Green & Healthy Homes Initiative

Introduction to Healthy Homes

Weatherization Plus Health
Atlanta, GA
September 13 to 15, 2011

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Green and Healthy Homes Initiative ™

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Why the Healthy Homes Approach is Important? - The Burden of Unhealthy and Energy Inefficient Homes

- American taxpayers lose **hundreds of millions of dollars** every year in medical bills, skyrocketing energy costs and lost wages due to inefficient and unhealthy housing conditions
- Nearly **6 million** households live with moderate to severe physical housing problems which place them at-risk for illnesses and injuries including asthma, lead poisoning, slip and falls, and respiratory illnesses
- Low income households typically spend 14% of their total income on energy costs compared with 3.5% for other households

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Asthma

Afflicts 20 million Americans yearly and causes:

- 2 million emergency room visits per year
- 500,000 hospitalizations per year
- $20.7 billion in asthma related medical costs per year

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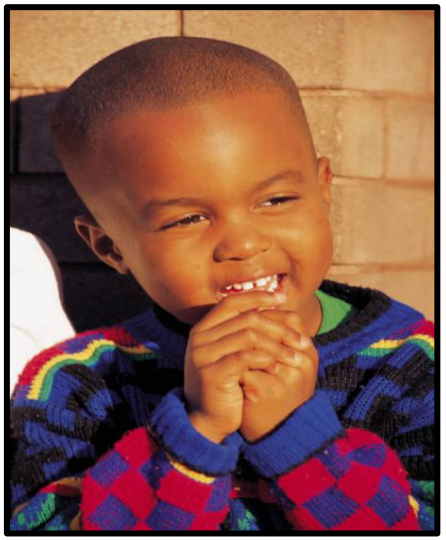
Lead Poisoning

- 250,000 Lead Poisoned Children in the United States
- Lead poisoning costs $43.4 billion annually in medical, special education, lost earnings, and criminal justice costs



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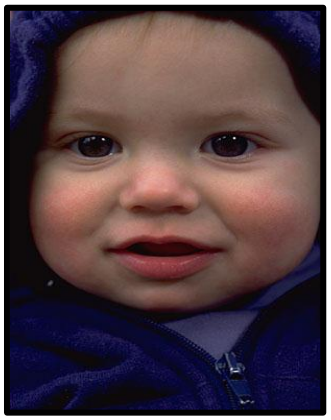
Household Injury

- Home injuries cause more than 10 million emergency room visits per year
- 18,000 unintentional home injury deaths occur each year and household injury is the leading cause of death among children



- 13 million preventable home related injuries occur annually costing $222 billion in medical costs

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Health and Safety Issues Encountered By Weatherization Assistance Programs

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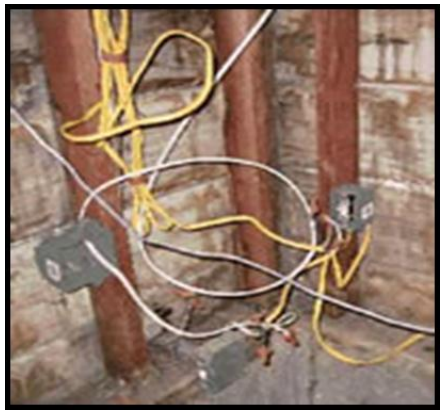
Discussion of health and safety issues you have personally seen during your work in homes

- Which Healthy Homes hazards do you see in your work?
- What is the impact (clients, program and community)?
- How do you currently address hazards?
- What do you consider a Healthy Home?



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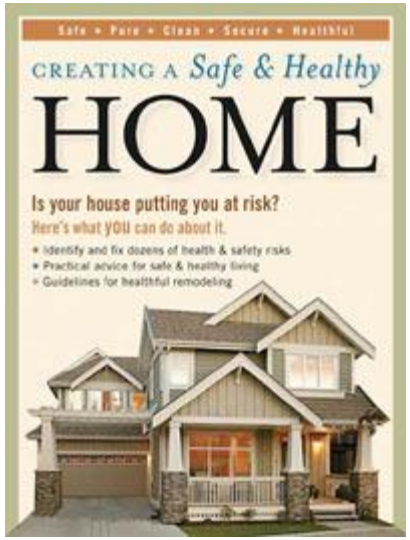

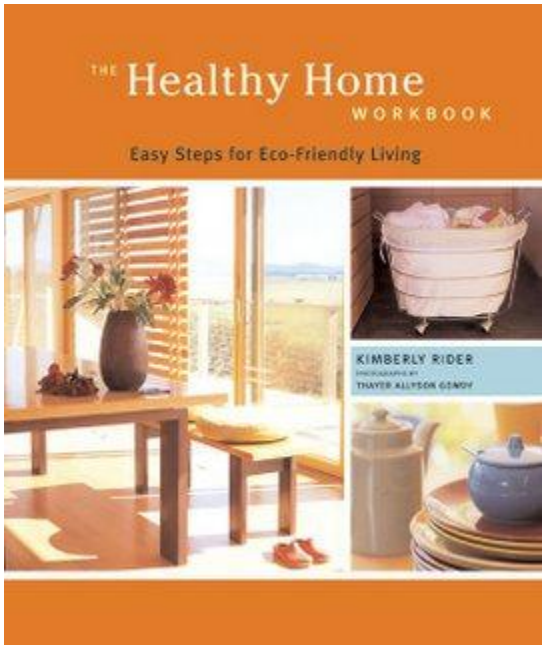

Healthy Home

A Healthy Home Is A Happy Home

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What makes a Healthy Home?

A Healthy Home is one that is marked not only by the absence of health and safety threats (lead, indoor allergens, radon, fire, carbon monoxide) in the built environment, but also one that nourishes physical, mental, social and environmental well being.

National Coalition to End Childhood Lead Poisoning (Report to the Annie E. Casey Foundation)

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Housing-Related Health and Safety Risks

- Lead Paint Poisoning
- Asthma Episodes
  - Pest allergens and diseases
  - Mold allergens
  - Inadequate weatherization
  - Chemicals and VOCs
- Household Injury
  - Fire and electrical hazards
  - Carbon monoxide poisoning
  - Injuries & accidents
- Radon Exposure
- Asbestos Exposure

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Healthy Homes Principles – 7 Elements

- Keep It Contaminant-Free
- Keep It Pest Free
- Keep It Clean
- Keep It Dry
- Keep It Well-Ventilated
- Keep It Safe
- Keep It Well-Maintained

Source: HUD and CDC

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Healthy Homes Principles – 7 Elements

Keep It Contaminant Free

Source: HUD and CDC

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Contaminants

- Lead
- Radon
- Asbestos
- Pesticides
- Sewer Gas
- Volatile Organic Compounds (VOCs)
- Combustion by products

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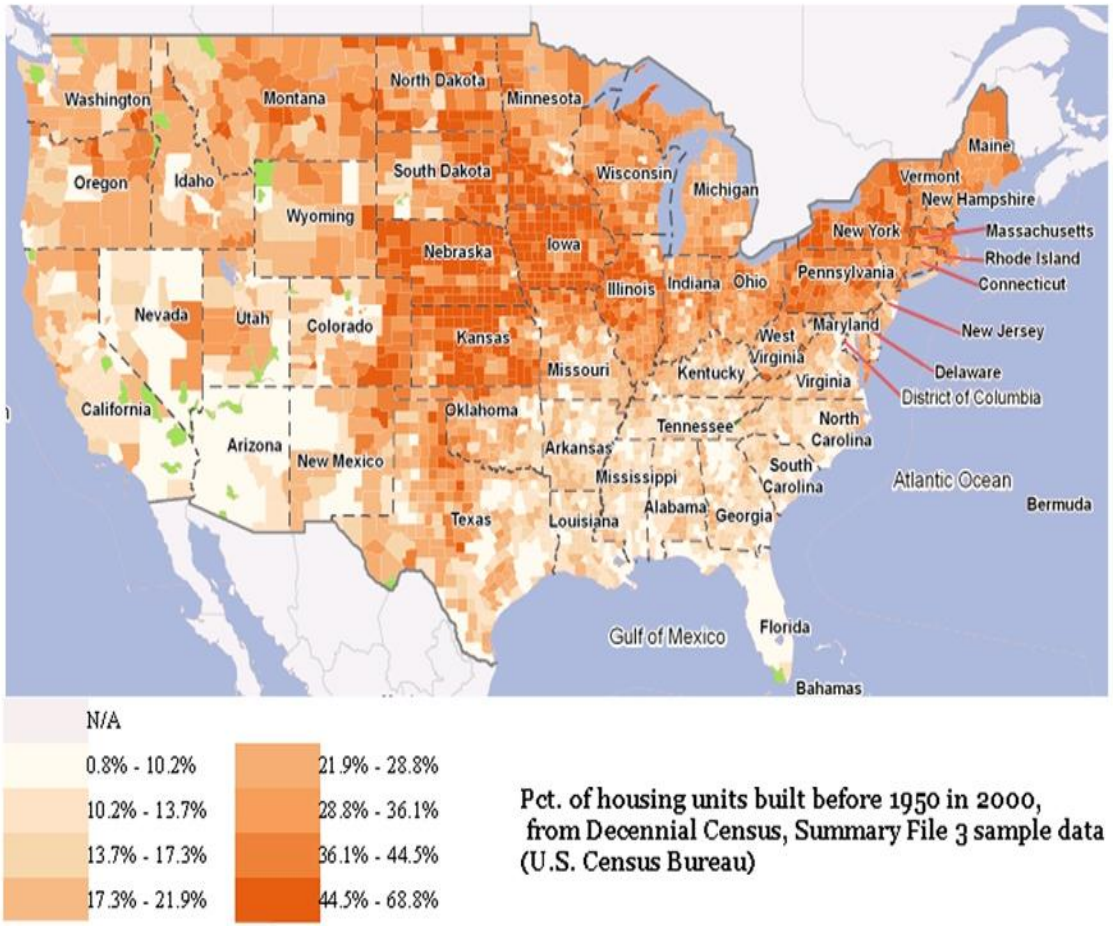
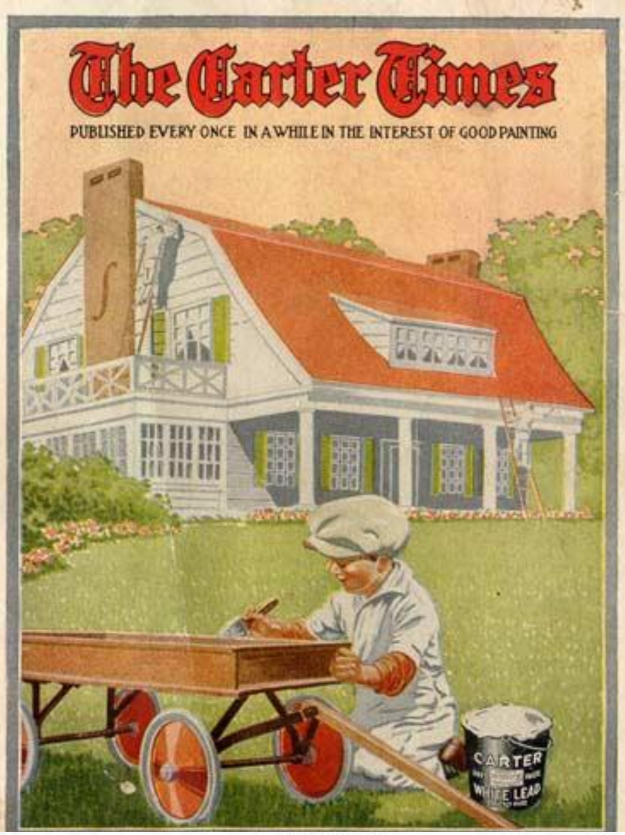
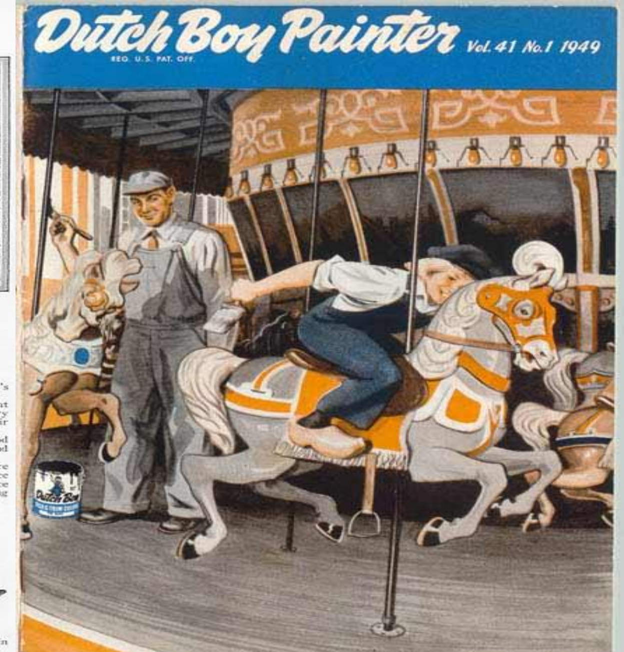
Lead-Based Paint and Lead Poisoning

- 38 million leaded homes
- 24 million homes with substantial lead hazards




The Carter Times
PUBLISHED EVERY ONCE IN A WHILE IN THE INTEREST OF GOOD PAINTING
CARTER
WHITE LEAD


How lead keeps the wolf from your door
LEAD helps to protect you from famine. Even before the farmer plants his seed, lead is working to produce fertilizers. And each year your daily food supply grows more dependent upon the proper use of the fertilizers lead helps to make.
Lead is also the farmer's assistant while crops are growing and fruit trees are bearing. Indeed, the farmer would be greatly handicapped without lead, and this loss would be felt throughout the world in inadequate food supplies.
Enriching the soil
Phosphates are the basis of nearly all artificial fertilizers. The phosphates mixed with sulphuric acid give one of the elements plant life needs. No lead enters into the fertilizer itself, but lead successfully resists the action of sulphuric acid. Hence it is used for lining the rooms and tanks in which the fertilizer-manufacturing processes are carried on, for making the pipes which convey the corrosive liquids, and for the pails and other containers used about the factory.
Guarding fruit trees
Lead aids the farmer in protecting his fruit trees, vines, and truck crops. He sprays them with arsenate of lead to poison insects that would otherwise destroy them.
Lead in batteries
The modern farmer's tractors, trucks, and automobiles depend largely on lead. A storage battery, mostly lead, provides electric current for the tractor's ignition system and for the starting, lighting, and ignition of truck and automobile. Lead-tin solder seals gasoline tank and radiator. Litharge, an oxide, is used in refining the gasoline that makes the tractor, truck, and automobile go.
"Save the surface and you save all"
Painting with lead
As paint, lead helps to protect the farmer's house, farm buildings, and equipment.
Red-lead, an oxide of lead, makes a paint that guards the metal of his wind-mill and machinery against the attacks of rust and thus prolongs their usefulness indefinitely.
White-lead is the paint usually used for wood and other non-metallic surfaces on farms and throughout the world.
More property owners than ever before are learning the value of the phrase, "Save the surface and you save all." And they are saving the surface with white-lead or at least with paint containing a high percentage of white-lead.
Look for the Dutch Boy
NATIONAL LEAD COMPANY makes white-lead of the highest quality and sells it, mixed with pure linseed oil, under the name and trade-mark of Dutch Boy White-Lead. The figure of the Dutch Boy is reproduced on every keg of white-lead and is a guarantee of exceptional purity.
Dutch Boy products also include red-lead, linseed oil, flatting oil, babbitt metals, and solder.
More about lead
If you use lead, or think you might use it in any form, write to us for specific information.
NATIONAL LEAD COMPANY


Dutch Boy Painter
REG. U.S. PAT. OFF.
Vol. 41 No. 1 1949
Dutch Boy


THE SATURDAY EVENING POST
The Drop of Solder...
EVAPORATED MILK
that puts a Cow in your Kitchen Cupboard
NATIONAL LEAD Company
SOLDER


DUTCH BOY PAINTER
Magazine
Volume 29
No. 3
1936
DUTCH BOY
WHITE LEAD


DECEMBER 1928
The Dutch Boy Painter

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Lead Poisoning
Nations prohibiting white lead in paint:

1909 France, Belgium and Austria ban white lead interior paint
1923 Czechoslovakia, Sweden
1924 Austria, Poland, Spain
1925 Bulgaria, Chile, Romania
1926 Belgium, France, Greece
1928 Cuba, Luxembourg
1929 Finland, Norway, Yugoslavia
1933 Columbia, Nicaragua, Uruguay, Venezuela
1936 Argentina
1938 Mexico
1939 Afghanistan, the Netherlands
1952 Italy
1953 Vietnam
1956 Hungary, Morocco, Tunisia
1960-1988 19 more

US did not ban the use of lead paint in homes until 1978

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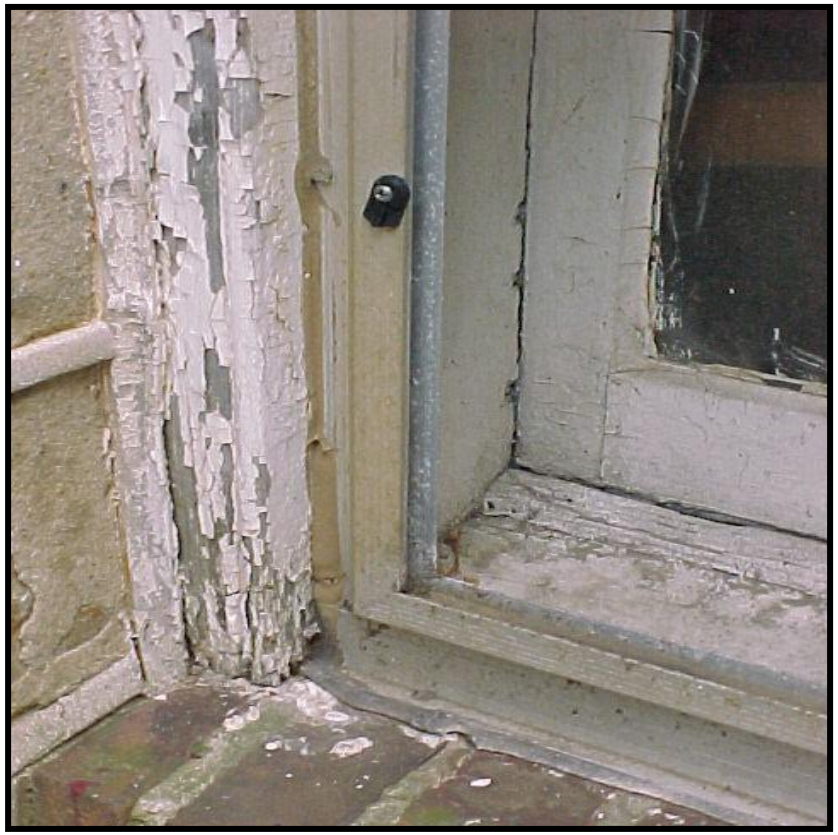
Lead Paint - Main Source of Lead Poisoning



Chipping, flaking, lead based paint in homes built before 1978 and the resulting very fine leaded dust as it breaks down in homes

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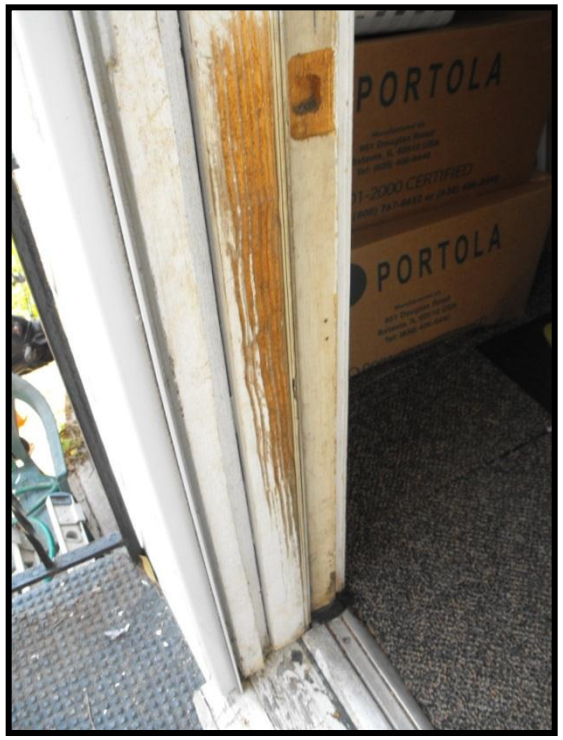
Major Sources of Lead Dust



Peeling, Chipping, or Flaking Paint Inside and Outside of the Home

- Banisters & Porches

Friction and Impact Surfaces

- Doors
- Window Wells
- Window Sills
- Window Sashes
- Floors

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Renovation activities that disturb leaded paint can create dangerous chips and lead dust if lead safe work practices are not utilized

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Routes of Absorption

- Ingestion of leaded dust through normal hand-to mouth activities

(It takes the equivalent of 3 granules of sugar of leaded dust to lead poison a child)

- Inhalation

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Lead Poisoning Effects on Children

- Learning Disabilities
- Violent, Aggressive Behavior
- Speech Delays
- Attention Deficit Disorder
- Hyperactivity
- Loss of IQ
- Hearing and Memory Problems
- Reduced Motor Control and Balance

Children poisoned by lead are

- 7 times more likely to drop out of school
- 6 times more likely to be in the juvenile justice system

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Lead Poisoning Effects on Adults

- 46% increased rate of early mortality
- 16% to 19% increased risk of cardiovascular disease
- Hypertension
- Depression
- Reproductive Problems
- Complications related to osteoporosis

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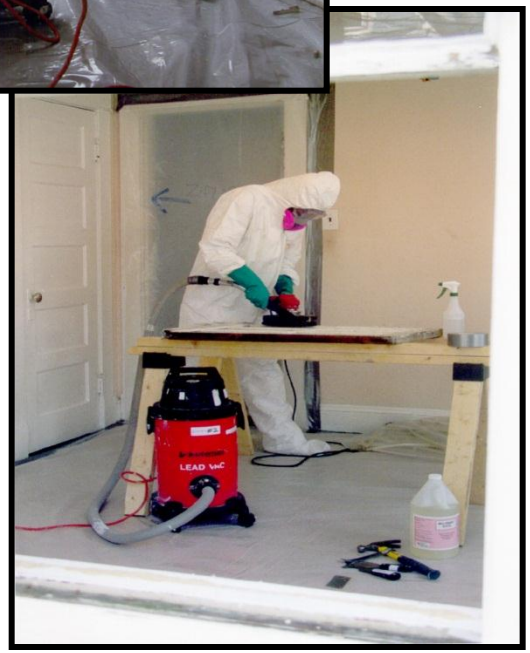
What can we do to limit exposure?

- Repair Chipping, Peeling Paint using lead safe work practices and certified workers
- Use Proper Containment
- Work Wet
- Keep Occupants Out of the Work Area
- Clean Up Properly



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EPA Renovation, Repair, and Painting Rule – Who Must Comply?

Any contractor who:

- Performs work for compensation
- In a pre-1978 constructed residence or child occupied facility
- Disturbs painted surfaces

LEAD-SAFE EPA CERTIFIED FIRM

NAT-31474-1

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What Activities are Covered?

- Disturbing 6 sq. feet or more of interior painted surface
- Disturbing 20 sq. feet or more of exterior painted surface

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What Must Contractors Do to Comply with the EPA RRP Rule?

- Distribution of Renovate Right pamphlet
- Pre Intervention Inspection and Testing
- Use of Certified and Trained Workers
- Use Lead Safe Work Practices
- Post Intervention Inspection

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Lead-Based Paint (WAP 11-6)

Health Effect	WAP 11-6 H&S Category	Action/ Allowability
Lead Poisoning	Lead Based Paint	Follow EPA's Lead; Renovation, Repair and Painting Program (RRP). In addition to RRP, Weatherization requires all weatherization crews working in pre-1978 housing to be trained in Lead Safe Weatherization (LSW). Deferral is required when the extent and condition of lead-based paint in the house would potentially create further health and safety hazards.
	Code Compliance	Correction of preexisting code compliance issues is not an allowable cost other than where weatherization measures are being conducted. State and local (or jurisdiction having authority) codes must be followed while installing weatherization measures. Condemned properties and properties where “red tagged” health and safety conditions exist that cannot be corrected under this guidance should be deferred.

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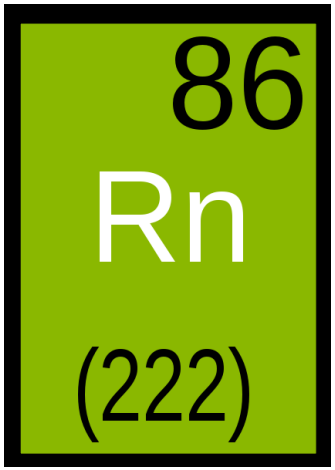
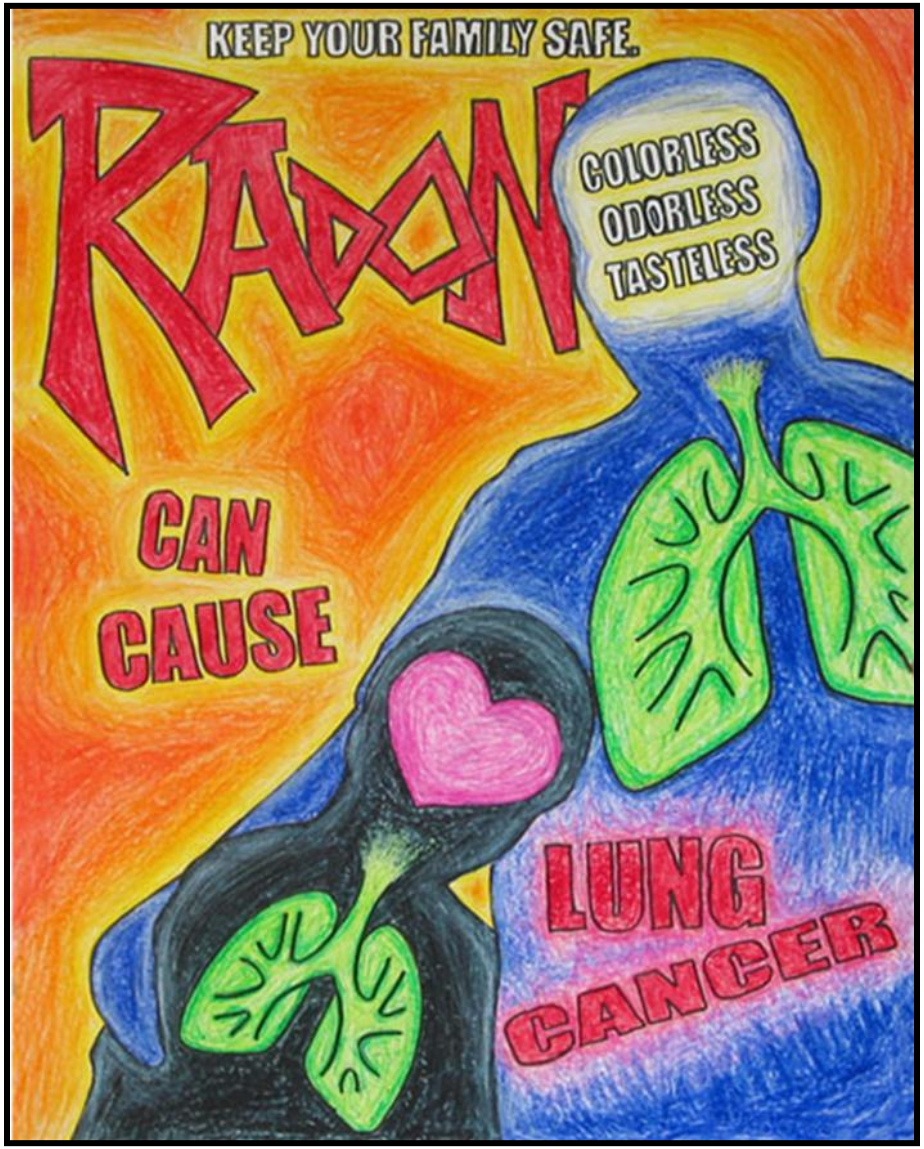
What is Radon?

- Radon is a colorless, odorless, invisible gas that can only be detected through radon testing
- Radon is a radioactive gas that is produced by the natural decay of uranium that is found in nearly all soils
- Radon is a form of ionizing radiation and a proven carcinogen



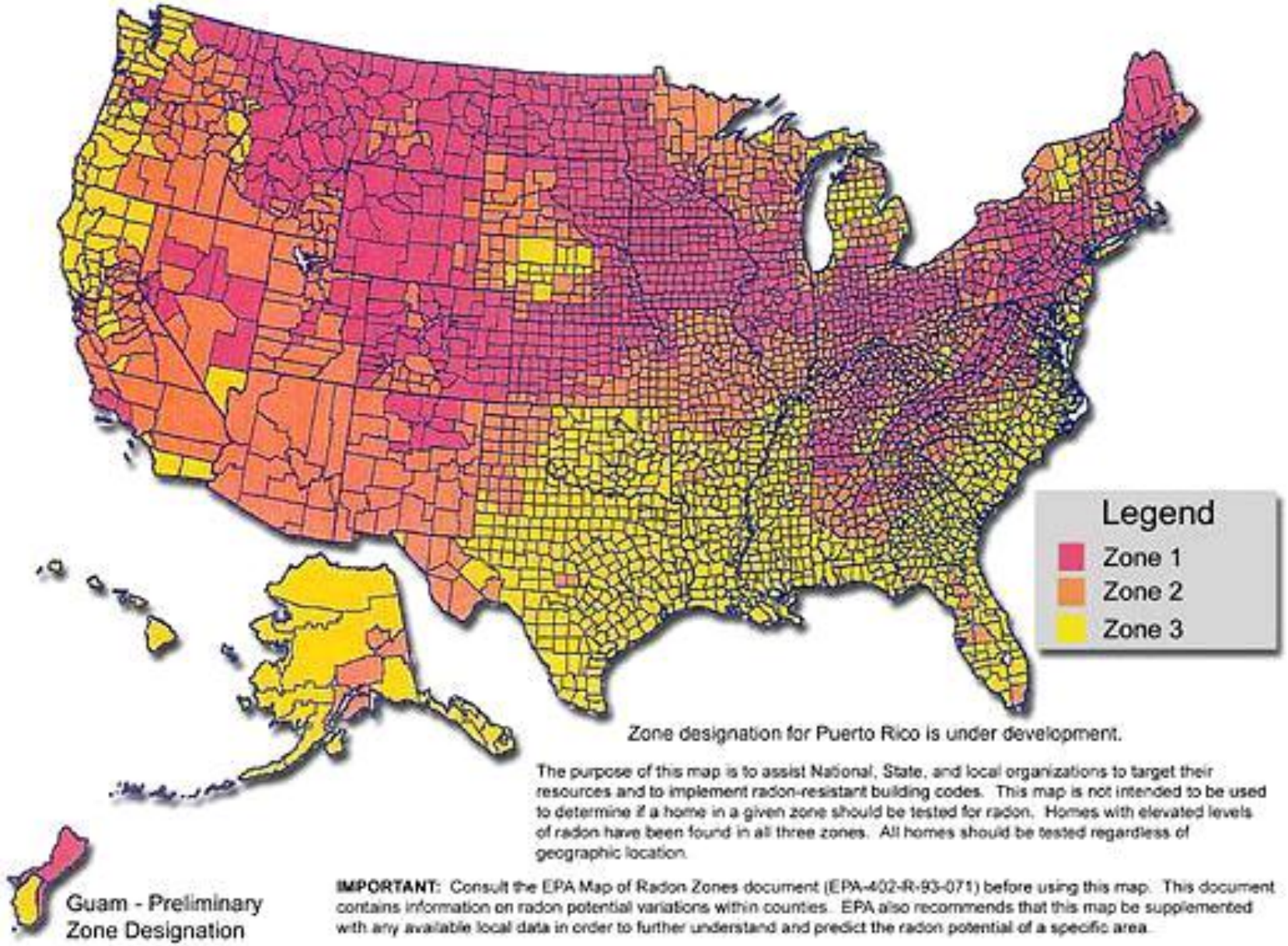


2011 annual national radon poster contest winner – “Keep Your Family Safe” by Logan, Age 14 of Dania, FL (Contest organized by Kansas State Univ. & EPA)

Exposure to Radon

- 1 out of 15 homes are above the EPA level of concern for radon
- To determine at risk areas go to the EPA’s radon website at *http://www.epa.gov/radon/zonemap.html*
- EPA estimates that about 21,000 lung cancer deaths each year in the U.S. are radon-related
- Exposure to elevated radon levels is the leading cause of lung cancer for non-smokers

EPA Map of Radon Zones

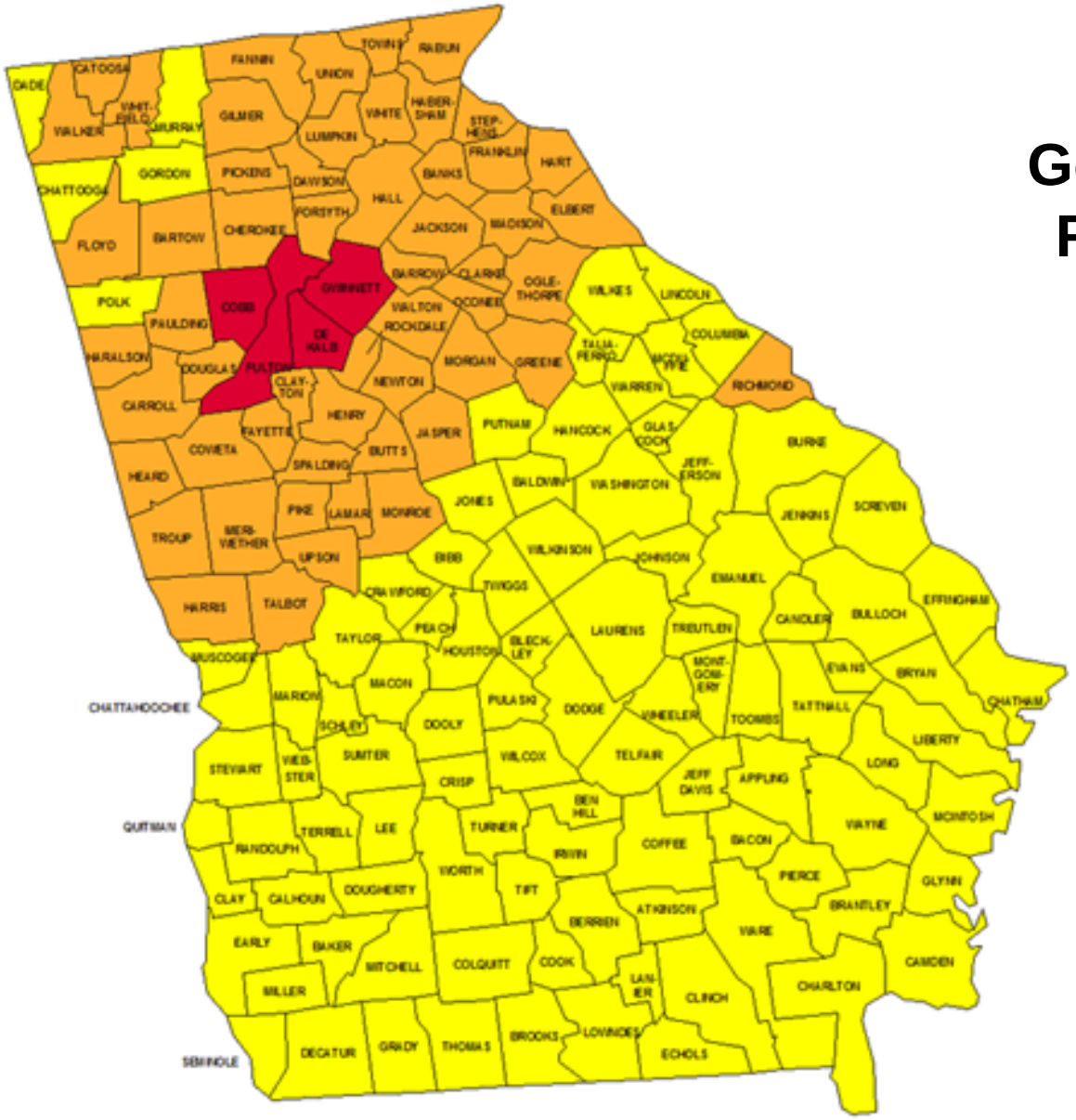


Zone designation for Puerto Rico is under development.

The purpose of this map is to assist National, State, and local organizations to target their resources and to implement radon-resistant building codes. This map is not intended to be used to determine if a home in a given zone should be tested for radon. Homes with elevated levels of radon have been found in all three zones. All homes should be tested regardless of geographic location.

IMPORTANT: Consult the EPA Map of Radon Zones document (EPA-402-R-93-071) before using this map. This document contains information on radon potential variations within counties. EPA also recommends that this map be supplemented with any available local data in order to further understand and predict the radon potential of a specific area.

Georgia Map of Radon Zones



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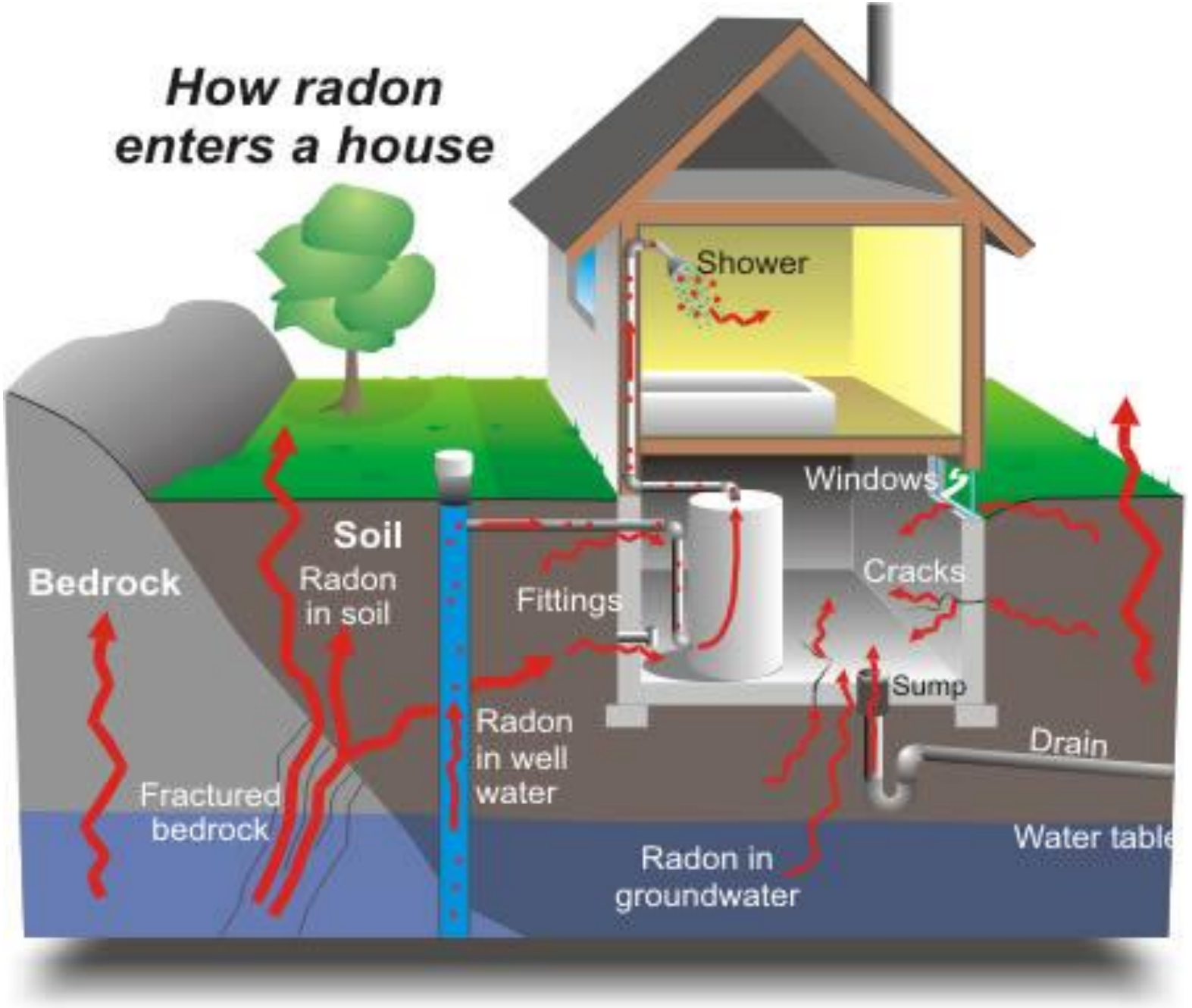
Radon

Lack of proper ventilation and air sealing can contribute to elevated levels of radon

Radon typically enters the home through:

- Cracks in foundations and solid floors
- Construction joints
- Cracks in walls
- Gaps in suspended floors
- Gaps around service pipes
- Cavities inside walls
- Water supply


How radon enters a house
Shower
Windows
Soil
Bedrock
Radon in soil
Fittings
Cracks
Sump
Radon in well water
Drain
Fractured bedrock
Water table
Radon in groundwater

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Radon Test Kits Available

- The USEPA recommends all homeowners test their residences for radon gas concentrations
- **Short term test kits** (3-4 days) $15
- **Long term test kits** (3-12 months) $25

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Why are Short- and Long-term Tests Used?

- Radon levels within a building often change on a day-to-day basis.
- Short-term test kits are the quickest way to test. Remain in the building from two to 90 days.
    - A short-term test is less likely than a long-term test to indicate year-round average radon level
- Long-term tests remain in your home for more than 90 days.
    - More likely to reflect the building's year-round average radon level than a short-term test
- If time permits (more than 90 days), long-term tests can be used to confirm initial short-term results between 4 pCi/L and 10 pCi/L.

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Radon - Exposure Limits

- The average indoor radon level is estimated to be about 1.3 pCi/L
- About 0.4 pCi/L of radon is normally found in the outside air
- Congress has set a long-term goal that indoor radon levels be no more than outdoor levels. Most homes today *can* be reduced to 2 pCi/L or below
- EPA believes that any radon exposure carries some risk - no level of radon is safe
- Even radon levels below 4 pCi/L pose some risk, and you can reduce your risk of lung cancer by lowering your radon level

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How do you Lower Radon Levels?

- Lowering high radon levels requires technical knowledge and special skills
- Use a contractor who is trained to fix radon problems
- A qualified contractor can study the radon problem in your home and help you pick the right treatment method

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Radon Mitigation - Vent Pipe System and Fan

- Primary system used which pulls radon from beneath the house and vents it to the outside.
- Also known as a soil suction radon reduction system, does not require major changes to your home.
- Sealing foundation cracks and other openings makes this kind of system more effective and cost-efficient.
- Similar systems can also be installed in houses with crawl spaces.
- Radon contractors can use other methods that may also work in your home. The right system depends on the design of your home and other factors.
- See attached Radon Mitigation Measures chart in binder

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Radon (WAP 11-6)

Health Effect	WAP 11-6 H&S Category	Action/ Allowability
Radon Exposure	Radon	Whenever site conditions permit, exposed dirt must be covered with a vapor barrier except for mobile homes. In homes where radon may be present, precautions should be taken to reduce the likeliness of making radon issues worse. Testing may be allowed in locations with high radon potential.

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Asbestos

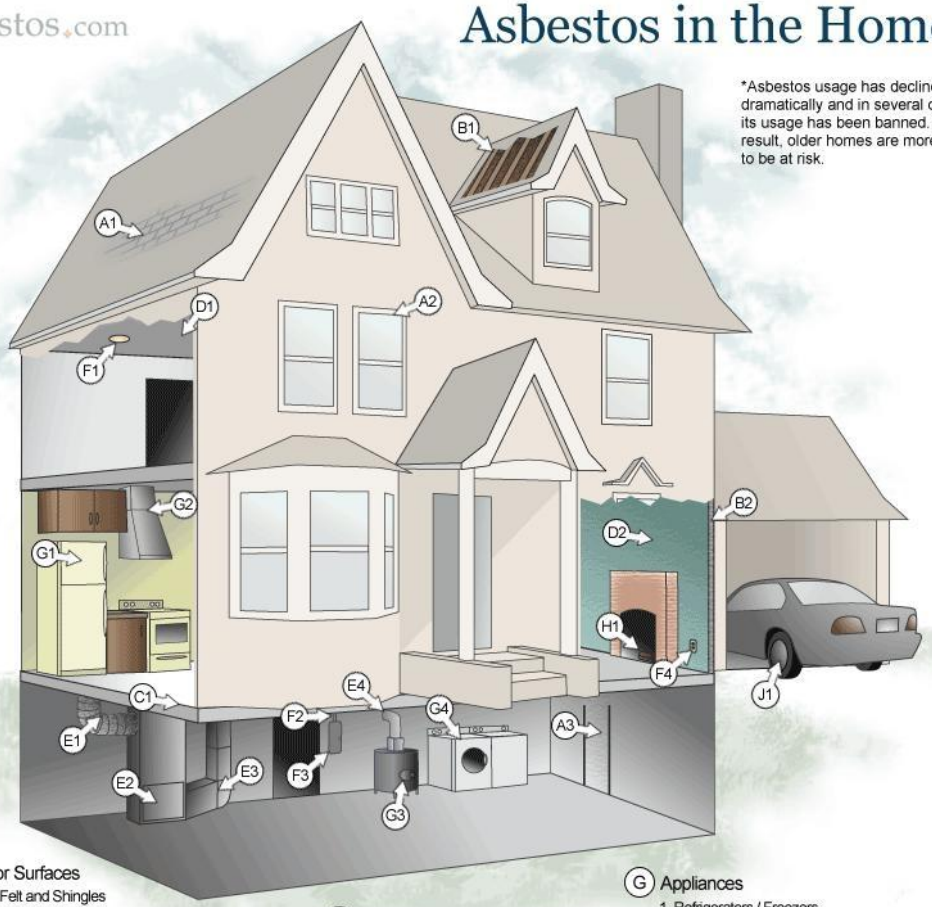
- Asbestos is most commonly found in older homes in: pipe and furnace insulation materials, asbestos shingles, millboard, textured paints and other coating materials, and floor tiles.

- Breathing high levels of asbestos fibers can lead to an increased risk of: lung cancer, mesothelioma (a cancer of the lining of the chest and the abdominal cavity), and asbestosis (condition that occurs where lungs become scarred with fibrous tissue)

Presence of Asbestos

Asbestos in the Home

*Asbestos usage has declined dramatically and in several cases, its usage has been banned. As a result, older homes are more likely to be at risk.



A Exterior Surfaces
1. Roof Felt and Shingles
2. Window Putty
3. Cement Asbestos Board Siding / Undersheeting

B Insulation
1. Vermiculite Insulation
2. Batt Insulation

C Flooring
1. Vinyl Asbestos Flooring Material

D Interior Surfaces
1. Sprayed-on Ceiling Material
2. Textured Paint

E Boilers, Heating and Piping
1. Heat Source Covering
2. Door Gaskets
3. Duct Lining
4. Wall Gaskets and Lining

F Electrical Equipment
1. Recessed Lighting
2. Wiring Insulation
3. Fuse Boxes
4. Outlets

G Appliances
1. Refrigerators / Freezers
2. Range Hoods
3. Woodstoves (Heat Reflectors)
4. Clothes Dryers

* Not Shown: Dishwashers, Toasters, Slow-cookers, Portable Heaters, Hair Dryers

H Miscellaneous
1. Fireplace Logs

J Automotive
1. Brake Linings, Gaskets, and Clutch Facings

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Asbestos was banned in all home construction uses beginning in 1990

PHOTO OF AN ATTIC CONTAINING VERMICULITE INSULATION

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Risks of Disturbing Asbestos

- Elevated concentrations of airborne asbestos can occur after asbestos-containing materials are disturbed by cutting, sanding or other remodeling activities

- Improper attempts to remove these materials can release asbestos fibers into the air in homes, increasing asbestos levels and endangering people living in those homes

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Exposure to Asbestos

- The more asbestos a person is exposed to, the greater the risk of developing an asbestos-related disease (lung cancer and mesothelioma)
- Exposure occurs through inhalation of airborne microscopic particles
- These particles can be present during renovation and demolition of buildings or building products
- Untrained individuals performing asbestos-related work can expose themselves, other individuals around the work site, and even their own families

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What to do with asbestos?

- If you think there may be asbestos in the house it is best to leave it alone
- ANY asbestos remediation work should be performed by a licensed specialist

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Asbestos (WAP 11-6)

Health Effect	WAP 11-6 H&S Category	Action/ Allowability
Asbestos Exposure	Asbestos - in siding, walls, ceilings, etc	Removal of siding is allowed to perform energy conservation measures. All precautions must be taken not to damage siding. Asbestos siding should never be cut or drilled. Recommended, where possible, to insulate through home interior.
	Asbestos - in vermiculite	When vermiculite is present, unless testing determines otherwise, take precautionary measures as if it contains asbestos, such as not using blower door tests and utilizing personal air monitoring while in attics. Where blower door tests are performed, it is a best practice to perform pressurization instead of depressurization. Encapsulation by an appropriately trained asbestos control professional is allowed. Removal is not allowed.
	Asbestos - on pipes, furnaces, other small covered surfaces	Assume asbestos is present in covering materials. Encapsulation is allowed by an AHERA asbestos control professional and should be conducted prior to blower door testing. Removal may be allowed by an AHERA asbestos control professional on a case by case basis.

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Volatile Organic Compounds

- Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids.
- Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

Examples include:

Paints, lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, graphics and craft materials including glues and adhesives, permanent markers

From: http://www.epa.gov/iaq/voc.html

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Health Effects of VOCs

1. Short-term (Acute) symptoms to high levels of VOCs
    - Eye, nose and throat irritation
    - Headaches and dizziness
    - Nausea/vomiting
    - Worsening of asthma symptoms
2. Long-term (Chronic) symptoms to high levels of VOCs
    - Increased risk of cancer
    - Liver and kidney damage
    - Central nervous system damage

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Formaldehyde

1. Passive formaldehyde monitor – easiest way to measure
2. Test kits can be ordered from various vendors
3. Acceptable formaldehyde levels is 0.10 ppm
4. To reduce high formaldehyde levels
    - Use alternative products
    - Ensure combustion sources are properly maintained and vented outdoors
    - Allow products to off-gas (before bringing in products)
    - Ventilate (open windows, fans, HVAC)
    - Control the climate (Keep temperature and humidity levels low – as they go up so does the amount of chemical released)

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Pesticides

A national survey found residues of DDT and chlordane, in 41% and 64% of homes, respectively, even though the use of these pesticides have not been used for more than 20 years

Health effects associated with pesticides

- Eye, nose, throat irritation
- Skin rashes
- Nausea
- Damage to the central nervous system, kidney damage, cancer, etc.

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How to reduce pesticide levels and risks in the home?

- Reduce the need to use chemical pesticides
- Source control - Remove unused chemicals from the home
- Ensure pesticides are stored in safe containers and in places where children can’t get to them
- The most effective way to limit pesticide levels indoors is to eliminate the use of pesticides or use alternative products

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How to reduce VOC levels in the home?

1. Source control
    - Remove unused chemicals from the home
2. Ventilation and climate control
    - Increase ventilation, keep temperature and relative humidity as low as possible or comfortable
3. Summary: the most effective way to limit VOCs indoors is to limit the potential sources of VOCs
4. Diluting effect by increasing amount of “fresh air”

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VOCs (WAP 11-6)

Health Effect	WAP 11-6 H&S Category	Action/ Allowability
Asthma Episodes	Formaldehyde, Volatile Organic Compounds (VOCs), and other Air Pollutants	Removal of pollutants is allowed and is required if they pose a risk to workers. If pollutants pose a risk to workers and removal cannot be performed or is not allowed by the client, the unit must be deferred

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Keep It Contaminant Free - Benefits

- Reductions in lead poisoning
- Reductions in lung cancer
- Reductions in asthma triggers
- Reductions in asbestosis

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Healthy Homes Principles – 7 Elements

Keep It Pest Free

Keep It Clean

Source: HUD and CDC

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Keep It Pest-Free

Utilizes integrated pest management (IPM) and other less toxic treatment methods to reduce pests such as cockroach, mouse, and rat infestations.

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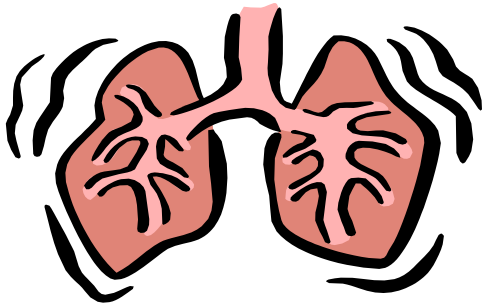
What is Asthma?

Asthma is a chronic inflammatory lung condition

- It affects the airways – the way a person breathes
- It is a condition that can only be treated –
  and not cured



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Asthma

- An average of one out of every 10 school-aged children has asthma
- 13% of US population has asthma
- 40% of asthma episodes are caused by asthma triggers in the home

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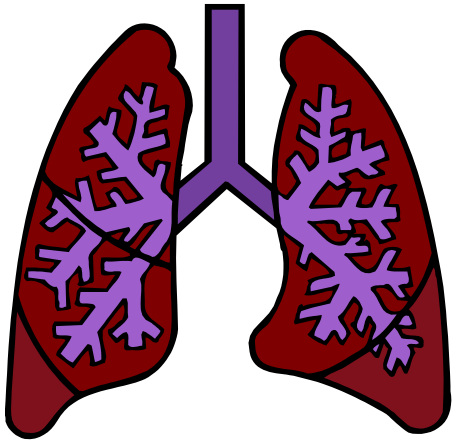
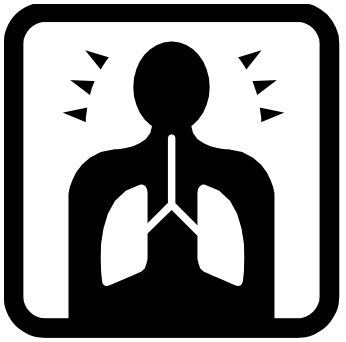
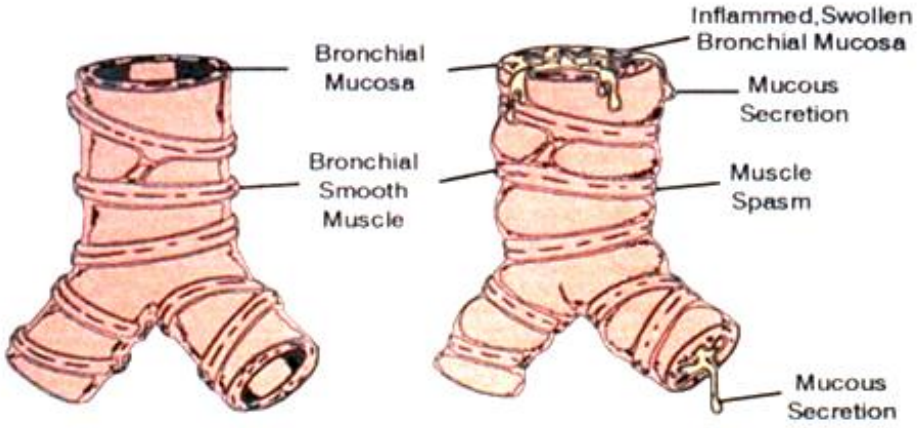
What Happens During an Asthma Attack?





- Airway muscles tighten
- Airway linings swell
- Mucus blocks airways

Narrow airways make it harder to breathe



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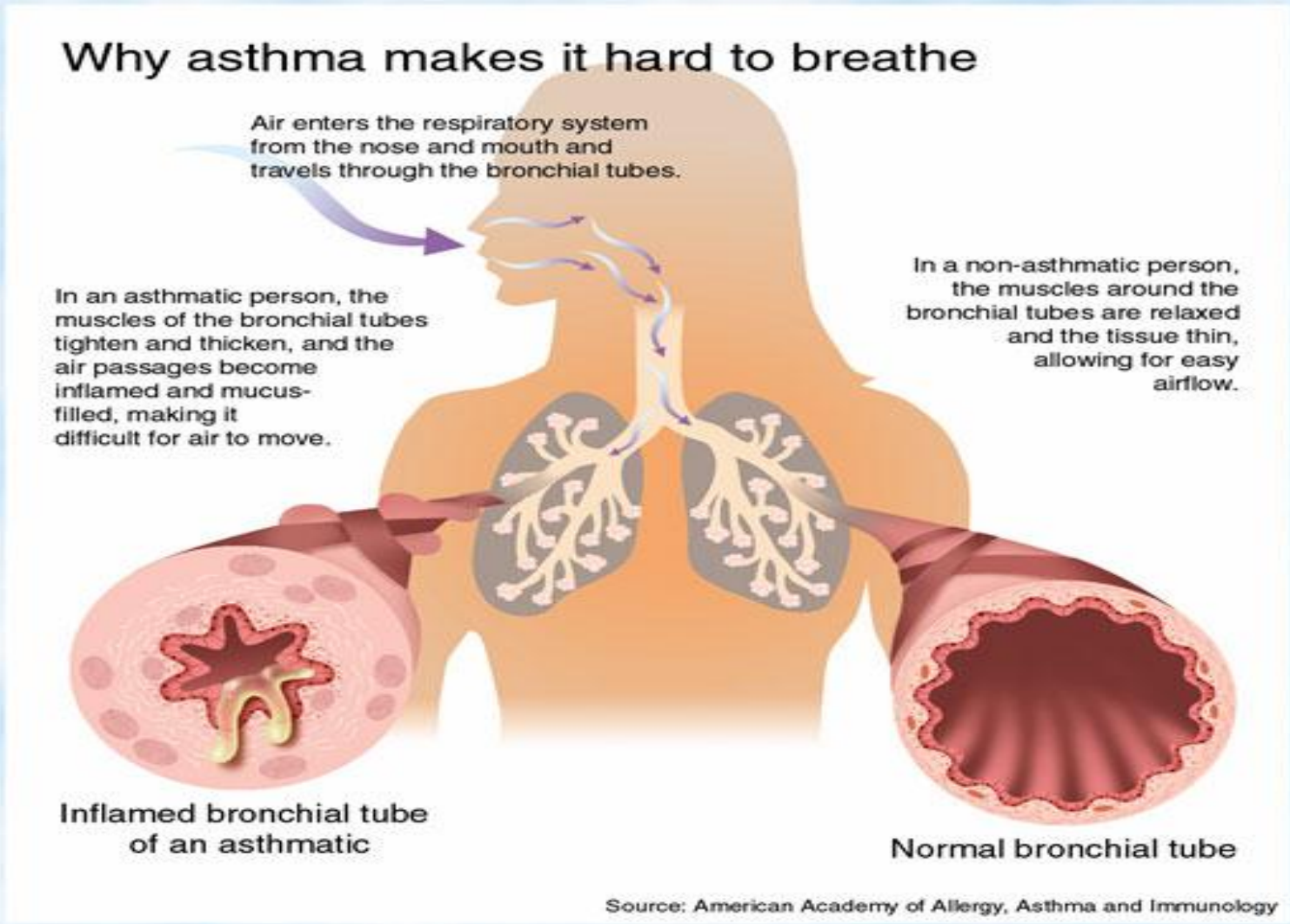
Asthma



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Asthma - Racial Disparity

African Americans and Hispanic populations in the US continue to have higher rates of asthma emergency department visits, hospitalizations, and deaths than do Caucasians:

<u>African-American Population</u>

- The rate of emergency department visits is 330% higher
- The hospitalization rate is 220% higher
- The asthma death rate is 190% higher

<u>Hispanic Population</u>

- Approximately 3 million Hispanics in the U.S. have asthma and Puerto Ricans are disproportionately impacted
- The rate of asthma among Puerto Ricans is 113% higher than non-Hispanic white populations and 50% higher than non-Hispanic black populations

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Asthma afflicts 20 million Americans yearly, including 6.8 million children, and causes:

- 14 million school days missed each year and is the leading cause of school absences for children ages 5 through 7
- Asthma accounts for about 10.1 million missed work days for adults annually
- 40% of asthma episodes are caused by asthma triggers in the home – representing $5 billion lost annually in preventable medical costs

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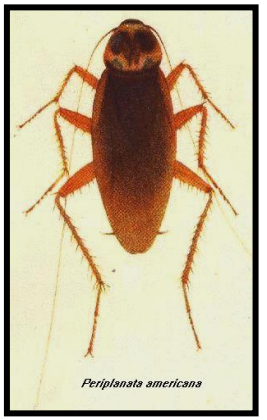
Asthma Triggers in the Home



Examples:

- Mold
- Mice and Rats
- Cockroaches
- Dust Mites
- Pet Hair and Dander
- Environmental Tobacco Smoke
- VOCs/Chemical Odors

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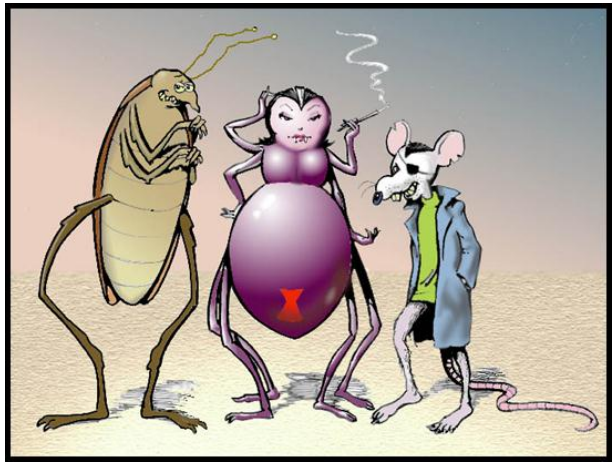
Keep It Pest-Free – Benefits:

- Reduces cockroach, mouse, and rat infestations that can trigger asthma episodes and other health problems
- Reduces inappropriate treatment for pest infestations that can exacerbate health problems and respiratory illnesses
- Reduces pesticide residues in homes that pose risks for neurological damage and cancer



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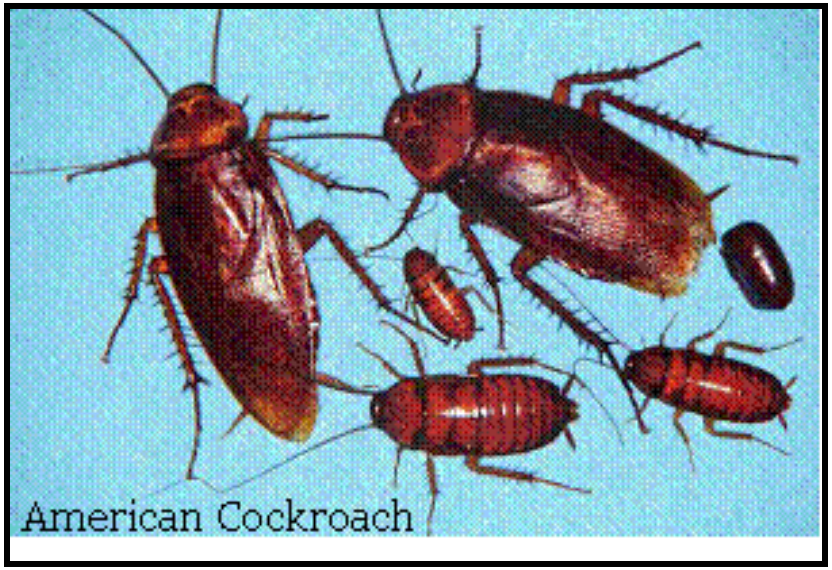
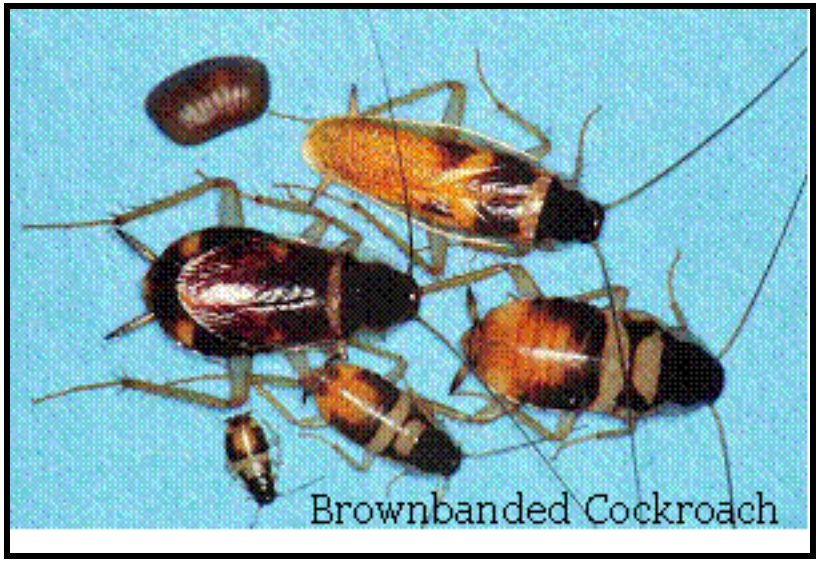
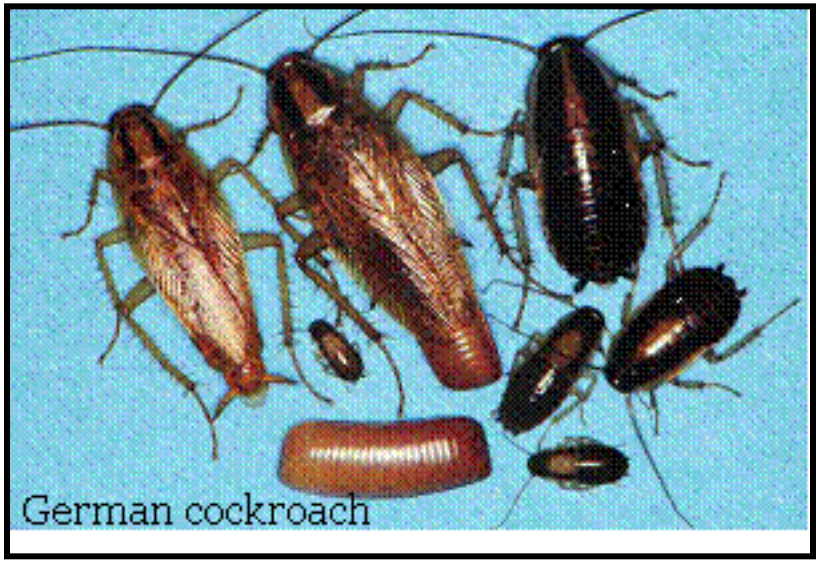
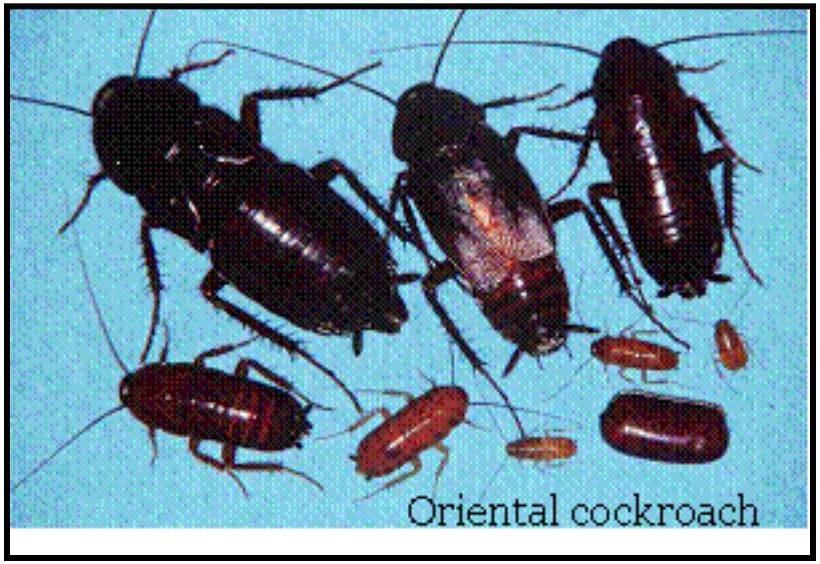
Cockroaches









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Health Threats From Cockroaches

- One of the most common and allergenic of indoor pests.
- There is a strong association between the presence of cockroaches and increases in the severity of asthma symptoms in individuals sensitive to cockroach allergens.
- Cockroaches are common even in the cleanest of crowded urban areas and older dwellings. They are found in all types of neighborhoods. Can contaminate food.
- The proteins found in cockroach saliva are particularly allergenic but the body and droppings of cockroaches (frass) also contain allergenic proteins.

Source: The Natl. Institute of Environmental Health Sciences

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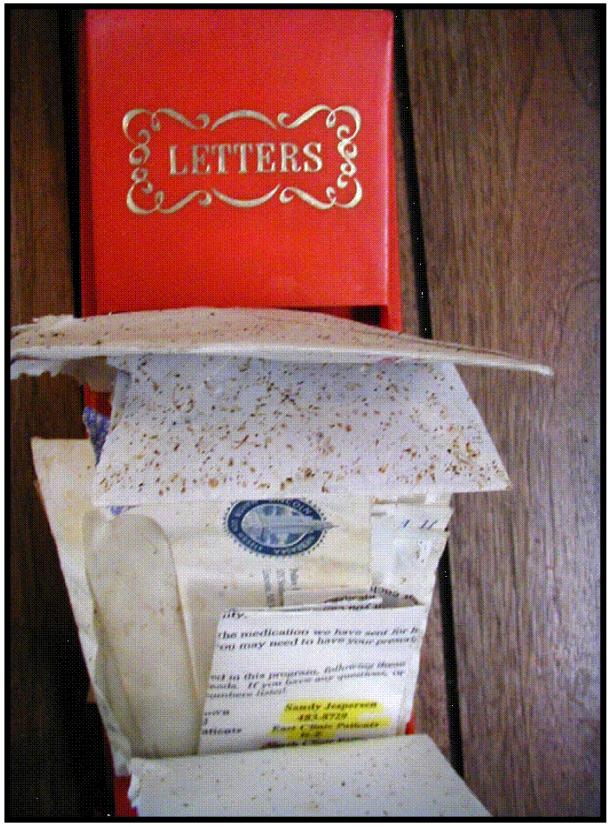
Frass



- Each fecal pellet – roach poop, called “frass” – contains enough of the allergen “Bla g1” to trigger many asthma attacks. Each and every pellet can contain 500 units of the allergen: enough to trigger over 50 allergy attacks!

http://extension.psu.edu/ipm/health/healthpests/asthma

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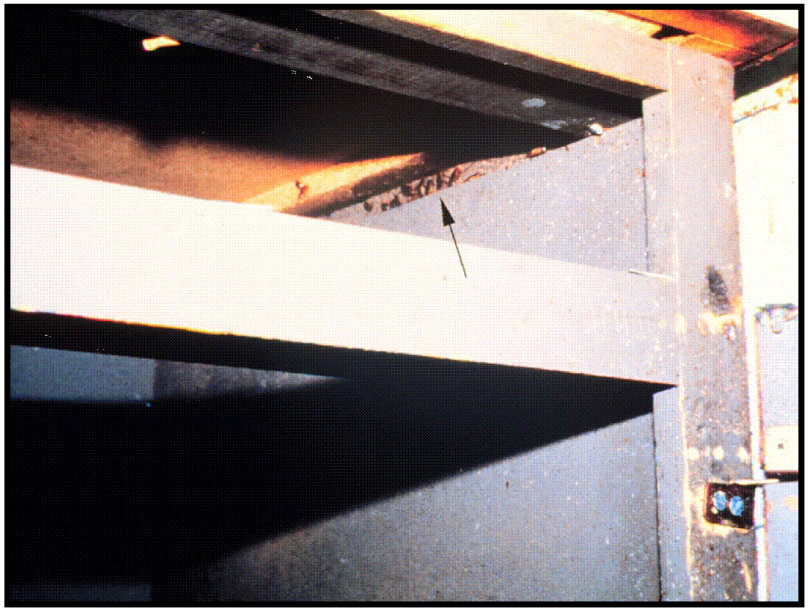
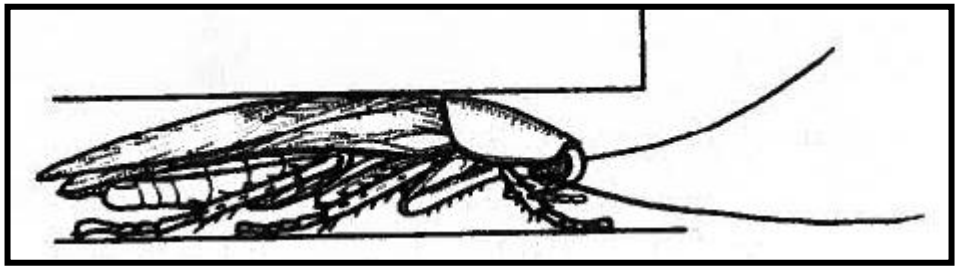
Cockroach Habitat





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Cockroaches - Eating Habits

- Most cockroaches are fond of fats and flour
- Roaches also love bread, stale beer, wine, fatty acids, alcohols, e.g., Jack Daniel's Whiskey
- Peanut butter is a big hit
- Attracted to ground up roaches and their own excrement
- Glue and paper are popular
- A water source is a necessity

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What is Integrated Pest Management (IPM)?

- IPM is one approach to pest management
- Relies on a combination of common-sense practices
- Uses information on the life cycles of pests and their interaction with the environment
- Manages pest damage with the most economical means
- Manages pest damage with the least possible hazard to people, property, and the environment

Source: USEPA

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Steps to Reduce Cockroach Infestations

- Keep food and garbage in closed, tight-lidded containers. Never leave food out in the kitchen.
- Do not leave out pet food or dirty food bowls.
- Eliminate water sources that attract these pests, such as leaky faucets and drain pipes.
- Mop the kitchen floor and wash countertops at least once a week to reduce urine and feces.
- Plug up crevices around the house through which cockroaches can enter.
- Use Sticky Traps.
- Use Boric Acid in safe areas.
- Use bait stations and other environmentally safe pesticides to reduce cockroach infestation. Place Gel Baits in areas where you see roaches and frass.

Source: The Natl. Institute of Environmental Health Sciences

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Health Threats From Rodents

- Significant asthma trigger
- Rodents can carry more than 200 human pathogens
- Salmonellosis can be transmitted to people who ingest food contaminated by salmonella bacteria in rat urine or feces
- Murine typhus, leptospirosis, listeriosis and trichinosis are other rat-transmitted diseases
- Rats have occasionally been known to bite sleeping people; these bites can result in an infection known as rat bite fever
- Plague bacteria can be transmitted from rats to people through the bite of rat fleas

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Signs of a Rodent Infestation

- Presence of live or dead rodents.
- Rodent nests (Bits of paper, straw, rags, etc.)
- Rodent odor (Distinct odor from rodent urine)
- Droppings (Activity and severity of the problem)
- Evidence of gnawing
- Rub marks (Indicator of habitual pathways)
- Runways (Frequently traveled paths)
- Tracks (Footprints)
- Rat Burrows (Tunnels dug below ground)

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House Mouse - Eating Habits

- Prefer seeds and grain
- They are not hesitant to sample new foods and are considered "nibblers”
- Foods high in fat, protein, or sugar may be preferred even when grain and seed also are present. Such items include bacon, chocolate candies, butter and nutmeats
- A single mouse eats only about 3 grams of food per day (8 pounds per year)
- Because of their habit of nibbling on many foods and discarding partially eaten items, mice destroy considerably more food than they consume
- Can get by with little or no water, although they readily drink water when it is available

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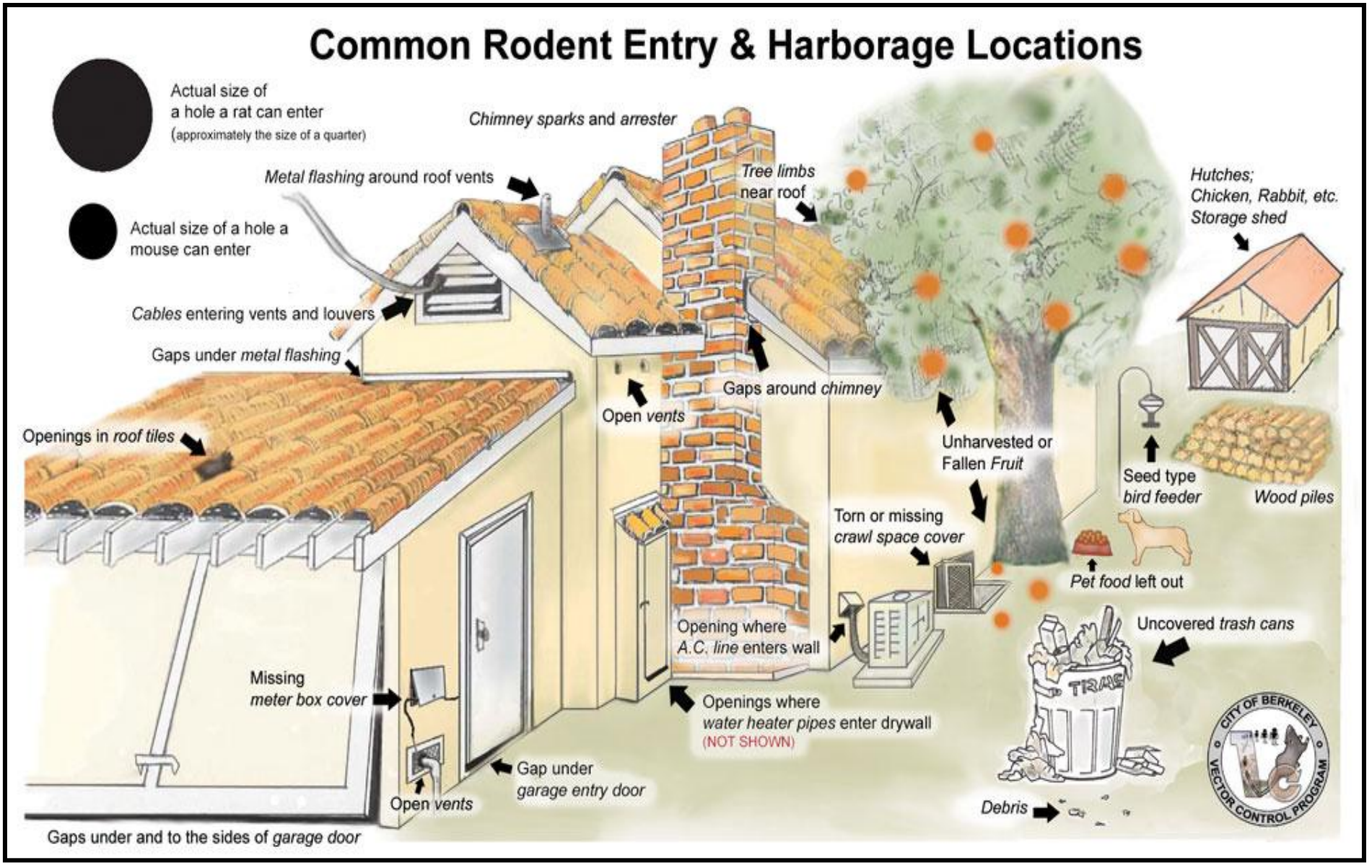
Common Rat - Eating Habits

- Rats prefer fresh food if they are offered a choice
- The common rat prefers to feed on protein foods like meat, fish, insects and pet feed
- Rats often cache or hoard food (including rat poison) in hidden areas for use when food supplies run short


Common Rodent Entry & Harborage Locations
Actual size of a hole a rat can enter (approximately the size of a quarter)
Actual size of a hole a mouse can enter
Chimney sparks and arrester
Metal flashing around roof vents
Tree limbs near roof
Hutches; Chicken, Rabbit, etc. Storage shed
Cables entering vents and louvers
Gaps under metal flashing
Gaps around chimney
Open vents
Openings in roof tiles
Unharvested or Fallen Fruit
Seed type bird feeder
Wood piles
Torn or missing crawl space cover
Pet food left out
Opening where A.C. line enters wall
Uncovered trash cans
Missing meter box cover
Openings where water heater pipes enter drywall (NOT SHOWN)
Gap under garage entry door
Open vents
Debris
Gaps under and to the sides of garage door
CITY OF BERKELEY VECTOR CONTROL PROGRAM

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Rodent Damage

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What is Integrated Pest Management for Rodents?

- Keep pests out and with no place to hide
  - Change surrounding landscape
  - Block pest entries, passages, harborage & clutter
  - Seal holes and cracks – use wire mesh
- Reduce food and water availability
  - Practice proper food storage & disposal
  - No dirty dishes in the sink overnight
  - Clean crumbs, grease, etc.
- Conduct regular cleaning to reduce urine and feces
- Knock down population
  - Traps
  - Appropriate pesticides ONLY when needed

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IPM For Rodents - Keep Them Out

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Pests (WAP 11-6)

Health Effect	WAP 11-6 H&S Category	Action/ Allowability
Asthma Episodes	Pests	Pest removal is allowed only where infestation would prevent weatherization. Infestation of pests may be cause for deferral where it cannot be reasonably removed or poses health and safety concern for workers. Screening of windows and points of access is allowed to prevent intrusion.

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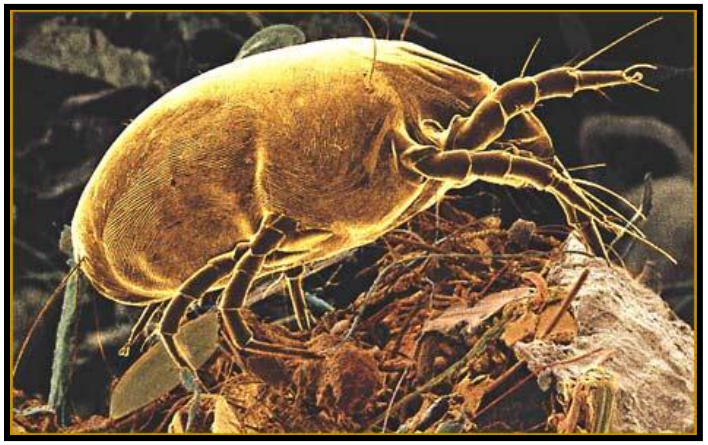

Dust Mites

- Microscopic spider-like creatures
- Live in dust, fabric, bedding, furniture, carpets, etc.
- Eat dead skin cells
- Need food, moisture, warmth

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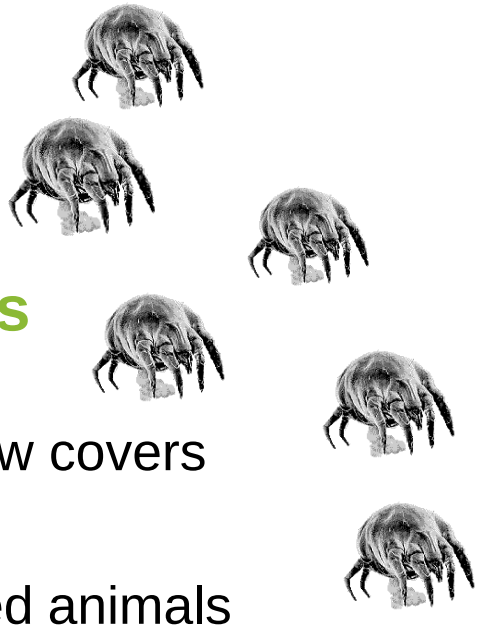

Steps to reduce exposure to dust mites

1. Purchase allergen blocking mattress and pillow covers
2. Wash bed linens weekly in hot water
3. Wash, freeze or put in dryer pillows and stuffed animals
4. Use a HEPA filter vacuum on all carpeted areas and on furniture and upholstery
5. Keep humidity levels down (under 50% RH) by using a dehumidifier, ventilation fan or AC

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Healthy Homes Principles – 7 Elements

Keep It Clean

Source: HUD and CDC

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Keep It Clean

Clean homes help reduce pest infestations and exposure to contaminants.

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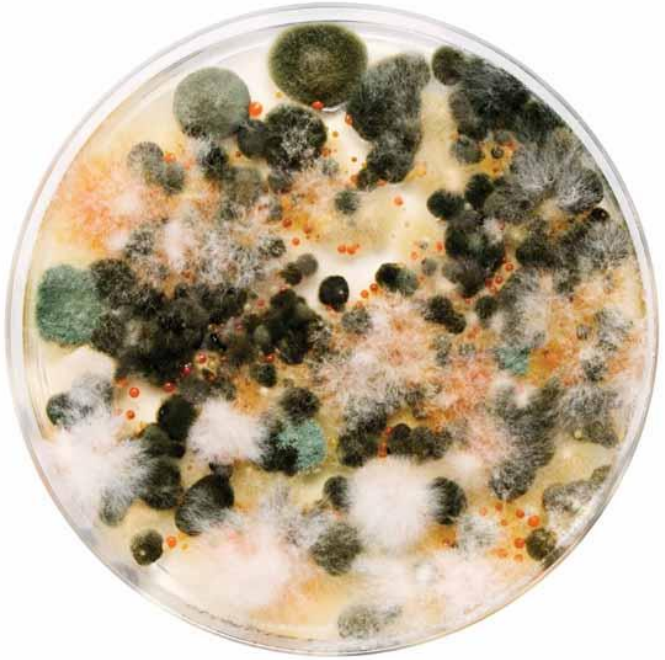
Biological contaminants include

1. Bacteria
2. Molds
3. Mildew
4. Viruses
5. House dust mites
6. Cockroaches
7. Pollen
8. Animal dander and cat saliva



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Keep It Clean - Benefits:

- Controls the source of dust and contaminants in the home
- Creates smooth and cleanable surfaces
- Reduces clutter that provides harborage for pests
- Reduces food and water sources for pests
- Prevents asthma episodes, household injury, and exposure to contaminants that may lead to illnesses such as hypersensitivity pneumonitis or allergic rhinitis
- Prevents impact of biological contaminants on health such as sneezing, watery eyes, coughing, shortness of breath, dizziness, lethargy, fever, and digestive problems

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Clutter & Waste Management

- Clutter provides harborage and food sources for rats, mice, and roaches
- Clutter is a safety hazard
- Clutter and garbage result in unsanitary conditions

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Clutter & Waste Management

Green & Healthy Homes Initiative

- Make Floors smooth and cleanable so that proper and effective cleaning can be regularly conducted
- Conduct wet cleaning and HEPA-vacuuming to reduce dust, other allergens, and contaminants

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Asthma Triggers - Chemical Odors

- Household cleaning agents used in the home leave behind chemical residue
- These odors can trigger an asthma attack in people with asthma. Also can cause ear, nose & throat irritation
- Use environmentally friendly products such as baking soda or vinegar as cleaning agents

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Healthy Homes Principles – 7 Elements

Keep It Dry

Keep It Well-Ventilated

Source: HUD and CDC

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Keep It Dry

Stop water from entering the home through leaks in the roofing system, poor drainage, or interior plumbing leaks.

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Problems with Moisture

- Moisture is a major cause of harm and damage to humans and building components
- Moisture and mold can cause:
  - Upper respiratory problems
  - Coughing
  - Wheezing
  - Asthma symptoms
  - Hyper sensitivity pneumonitis

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Keep It Dry – Benefits:

Maintaining a dry rather than a damp home can:

- Prevent mold growth
- Prevent a hospitable environment for dust mites, roaches, and rodents
- Reducing indoor allergens

Molds are fungi that can be found both indoors and outdoors. Molds grow best in warm, damp, and humid conditions.
Source: Center for Disease Control

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Why is Mold Harmful?

- Asthma trigger
- Allergen
- Respiratory issues
- Structural damage to the home

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Places You Might Find Mold

- Bathrooms – especially around the shower or tub, and on the walls, ceiling or floor
- In wet or damp basements and crawl spaces
- Around leaky bathrooms and kitchen sinks
- In attics under leaky roofs
- On windows and walls where condensation collects
- Under wallpaper or carpet
- In or around air conditioner, etc.

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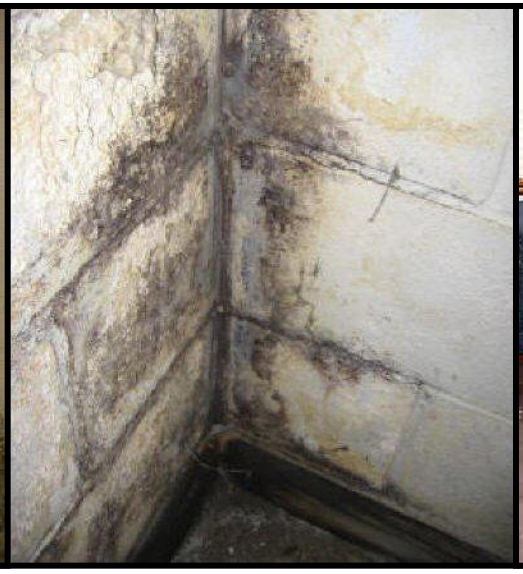
Mold Contamination



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How Does Water Get Into a House?

Roof Leaks

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How Does Water Get Into a House?

Plumbing Leaks

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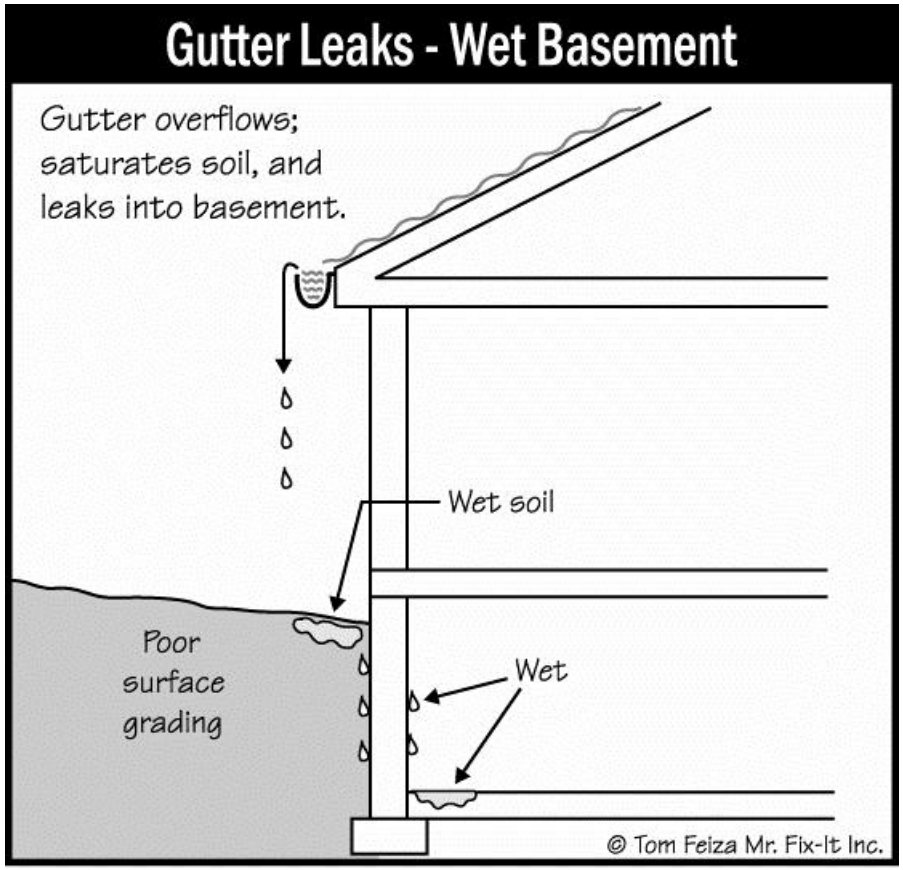
How Does Water Get Into a House?

Defective Gutters & Downspouts



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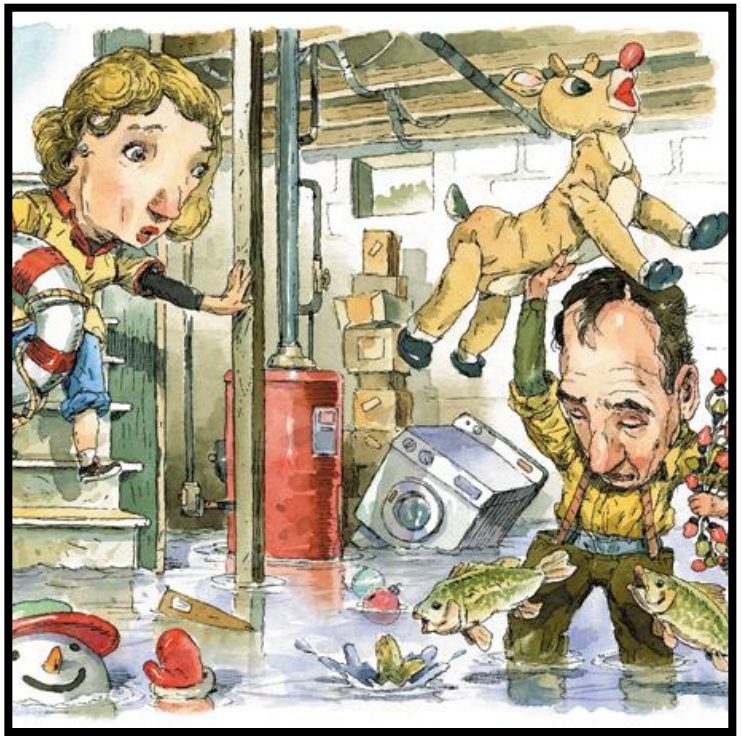
How Does Water Get Into a House?

Dripping air conditioner, heavy snow

Pipe burst, sewer backup, hot water tank, washing machine



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Moisture in Basements & Crawlspaces

There are 3 main sources of moisture into basements or crawlspaces:

1. Liquid water from rain or ground water
2. Interior moisture sources (humidifiers, unvented clothes dryers, bathrooms, cooking, moisture in concrete)
3. Exterior humid air entering basement and condensing on cooler surfaces

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Typical Causes of Basement Moisture Problems

1. **Inadequate Grading** - Place earth around the house so water slopes away from foundation wall. Minimum of 1 inch/foot for at least 6 feet
2. **Defective or missing gutters and downspouts** - Install proper downspouts. Extensions should discharge water at least 4 ft. beyond the wall
3. **Structural cracks** - proper footing design and proper connection between foundation wall and structure above
4. **Ineffective drain tile and sump pit**

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How to Prevent Basement Moisture Problems

- Remove excessive internal moisture sources (humidifiers, cooking) and ventilate other sources (bathroom, dryer)
- Dehumidification (not a permanent or complete solution)
- Coating the inside with water sealant or membrane (works for a short time)
- Evaluate the gutters, downspouts, and surface grading and fix if deficient (recommended approach)
- Interior or exterior drainage system if problem persists

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The Key to Mold Control is Moisture Control

- When addressing mold problems: address the source of the moisture problem or the mold problem may simply reappear
- Check for high humidity and condensation problems as well as actual water leaks, maintenance issues, and HVAC problems
- Protect the health and safety of the building occupants and remediators (PPE & containment)
- Consult a health or mold professional as needed

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The key to mold control is moisture control

Mold Prevention

1. Fix source(s) of moisture problem(s) as soon as possible
2. Fix leaky plumbing and leaks in the building envelope as soon as possible
3. Watch for condensation and wet spots
4. Clean and dry wet or damp spots within 48 hours
5. Throw away wet carpeting, mattresses, cardboard boxes, insulation, or other things that have been very wet for more than two days

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The key to mold control is moisture control

Mold Prevention

6. Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing properly, and unobstructed
7. Vent moisture-generating appliances, such as dryers, to the outside where possible
8. Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible
9. Perform regular building/HVAC inspections and maintenance as scheduled

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The key to mold control is moisture control

Mold Prevention

10. Don’t let the foundation stay wet. Provide drainage and slope the ground away from the foundation
11. Use downspouts to direct rainwater away from the house. Make sure the gutters are working
12. Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in the air (humidity)

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Safety Measures While Investigating and Evaluating Mold and Moisture Problems

- Do not touch mold or moldy items with bare hands
- Do not get mold or mold spores in your eyes
- Do not breathe in mold or mold spores
- Consider using Personal Protective Equipment when disturbing mold (The minimum PPE is an N-95 respirator, gloves, and eye protection.)

Guidelines for remediating materials with mold growth caused by clean water

Area of Material Affected	*Personal Protective Equipment*	*Containment*
Small area – Total surface area affected is less than 10 sq. ft.	**Minimum** – N-95 respirator, gloves, and goggles	**None required**
Medium area – Total surface area affected between 10 and 100 sq. ft.	**Limited (or full) –** N-95 or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection	**Limited –** Use polyethylene sheeting ceiling to floor around affected area with a slit entry and covering flab. Maintain area under negative pressure (HEPA filtered fan)
Large area – Total surface area affected greater than 100 sq. ft. or potential for increase occupant or remediator exposure during remediation estimated to be significant	**Full –** Gloves, disposable full body clothing, head gear, foot coverings, full-faced respirator with HEPA filter	**Full –** Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building.

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Before Cleaning the Mold Hazard

1. Assess size of moldy area
2. Consider the possibility of hidden mold
3. Remove small children, sick people, elderly and anyone with allergies or asthma from the home until it is cleaned up
4. Protect yourself (Use PPE)
5. Throw away things that have been wet for over 48 hours
6. Wrap anything you are going to throw away in plastic to stop mold from spreading
7. Biocides such as bleach are not recommended as routine practice due to their toxicity

Clean up Methods

Method 1	**Wet vacuum** (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
Method 2	**Damp-wipe** surfaces with plain water or with water and detergent solution (except wood – use wood cleaner); scrub as needed.
Method 3	**High Efficiency Particulate Air (HEPA)** vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
Method 4	**Discard** – remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Small mold issues can be cleaned with a detergent and water solution. Leave big mold jobs for a mold remediation specialist.

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Mold and Moisture (WAP 11-6)

Health Effect	WAP 11-6 H&S Category	Action/ Allowability
Asthma Episodes	Mold & Moisture	Limited water damage repairs that can be addressed by weatherization workers and correction of moisture and mold creating conditions are allowed when necessary in order to weatherize the home and to ensure the long term stability and durability of the measures. Where severe Mold and Moisture issues cannot be addressed, deferral is required
	Drainage - gutters, down spouts, extensions, flashing, sump pumps, landscape, etc.	Major drainage issues are beyond the scope of the Weatherization Assistance Program. Homes with conditions that may create a serious health concern that require more than incidental repair should be deferred. See Mold and Moisture guidance below.

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Keep It Well-Ventilated

Ventilate bathrooms and kitchens and use whole house ventilation for supplying fresh air to reduce the concentration of contaminants in the home.

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Keep It Well-Ventilated – Benefits:

- Ventilation plays an important role in maintaining health to humans and house (Improves respiratory health)
- Ventilation is necessary to remove humidity (reduces mold growth) and dilute or remove contaminants (reducing the effects of VOCs, radon exposure, and other contaminants)

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Indoor Air Quality in Households in the US

- Indoor Air Quality (IAQ) is often 2-5 times worse than outdoor air (USEPA)
- Pollutants can be found in concentrations 2-5 times higher than outdoors
- We spend 70 – 80% of the time indoors
- Higher rates of respiratory irritation and illness in housing with poor ventilation
- Increased rates of absences from school or work

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Common Indoor Contaminants

- VOC's (volatile organic compounds)
- Moisture
- Radon
- Environmental Tobacco Smoke
- Particulate Matter
- Allergens
- Mold
- Carbon Monoxide
- Nitrogen Dioxide

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A Well-Ventilated Building Provides

- Whole house ventilation - supplies fresh air to reduce contaminants by dilution
- Control of airflow throughout building – so it won’t carry contaminants into or around the house
- Local exhaust or spot ventilation - removes moisture, odors, and other pollutants at the source

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Airflow in Homes

- Typical homes do not have a planned supply of air
- We depend on leakage such as windows, door, and cracks
- Also known as: Natural Ventilation
- This is not adequate

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ASHRAE 62.2-2010

- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) sets ventilation standards
- ASHRAE 62.2-2010 – Whole House Ventilation Requirement
- Requires fan powered ventilation in all homes with exception of very leaky homes or homes that require heating and cooling
- Local (Spot) Ventilation Requirement

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Mechanical Ventilation

- Intentional (HVAC system)
- Controlled amount & timing of air exchange
- Provides fresh air
- Remove pollutants, odors, moisture, CO, formaldehyde, radon, VOC's, stale air, moisture (mold growth)

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Spot Ventilation

- Use of localized exhaust fans to quickly remove pollutants at their source as they are generated
- Noise is a big reason people avoid using exhaust fans
- Bathroom (moisture) & kitchen (CO) fans
- Attic fans draw cool air out of a home which is replaced with humid air through gaps/cracks

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What Needs Spot Ventilation?

- Bathrooms
- Clothes dryers
- Kitchen ranges
- Boilers, furnaces, hot water heaters
- Fireplaces, wood burning stoves

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Sources of Combustion Contaminants

- Oven as heater
- Spillage from furnace, water heater, fireplace
- Vent-less heater, fireplace, or stove
- Car exhaust from attached garage

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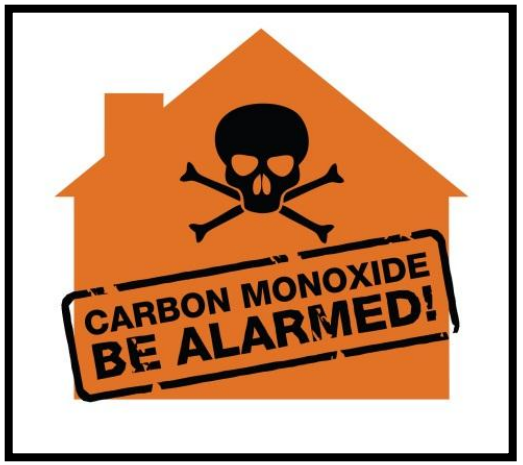
Combustion Contaminants Health Effects

Carbon Monoxide (CO)

- Colorless, odorless, and tasteless gas
- Silent Killer

Nitrogen Dioxide (No_2)

- Eye, nose, and throat irritation
- Shortness of breath



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Health Effects of Carbon Monoxide

At low concentrations

- Fatigue in healthy people and chest pain in people with heart disease

At higher concentrations

- Impaired vision and coordination
- Headaches, dizziness, confusion, nausea, reduced brain function

Fatal at very high concentrations

- At higher concentrations, CO exposure can be fatal

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Carbon Monoxide Alarms

- Place near sleeping area
- Put on every level of a home for extra protection
- Do not install directly above or beside fuel-burning appliances
- Install on ceiling or on walls (5-6 in from ceiling)

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Environmental Tobacco Smoke (ETS)

- Secondhand smoke can trigger asthma episodes and increase the severity of attacks
- Secondhand smoke is linked to other health problems, including lung cancer, ear infections and other chronic respiratory illnesses, such as bronchitis and pneumonia.

United States Environmental Protection Agency

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Asthma Triggers - Chemical Odors

- Air fresheners, perfumes, paint, pesticides, certain glues, particleboard, vinyl flooring and tiles, dry-cleaned clothes, toner from photocopiers, and cleaning agents used in the home
- These odors can trigger an asthma attack in people with asthma

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Ventilation and Filtration

1. Pollutant Prevention/Source Control
    - Particulates, VOCs, Pets, Chemicals, Cleaning. ETS
2. Whole House Filtration
    - Minimum Efficiency Reporting Value (MERV) Rating
3. Portable Air Cleaners
    - Clean Air Delivery Rate (CADR) Rating
4. Other Filtration Terms
    - High Efficiency Particulate Air (HEPA) Filter
    - Ultraviolet Germicidal Irradiation (UVGI)
    - Ozone

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Healthy Homes Principles – 7 Elements

Keep It Safe

Source: HUD and CDC

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Keep it Safe

- Injury is the leading cause of death and disability among children and young adults
- Household Injuries are Commonly Caused by
  - Falls
  - Fires/burns
  - Electrical hazards
  - Slip and fall hazards
  - Tripping hazards
  - Chemical poisonings
  - Choking hazards

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Injury or Accident?

- Accidents are events that happen completely by chance, with no planning or deliberate intent
- Injuries are *preventable*: they do not occur at random

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Household Injury

- 1.6 million older adults were treated in U.S. emergency departments for unintentional fall-related injuries and 388,000 of these patients were subsequently hospitalized
- 47% of households in the US with children under 5 years old had a pesticide stored in an unlocked cabinet within reach of a child
- 400,000 residential fires/year result in ~ $7 billion in property damage and 3,000 deaths
- Each year, more than 500 people in the US die from accidental CO poisoning

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Keep It Safe – Benefits:

- Prevents chemical poisonings
- Prevents carbon monoxide poisonings
- Prevents burns and death from fire
- Prevents household injuries from tripping, falls, sharp objects, choking hazards, etc.

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Child Safety

- Presence & location of crib
- Choking hazards
- Accessibility/storage of toxic products
- Covers for radiators
- Cabinet locks
- Safety covers for electric outlets
- Stability of big appliances (stove, refrigerator, TV)

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Fires and Burns

- 75% of households do not know the temperature setting on their water heaters
- 91% are unaware of the temperature of hot tap water

FACT:
There is a 50-80% reduction in injury and death due to fire in homes with smoke alarms
(Source: CDC 2002)

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Fire Safety

- Presence/absence of smoke alarms
  - Install or replace units
- Fire Exits
  - Are fire exits available?
  - Are fire exits functional?
  - Fire escape plan?

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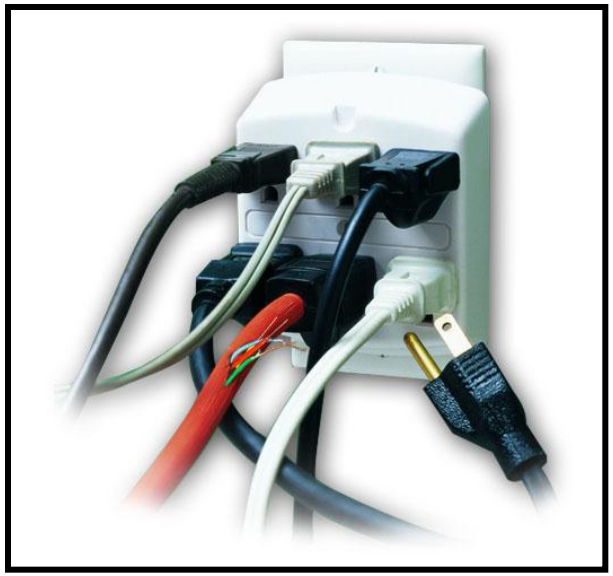
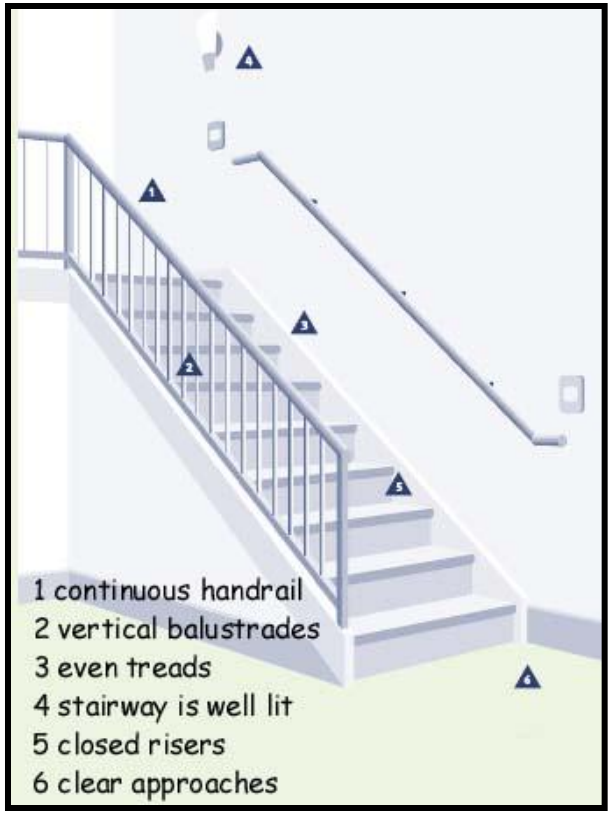


Electrical Hazards

- Exposed wires
- Condition of electrical outlets
- Overloaded power strips
- Knob and tube wiring

Structural Hazards

- Unsafe doors or windows
- Holes, unsafe stairs or handrails



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Tripping Hazards

- Smooth floors or slippery floors
- Worn-out areas
- Cables across the floor

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Carbon Monoxide Sources

Leaking Chimneys or furnaces

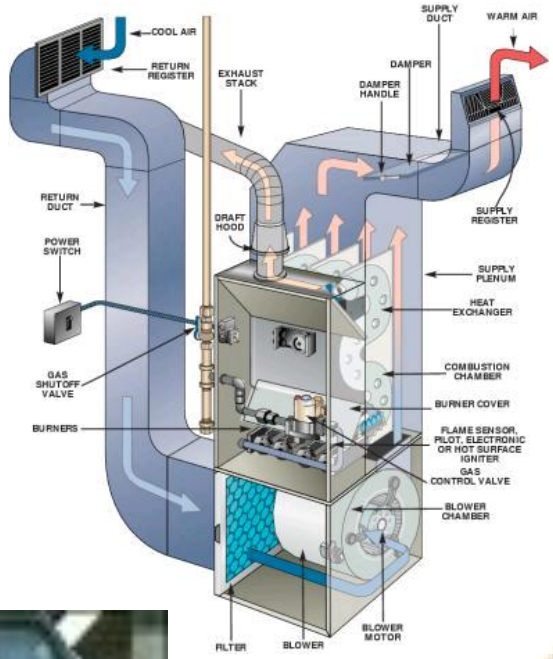
Gas space heaters

Gas and Wood Stoves

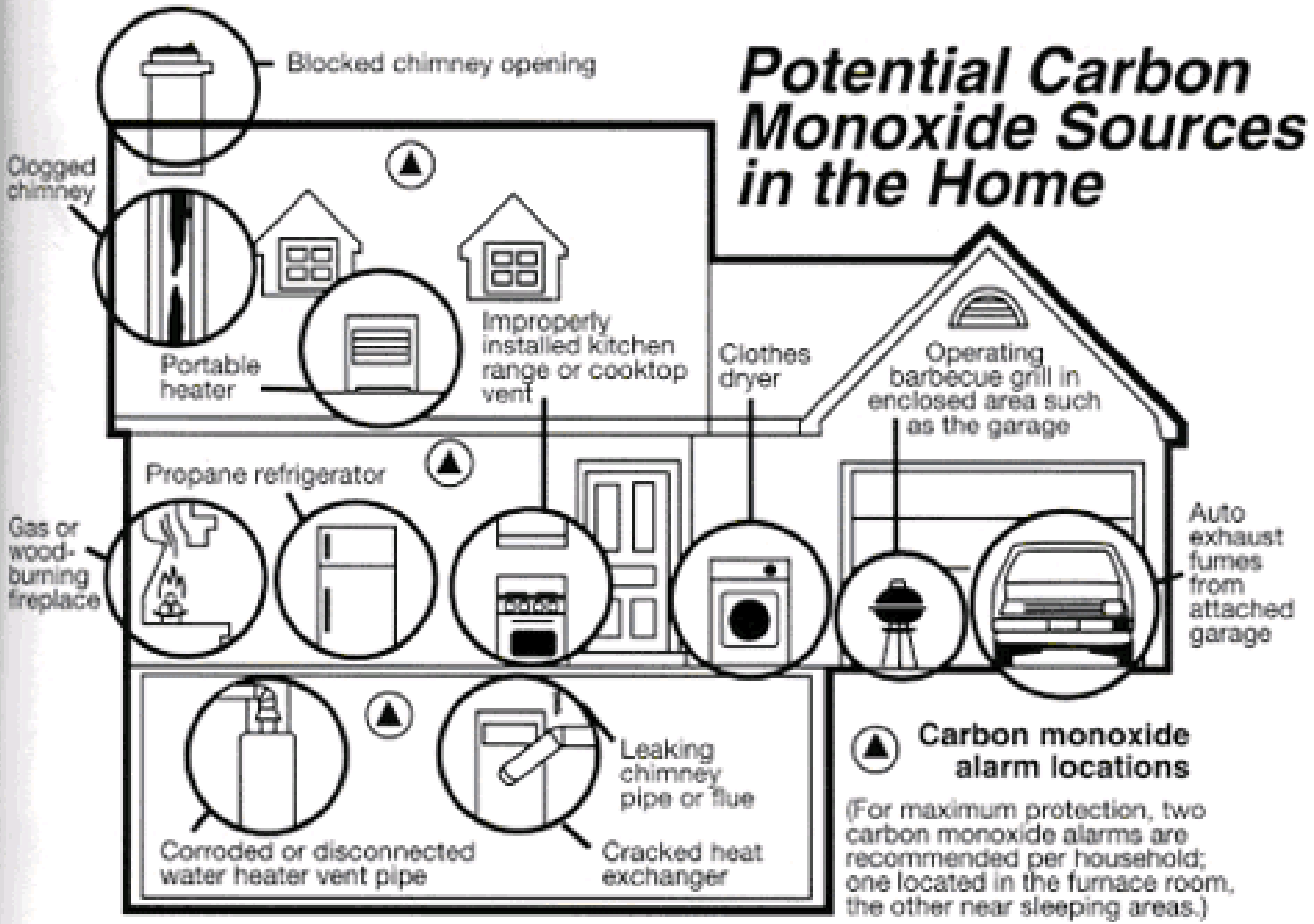
Generators

Tobacco Smoke

Automobile Exhaust



Potential Carbon Monoxide Sources in the Home



Information provided by BRK Electronics.

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Steps to Reduce Safety Hazards in the Home

1. Smoke detectors. One on each floor and outside of bedrooms. Free from your local fire department
2. Carbon Monoxide Detector. One outside of bedrooms and one on the main level of the house
3. Poisonous chemicals away in a kid-proof cabinet (safety latches). Anything with Caution, Warning, or Danger on the label needs to be away from your children
4. Storage of weapons and ammunition separately. Ammunition should be locked up so that kids cannot access it
5. Prevent slips, trips and falls by keeping floors clear of anything that may cause tripping

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Household Injury (WAP 11-6)

Health Effect	WAP 11-6 H&S Category	Action/ Allowability
Household Injury	Building Structure and Roofing	Building rehabilitation is beyond the scope of the Weatherization Assistance Program. Homes with conditions that require more than incidental repair should be deferred.
	Electrical, other than Knob-and-Tube Wiring	Minor electrical repairs are allowed where health or safety of the occupant is at risk. Upgrades and repairs are allowed when necessary to perform specific weatherization measures.
	Fire Hazards	Correction of fire hazards is allowed when necessary to safely perform weatherization.
	Injury Prevention of Occupants and Weatherization Workers - Measures such as repairing stairs and replacing handrails.	Workers must take all reasonable precautions against performing work on homes that will subject workers or occupants to health and safety risks. Minor repairs and installation may be conducted only when necessary to effectively weatherize the home; otherwise these measures are not allowed.

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Healthy Homes Principles – 7 Elements

Keep It Well Maintained

Source: HUD and CDC

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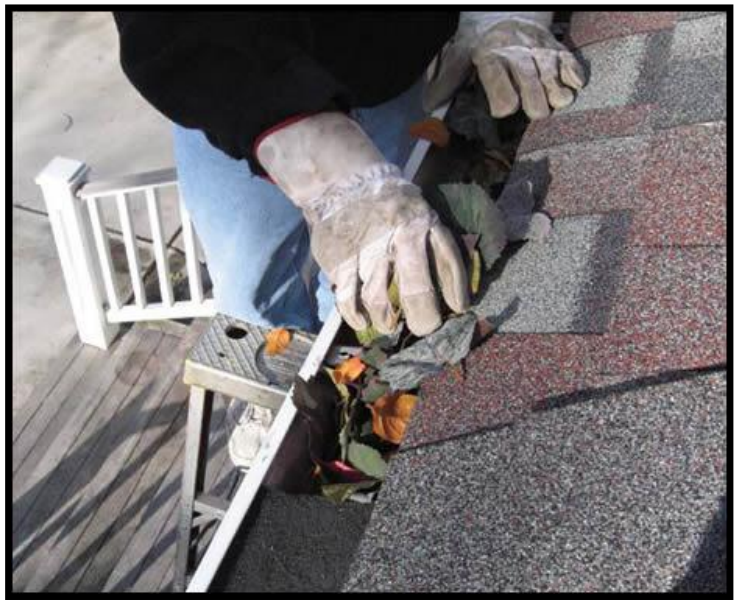
Keep It Well-Maintained

Inspect, clean and repair the home routinely. Take care of minor repairs and problems before they become large repairs and problems.



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Keep It Well-Maintained – Benefits:

- Addressing deteriorated lead-based paint and lead dust in older housing prevents the primary cause of lead poisoning
- Properly maintained homes reduces the risk for moisture and pest problems that lead to asthma episodes and other respiratory health problems

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Steps to Reduce Hazards Related to Poorly Maintained Home

- Remove clutter to avoid pests or tripping hazards.
- Routinely inspect and provide preventive maintenance to gas appliances (HVAC, water heater, gas stove, gas space heaters, etc.).
- Test all combustion appliances for carbon monoxide.
- Inspect for natural gas leaks (gas appliances and gas lines) exhaust pipes.

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Steps to reduce hazards related to poorly maintained home

- Inspect for blocked or clogged chimney opening.
- Look and fix cracked or separated exhaust flues.
- Look and fix corroded or disconnected vent pipes.
- Replace dirty HVAC air filter.
- Install and routinely test smoke alarms and CO detectors.
- Look for holes or gaps outside and inside that need to be filled in.

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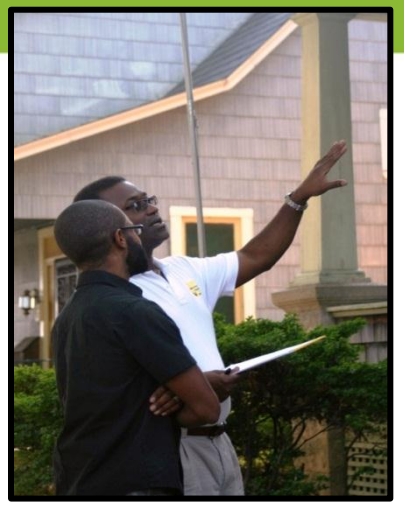

Owner and Resident Education

- Post remediation education with occupants to enhance intervention (Behavioral change – ETS, food and water sources for pests, clutter, thermostat)
- Behavioral training component to educate occupants on energy efficiency and reduction of energy usage
- Post remediation education with owners on how to sustain the intervention (Lead safe work practices (EPA RRP), ongoing maintenance)
- Use of program partner resources to conduct resident educations (health department, nonprofits)

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Benefits of Healthy Homes Strategy:

- Healthy Children Becoming Productive Adults
- Reduced Health Care Costs
- Reduced Childhood Injury
- Improved School Readiness
- Improved School Performance
- Reduced Special Education Costs
- Reduced Juvenile Crime and Delinquency
- Increased Property Values
- More Homes Eligible for WAP Interventions