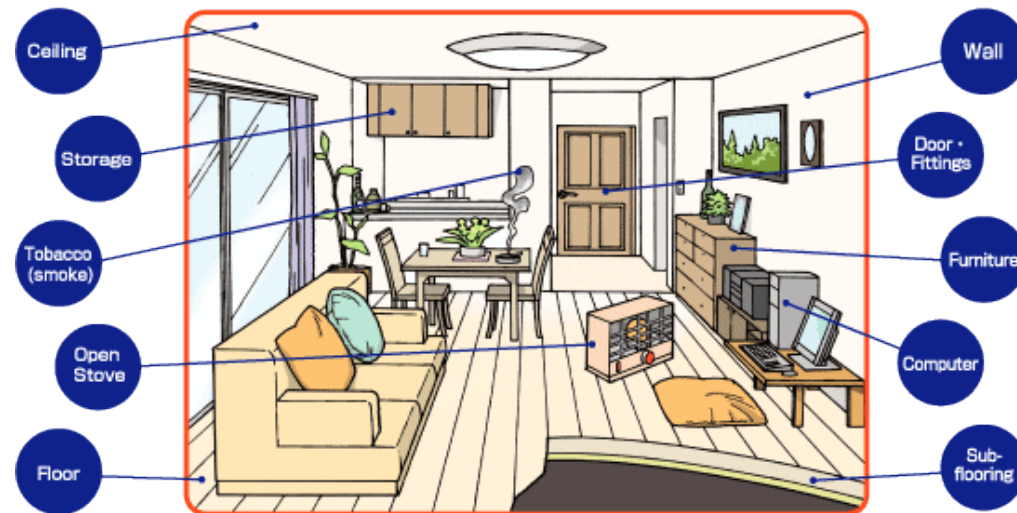
1. Phthalates
2. BPA
3. Chlorine
4. Radon
5. PFCs
6. Lead
7. Pesticides & Fertilizers
8. Formaldehyde
9. Parabens
10. PBDEs & PBBs



## Unhealthy, Energy Consuming Conditions

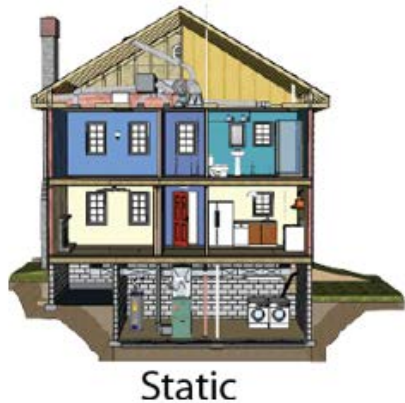
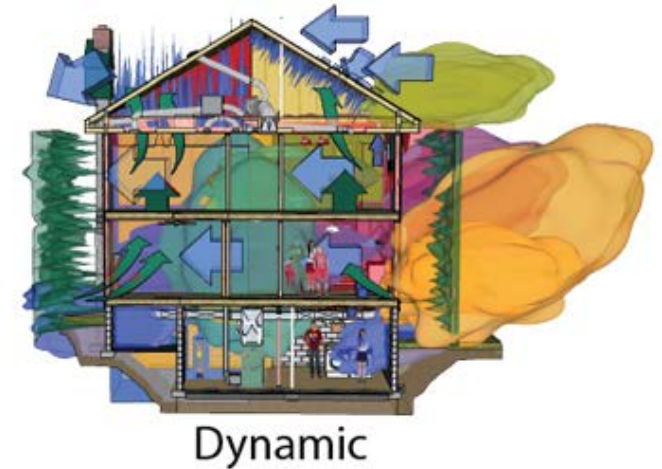
Can become opportunities to improve the lives of your customers.

Through Healthy Energy Efficient Upgrades



# Conclusions

- All chemicals matter
  - All particulates matter
  - All homes matter
- All occupants matter



Thank You

[jmedosch@haywardscore.com](mailto:jmedosch@haywardscore.com)

