

Creating Healthy & Energy Efficient Housing

Ellen Tohn, Tohn Environmental Strategies

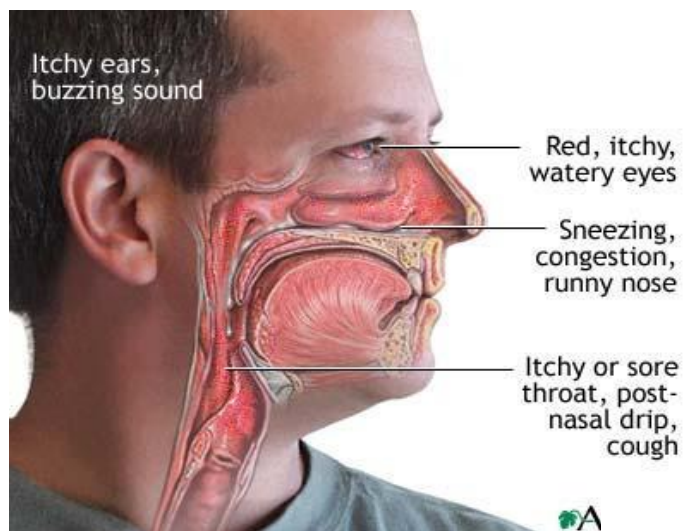
etohn@tohnenvironmental.com

508-358-7770

The National Center for Healthy Housing

www.nchh.org

Are We Sick?



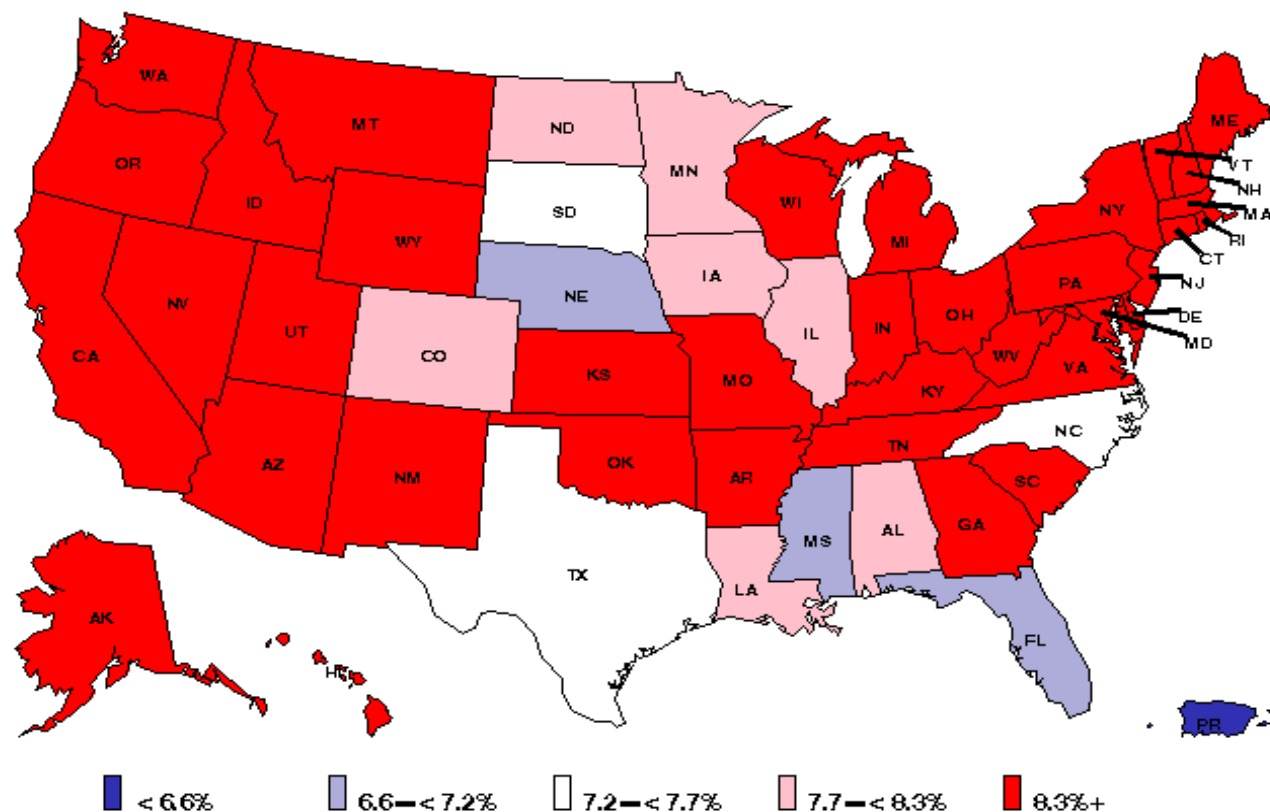
Health Issues Linked to Housing

- Lead poisoning
- Allergic reactions: asthma, breathing problems, skin rash
- Cancer: lung – radon & smoking
- Injuries: falls, poisoning
- Carbon monoxide poisoning
- Neurological effects of chemicals

Adult Asthma

Map C1

Adult Self-Reported Current Asthma
Prevalence Rate (Percent) by State, BRFSS 2008



Footnote: Ranges are based on quintiles of the overall prevalence estimates from year 2000 data

Air Pollution and Respiratory Health Branch, National Center for Environmental Health
Centers for Disease Control and Prevention

Housing-Based Asthma Triggers

Moisture



Tobacco Smoke



Dust Mite



Pest: Cockroach Feces



Pest: Cockroach



Pest: Mice Feces

Weatherization Can Improve Health

- Families receiving fuel assistance showed:
 - Increase growth and healthier weights for babies
 - Reduced hospital stays in colder months
- Standard health & safety measures
 - CO & Smoke alarms – reduce risk death from fires by 50%
 - Repair CO issues
 - Lead safe work practices
 - Address moisture problems linked to asthma
- WAP II-6 Guidance provides clear standards



Key Principles

- Make the house:
 - Dry
 - Cleanable
 - Pest free
 - Contaminant Free
 - Well Ventilated
 - Safe
- Maintain the house

Damp Homes Increase Health Risks

Health Problem	Estimated % Increase Risk of Health Problem in Damp Homes
Upper respiratory tract symptoms	52%
Cough	50%
Wheeze	44%
Current asthma	50%
Ever-diagnosed asthma	33%

Source: National Academy of Sciences (2004)

Moisture Sources

- Poorly managed rainwater/groundwater
 - Poor roof, wall, window and foundation drainage
 - Defects in rain barriers
- Plumbing leaks
- Condensation on surface
 - Surfaces chilled by mechanical equipment, earth contact, outdoor air contact
- Construction moisture
 - Concrete, wet spray cellulose, gypsum mud
 - Damp earth in crawlspace
- How do we identify and respond to moisture, ventilation, and pest problems?

Overhangs Matter



Site Grading & Gutters



Moisture Precautions

- Hot water heater drip pans
- Durable, moisture resistant materials, tub enclosures
- No use of can lights
- Hard surfaces in entry and dining



**Hot water heater, drip pan,
insulated under**

Insulation Helps Avoid Condensation

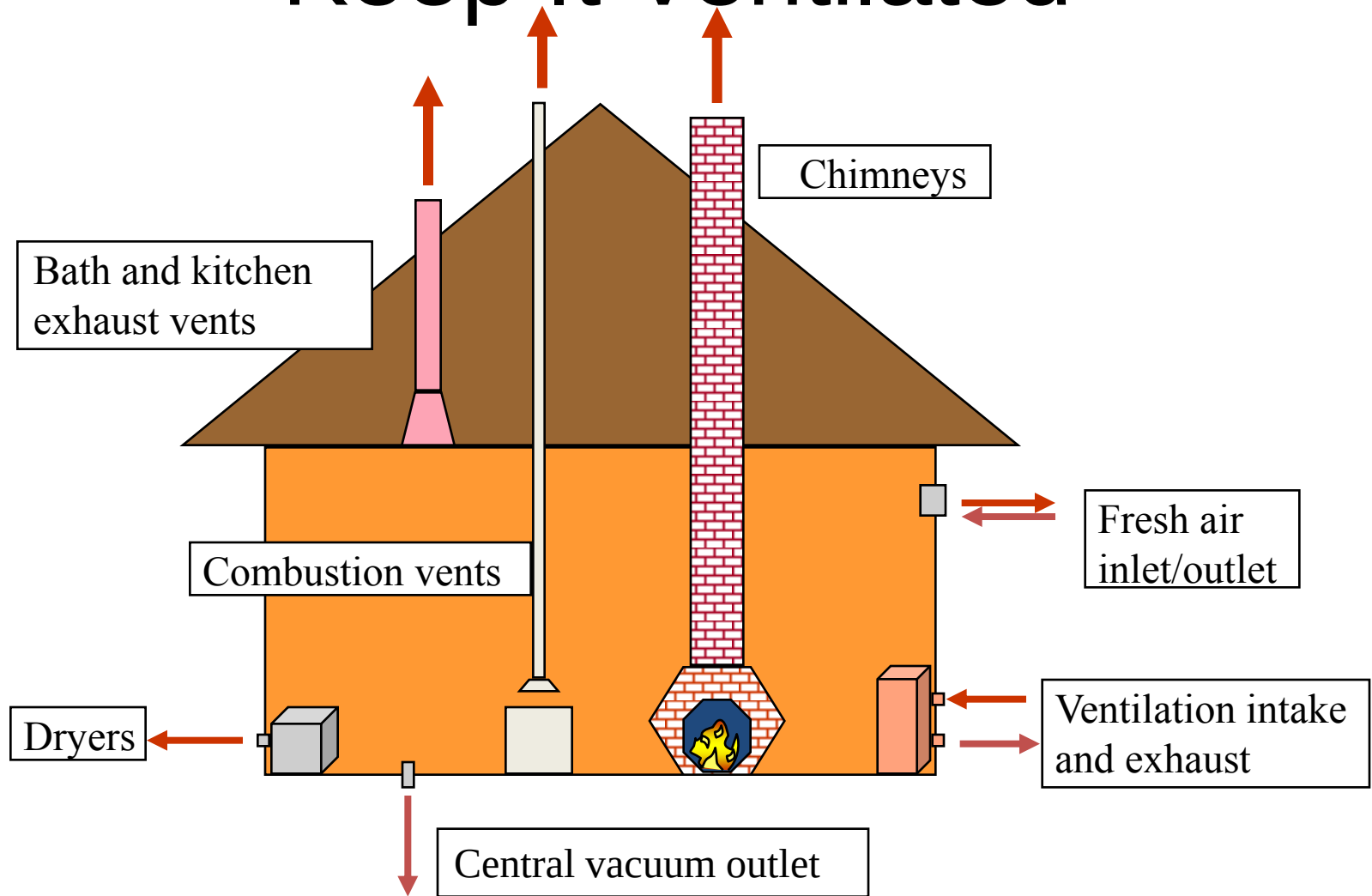


Poor Ventilation Can Increase Health Risks

- Higher rates of respiratory irritation and illness in housing with poor ventilation
 - Common colds
 - Influenza
 - Pneumonia
 - Bronchitis



Keep It Ventilated



Ventilation Helps Reduce Moisture & Contaminants



- Fans reduce moisture in:
 - Bathrooms
 - Kitchens
- Exterior venting of dryers reduces moisture
- Venting reduces contaminants like carbon monoxide from:
 - Boilers/furnaces
 - Hot water heaters (gas)
 - Fire places & wood stoves
- Key Standards: ASHRAE 62.2 < 4 stories or 62.1 > 4 stories



Testing for CO

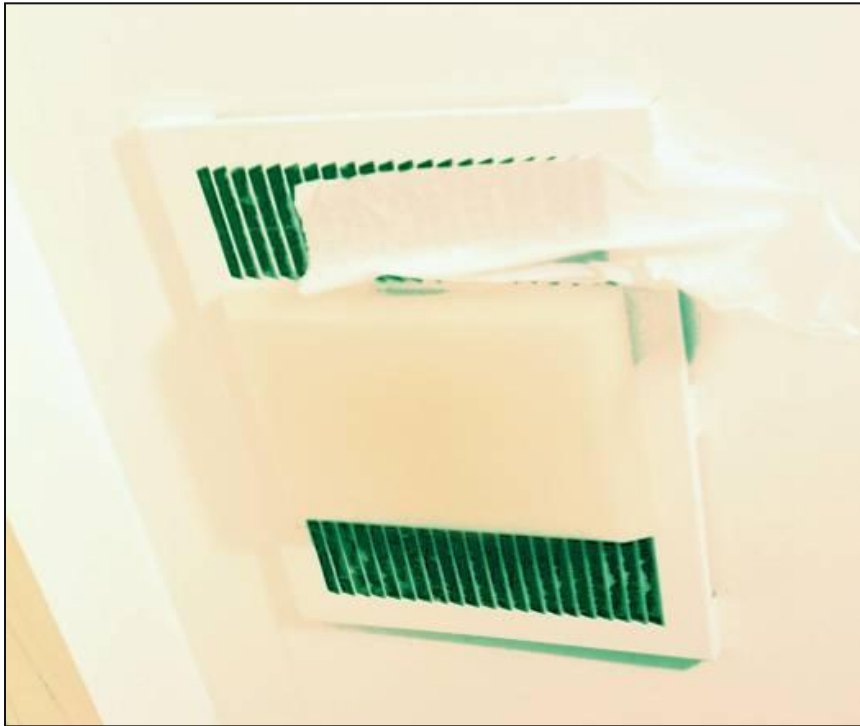


Dryer vented
inside

Without a Bath Fan We Can Get Mold



Does Bath Fan Work & Exhaust Outside?



Low tech toilet paper method



Use flow hood

Just because we see a fan does not mean it works. Also check the fans vents to the outside.

Fan Flow Meter

A fan flow meter connected to a manometer measures fan flow. Needed for ASHRAE 62.2 calculations and to verify CFM of newly installed fans.



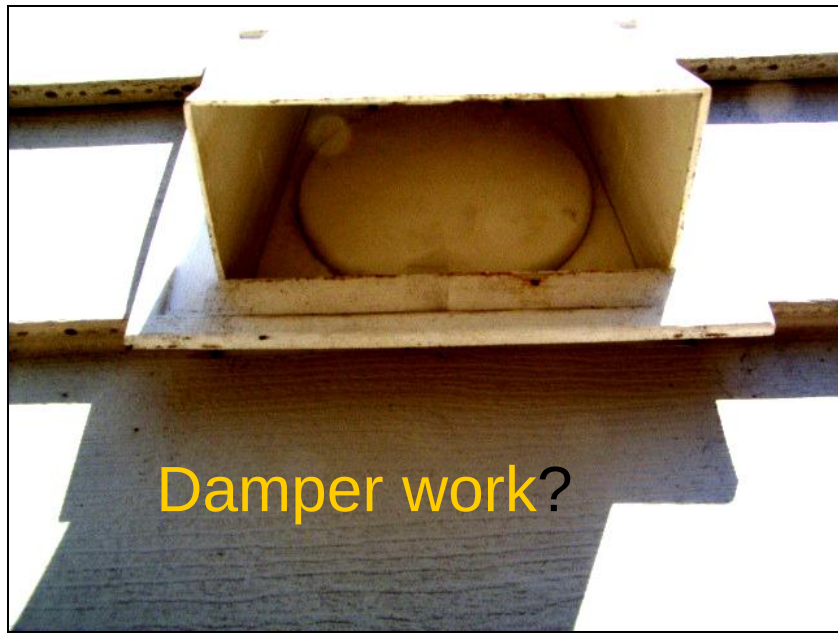
Energy Star Fans & Timers



Keep It Ventilated

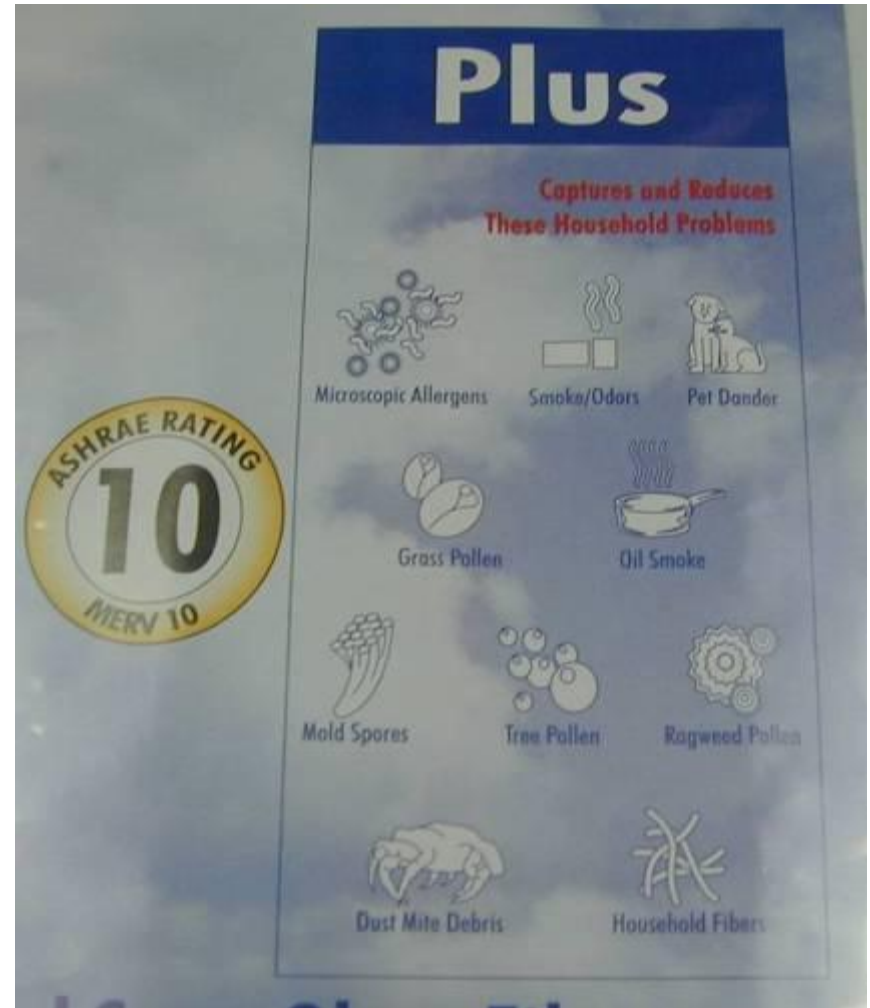
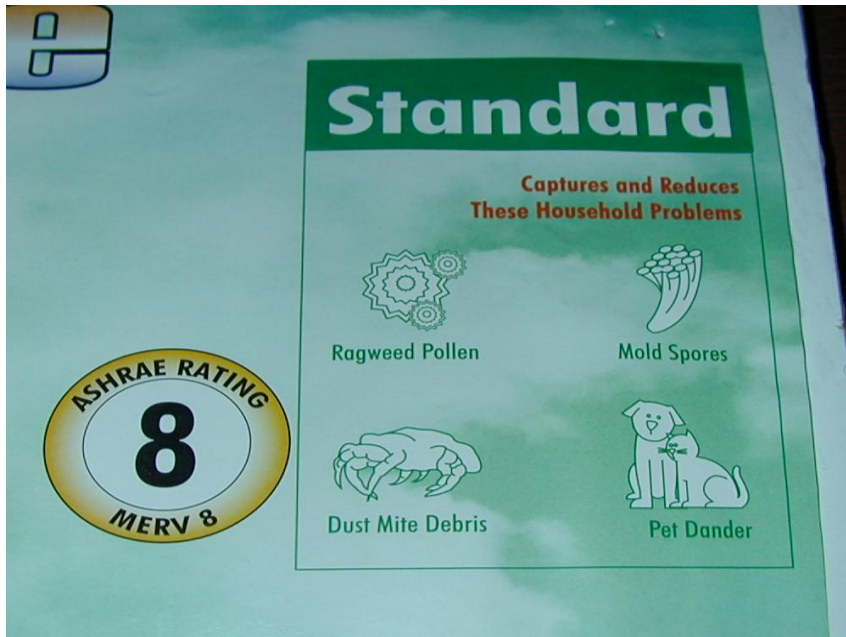
ASHRAE 62.2 Excerpts

	Continuous	Intermittent
Bath	20 cfm	50 cfm
Kitchen	5 air change/hour	100 cfm
House 2000 ft²/3 bdrm	60 cfm	



Forced Hot Air Systems

- Size correctly – ACCA Manual J
- MERV 8 or better filter



MERV Ratings

MERV	PARTICLE SIZE (μm)	TYPICAL CONTROLLED CONTAMINANT
1 – 4	>10.0	Pollen, sanding dust, textile and carpet fibers
5 – 8	3.0 – 10.0	Mold, spores, hair spray, cement dust
9 – 12	1.0 – 3.0	Legionella, lead dust, welding fumes
13 – 16	0.3 – 1.0	Bacteria, most tobacco smoke, insecticide dust, copier toner
17 - 20	≤ 0.3	Virus, combustion particles, radon progeny

Whole House Ventilation

- CARB Study: Even in moderate climates 1/5 never open windows
- In tighter homes need ventilation
- Formaldehyde levels found in 3 year old homes
- Formaldehyde substantially lower in homes with HRV/ERV – varied results with ducted outdoor air systems

Keep It Pest Free

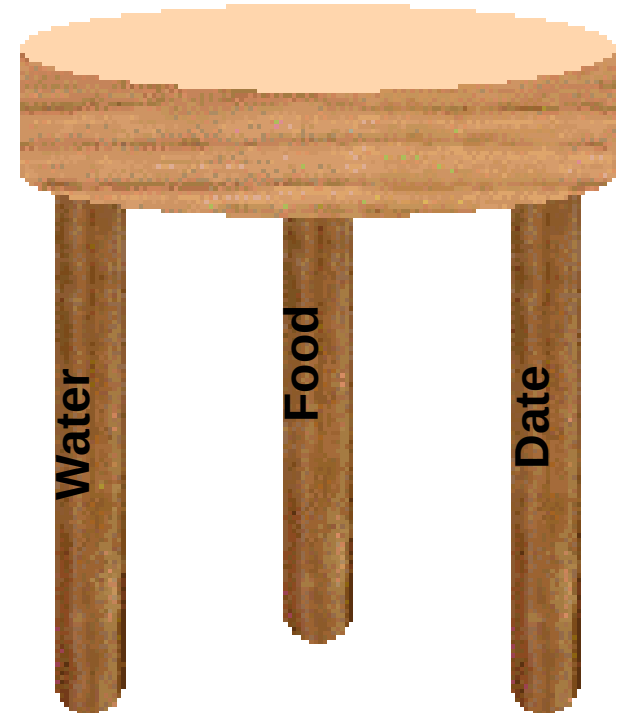
- Seal holes and cracks
- Use corrosion proof materials
- Avoid plantings up against buildings



Keep It Pest Free

All Pests Need:

- Food
- Water
- Date (another pest



Rodents in Attics



Pest Exclusion & Air Sealing

Mice Nests in Insulation



Cement Board and Foam



Integrated Pest Management

- Keep them out and give them no place to hide
 - Change surrounding landscape
 - Block pest entries, passages, hiding places
- Reduce food availability
 - Practice proper food storage and disposal
 - No dirty dishes in the sink overnight
 - Clean crumbs, grease etc.
- Knock down population
 - Traps
 - Appropriate pesticides

Pest Exclusion & Air Sealing

Before



After



Controlling Contaminants

Lead, Environmental Tobacco Smoke,
Volatile Organic Compounds (VOCs)

Likelihood of Lead-Based Paint

	Percent of Housing Units <u>Without</u> Lead-based Paint ¹		
Age	Interior	Exterior	Anywhere
Before 1940	21%	28%	13%
1940 to 1959	54%	41%	31%
1960 to 1977	84%	87%	76%

1. Lead-based paint is paint with >1 mg of lead per square centimeter

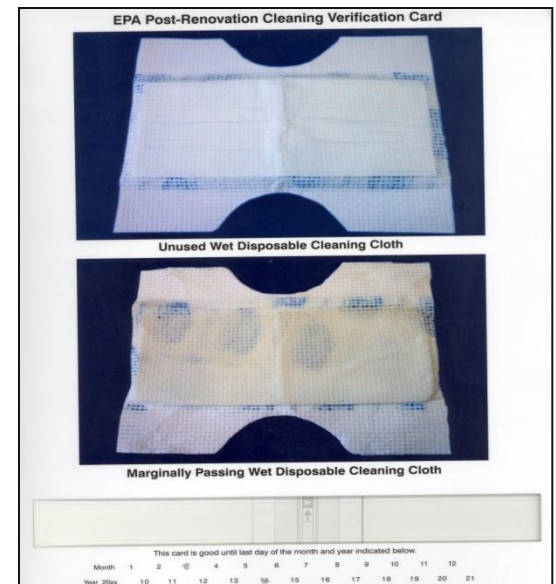
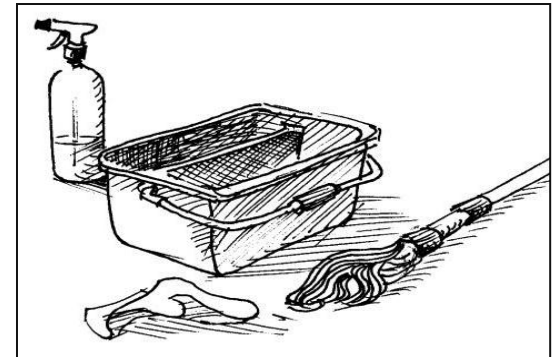
Consider testing paint for lead, particularly if property age is 1960-1978. Buildings less likely to have lead based paint and may be exempt from requirements.

Safe Work Practices

Isolate work area to contain lead dust



HEPA vacuum & wet wash



Post cleaning verification

Consider Smoke Free Housing

Resident Benefits

- Improves resident health
- Reduces complaints
- Reduces unit transfer requests
- Most tenants want smoke free environments – survey tenants to find out!

Owner Benefits

- Reduce maintenance costs
- Reduce complaints
- Reduce unit transfer
- Reduce unit turnover costs
- Can reduce insurance
- Can increase demand
- Consistent with HUD Guidance



Secondhand Smoke is Deadly

- Secondhand smoke is the third leading cause of preventable death in US, killing 53,000 nonsmokers/year. For every 8 smokers one non smoker is killed.
- Children exposed to secondhand smoke are 44% more likely to suffer from asthma.
- Exposures increases the risk of SIDS.
- 7.3% of persons 65 and older smoke, 70% report a desire to quit.

Source: U.S. Surgeon General (2006), Asthma Regional Council (2006), Smoke Free New England

Tenants Want Smoke Free

- 78% of Maine tenants surveyed prefer smoke free environments.
 - Washington State- nearly 70% of renters very interested or interested in living in smoke-free housing (2003)
 - Los Angeles-Telephone survey 69% favor requiring all apartment buildings to offer nonsmoking sections (2004).
 - Oregon- Portland metro-area survey -- 75% of renters say they would choose a smoke-free rental, "other things being equal".
- **Survey your tenants. Find out what they think.**

Source: Smoke Free New England (2010)

Smoke Free Saves Property Owners

The Monetary Impact

Cost to Rehabilitate a Unit Where Smoking is Prohibited vs. a Unit Where Smoking is Allowed

	Non-Smoking	Light Smoking	Heavy Smoking
General Cleaning	\$240	\$500	\$720
Paint	\$170	\$225	\$480
Flooring	\$50	\$950	\$1,425
Appliances	\$60	\$75	\$490
Bathroom	\$40	\$60	\$400
TOTAL	\$560	\$1,810	\$3,515

Data reflects surveys from housing authorities and subsidized housing facilities in New England.
Collected and reported by Smoke-Free Housing New England, 2009.

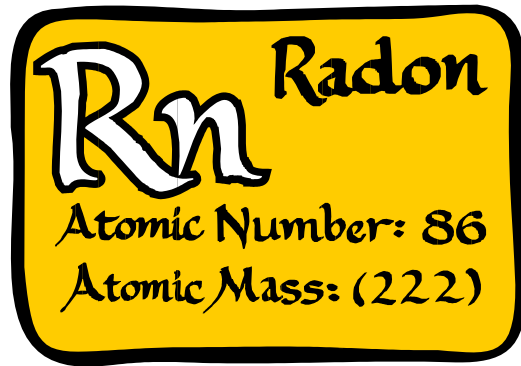
Source: Source: Smoke Free New England Free Housing New England

Contaminant Free: Carbon Monoxide

- Sources Include:
 - Oven as heater
 - Spillage from furnace, water heater, fireplace
 - Ventless heater or fireplace
 - Car exhaust from attached garage
- Alarms over >15 states



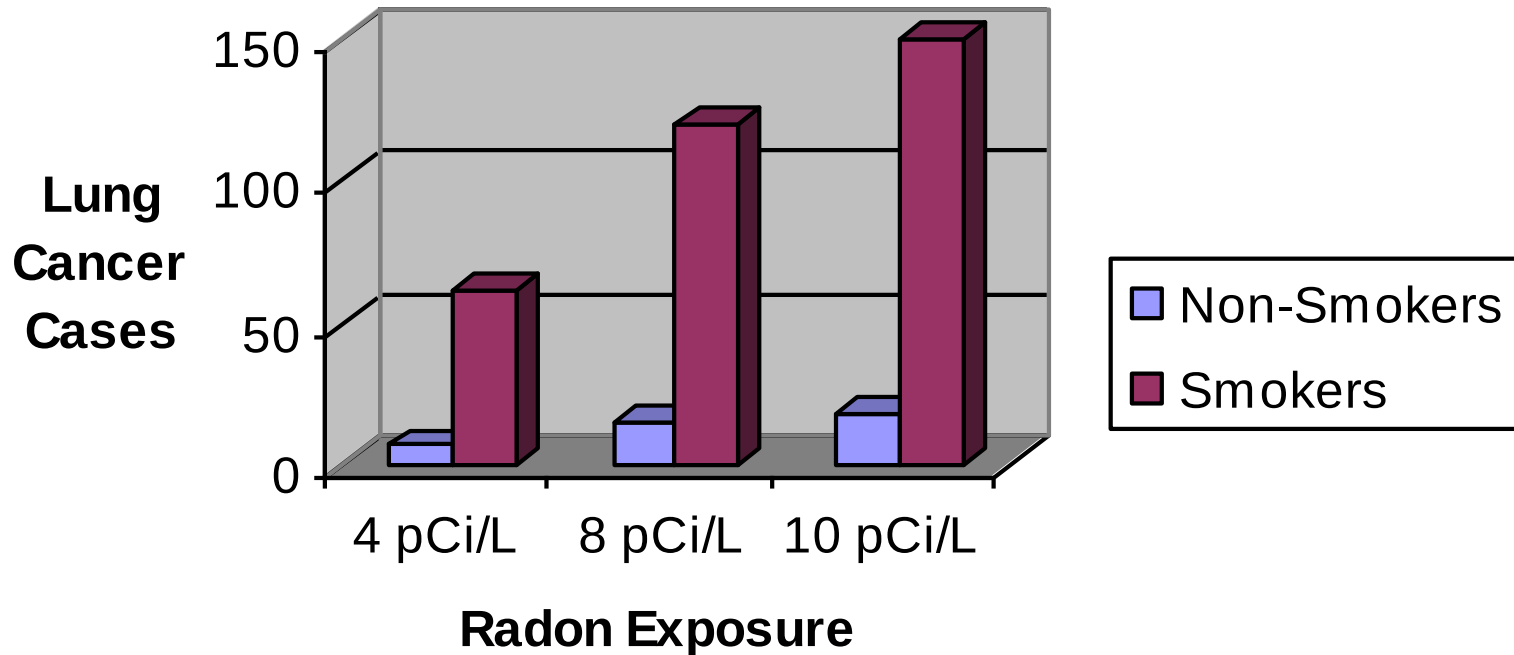
Radon



Second leading
cause of lung
cancer - estimated
21,000 deaths per year

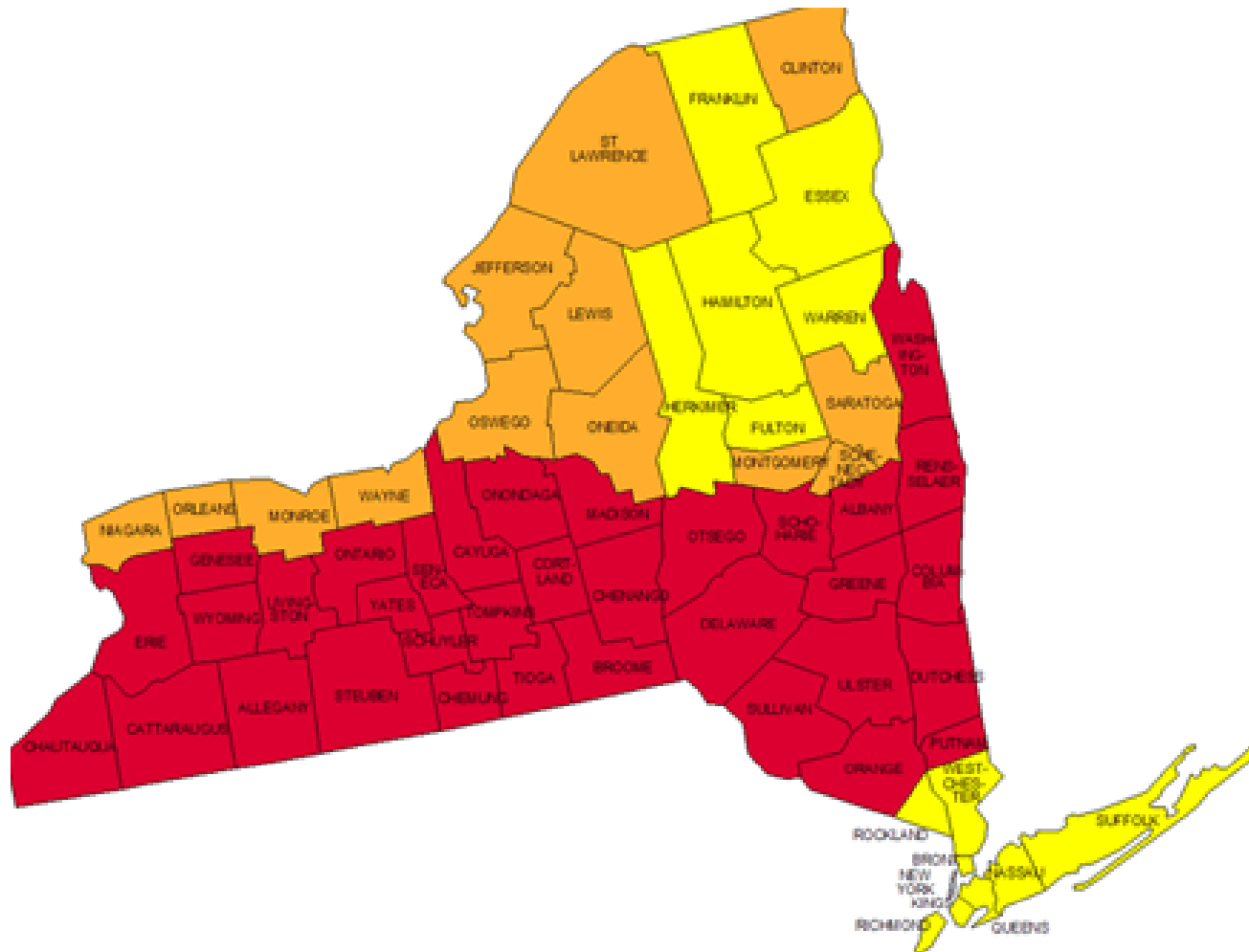
- ✓ High levels of radon are found in every state.
- ✓ 1/15 homes may have an elevated radon level (above EPA action level of 4 pCi/L).

Estimated Lung Cancer Cases In a Population of 1,000 (US EPA, 2005)



✓ 1/15 homes may have an elevated radon level (above EPA action level of 4 pCi/L).

New York Radon



Testing for Radon

- Short Term

- Minimum 48 hours - \$10-\$20
- Useful results (home sales, rental, occupancy)
- If >4 pCi/L, do it a second time or do a long term test



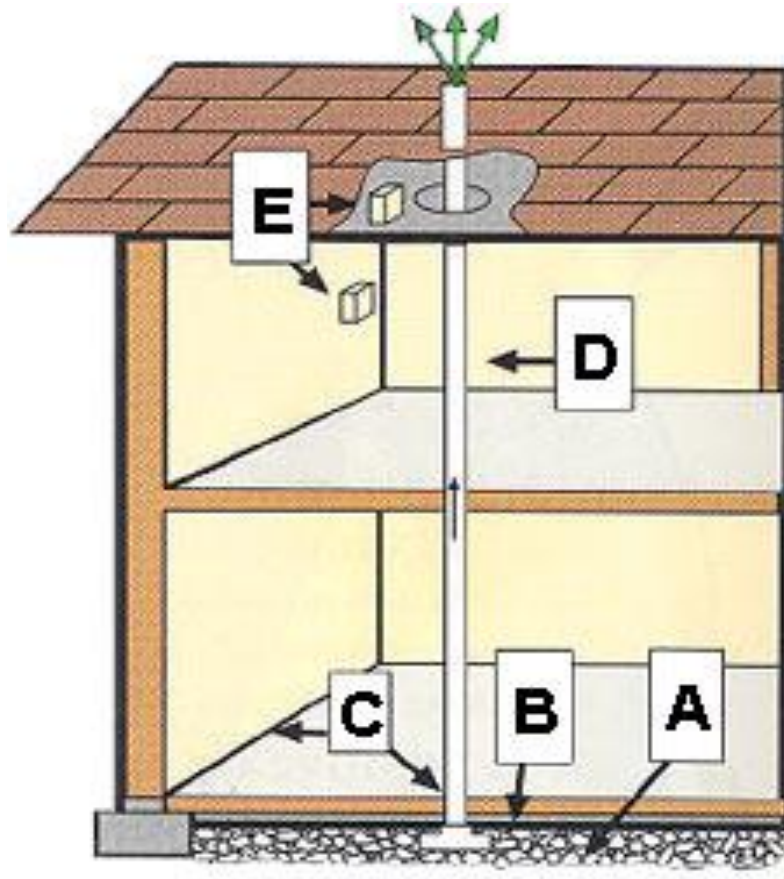
- Long Term

- 91 days to 1 yr - \$20-\$30
- Better indicator of need to mitigate
- If result is 4 pCi/L or higher, fix the home



Radon Control in New Construction

Passive Sub-Slab Depressurization System



- A. Gas-Permeable Layer
- B. Plastic Sheetting
- C. Seal and Caulk
- D. Vent Pipe
- E. Junction Boxes

Volatile Organic Compounds

- Air Fresheners
- Cleaning Products
- Sprays & Coatings
- Formaldehyde
- Carpets & Vinyl Floors
- Drywall
- Paint
- Health Effects: Breathing issues; allergic reactions; eye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system.

Air Freshener



Paint

Green Choices Reduce VOCs

Cleaning

- GreenSeal or EcoLogo Products. Dfe products are not certified but reviewed.
- Supply microfiber wipes and mops. Use HEPA filtration vacuums.
- Purchase paper products that are either Green Seal certified or Forest Stewardship Council (FSC) certified.

Painting

GreenSeal certified or meet LEED for Homes VOC standards.

- Examples : Sherwin Williams Property Solutions and Benjamin Moore Eco Spec Waterborne.

Flooring

- GreenLabel Plus Carpet (e.g., - Mohawk Everstrand Green Label Plus) or Florescore resilient flooring products (e.g., Armstrong Imperial Textures VCT).
- Smooth and cleanable flooring.
- Entryway mats /grates to capture dust and contaminants.



Opportunities During Energy Upgrades

- Test CO & address high levels
- Exclude pests
- Lead Safe Work Practices
- Radon testing – Don't make it worse
- Do not disturb asbestos/vermiculite – test?
- Enhance filtration heating/cooling systems
- Seal garage connection
- Minimize contaminants in products

Keep It Safe

