Seven Principles of Healthy Homes

The Link Between Housing & Health

“The connection between health and the dwelling of the population is one of the most important that exists”.

*Florence Nightingale*

Maslow’s Hierarchy of Need

- Self-Actualization
- Ego
- Belonging
- Safety and Security
- Physiological Needs

Why Do We Care About Healthy Homes?

Young children spend nearly 80%-90% of their time inside.

Housing affects health both directly and indirectly:
- Physical, chemical, biological exposures
- Psychological
Start with People

- What good are they?
- What’s difficult about people?
- How can you deal with people?

Special Communication Issues

- Cultural
  - Shoes in the Home
  - Men and Women
  - Other
- Responding to Problems
  - Hoarding
  - Tolerance for Clutter and Pests
No Place Like Home!

Resident Overall Opinion of Structure
American Housing Survey – National 2005

<table>
<thead>
<tr>
<th>Type of Resident</th>
<th>Worst</th>
<th>2 to 4</th>
<th>5 to 7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>0.4%</td>
<td>1.8%</td>
<td>24%</td>
<td>28%</td>
<td>16%</td>
<td>28%</td>
</tr>
<tr>
<td>Renters</td>
<td>1.0%</td>
<td>4.1%</td>
<td>37%</td>
<td>27%</td>
<td>11%</td>
<td>19%</td>
</tr>
<tr>
<td>Severe Problems</td>
<td>3.4%</td>
<td>6.2%</td>
<td>35%</td>
<td>21%</td>
<td>12%</td>
<td>20%</td>
</tr>
<tr>
<td>Below Poverty</td>
<td>13.3%</td>
<td>3.6%</td>
<td>27%</td>
<td>23%</td>
<td>12%</td>
<td>28%</td>
</tr>
</tbody>
</table>

It may be frail; its roof may shake; the wind may blow through it; the storms may enter; the rain may enter – but the King of England cannot enter; all his forces dare not cross the threshold of the ruined tenement.

William Pitt

Where thou art, that is home.
Emily Dickinson

Home is the place where, when you have to go there, They have to take you in.
Robert Frost

He is happiest, be he king or peasant, who finds peace in his home.
Johann Wolfgang von Goethe

Home is where the heart is.
Timothy Radcliffe

The strength of a nation derives from the integrity of the home.
Confucius

There’s no place like home.
Dorothy, Wizard of Oz

One of our deepest needs is to be at home.
Different Approaches

HEALTH

- Primary Prevention
- Secondary Prevention
- Epidemiologic Triangle

HOUSING

- Lead
- Radon
- Allergens/Asthma
- Combustion Products
- Unintentional Injuries
- Insects & Rodents
- Mold & Moisture
- Pesticides
- Asbestos
- Fire

Well Constructed
- Energy Efficient
- Affordable
- Comfortable
- Well Maintained

What is Healthy Housing?

Healthy Housing is
- Designed,
- Constructed,
- Maintained, and
- Rehabilitated in a manner that is conducive to good occupant health.
The Real World is Complex

- Current knowledge
- Economic factors
  - Community
  - Family
- Social and cultural
- Affordability
- Political and legal factors
- “Do No Harm”
- Precautionary principles

But . . .

- 6.2 million homes had severe or moderate physical problems in the U.S. in 2005
- Total does not consider cockroaches, mold, dampness and other problems linked to health.
Why a Holistic Approach?

Moisture / Water Intrusion

Mold

Asthma Exacerbation

Structural Damage

Moisture / Water Intrusion
Seven Principles

1. Structural Damage
   - Pests
   - Lead Poisoning
   - Fire
   - Injuries

2. Asthma and Allergy Exacerbation
   - Pesticide
   - Pests
National Healthy Homes Training Center and Network
Seven Principles

Pesticide

Moisture

Mold

Structural Damage

Asthma Exacerbation

www.healthyhomestraining.org/launching
7 Healthy Homes Principles

Keep It:

1. Dry
2. Clean
3. Ventilated
4. Pest-Free
5. Safe
6. Contaminant-Free
7. Maintained

Keep It Dry
Keep It Dry

- Poorly managed rainwater/groundwater
  - Poor roof, wall, window & 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

Exterior Water Leakage

- About 12 million homes (10.7%) had exterior water leakage in 12 month period
  - 5.8 million - roof
  - 3.6 million - basement
  - 2.4 million - walls, closed windows or doors
  - 1.3 million - other or unknown source
- 6.4% of homes constructed since 2000 had problem.

From American Housing Survey – 2005
Interior Water Leakage

- More than 9 million homes (8.3%) had interior water leakage in 12 month period
  - Leaking pipes and fixtures key sources
- 5.5% of homes constructed since 2000 had problem.

From American Housing Survey – 2005

Overhangs Work
Air conditioner condensate drains into building

Poorly managed rainwater often causes moisture problems – either or by humidifying the whole house. Efflorescence is sometimes mistaken for mold.
Ground slopes toward house

Below grade

Bad Crawlspace

Crawlspace may contain mold, pests, pesticides, asbestos, lead paint and sewer gas. An apparently dry crawlspace can add excessive water vapor to a house.
Good Crawlspace

Plumbing problems
Leaky refrigerator drip pan causes mold

Mold in the air conditioner?
Condensation when cold outside

Mold due to poor insulation or wind blowing through insulation.

Mold around window where there is no insulation.

Unsealable recessed light allows warm, moist air into the unheated attic.
Keep It Clean

- Reduced exposure to:
  - Chemical contaminants
  - Allergens
  - Pest droppings and urine
  - Pesticides and consumer chemicals
  - Heavy metals such as lead and arsenic
- Reduced harborage for pests
Humid buildings may be colonized by dust mites. In dry climates dust mites are limited to porous materials that get humidified.

Where does house dust come from?

- Brought-In
- Home-Grown
  - Lead Dust
  - Dust Mites
- Resident-Made
  - Garbage
  - Clutter
What can we do to buildings to make them more cleanable?

- Install dust walk-off systems at entryways
- Keep activities which create dust away from people.
- Provide smooth, cleanable surfaces
- Provide effective storage space (to help avoid clutter)
- Choose flooring that is easy to clean
- Use vacuums that have good filtration and can be emptied quickly and thoroughly

Isolate Problems

Keep pets off beds and out of bedroom.
Cleanable Flooring

What to look for in a vacuum?

- Beater Bar
- Vacuum Strength
- Filter Type
- Dirt Sensor
How clean is clean?

- Clearance testing for lead
  - 40 micrograms of lead per square foot on floors
  - 250 micrograms of lead per square foot on window sills.
- Standards for allergens?
- Standards for dust?

What cleaning measures are problematic?

- Carpet cleaning
- Overuse of anti-microbials
- Sanitizers
- Air fresheners
Duct Cleaning

EPA recommends duct cleaning when:
- Substantial visible mold on hard surface ducts and other ventilation components.
- Ducts infested with rodents or insects.
- Ducts clogged with excessive dust and debris.
- Ducts actually release particles from supply registers.

Keep It Ventilated
Keep It Ventilated

- Pollutants can be found in concentrations 2-5 times higher indoors than outdoors.
- Proper ventilation can reduce hazards of:
  - Volatile organic compounds
  - Radon
  - Moisture
  - Environmental tobacco smoke
  - Particulate matter
  - Allergens
  - Mold
  - Carbon monoxide

Ventilation Problems

- Almost 8 million homes (7.3%) were uncomfortably cold for more than 24 hours last winter.
- More than 1.3 million homes (1.2%) used a space heater without a flue.

From American Housing Survey – 2005
Combustion Contaminants?

- Carbon Monoxide
  - Fatigue, headaches, dizziness, confusion
  - The “Silent Killer”
- Nitrogen Dioxide
  - Eye, nose, and throat irritation
  - Shortness of breath
- Moisture
  - Damp Indoor Environments

Sources of Combustion Contaminants

- Oven as heater
- Spillage from furnace, water heater, fireplace
- Ventless heater or fireplace
- Car exhaust from attached garage
Carbon Monoxide

Approximately 300 deaths plus more than 100,000 medical visits occur per year.

Carbon Monoxide Alarms

- Protects Against Life-Threatening Conditions
- Placement:
  - Place near sleeping area
  - Put on every level of a home to provide extra protection
  - Do not install directly above or beside fuel-burning appliances
Multi-family dwellings need planned fresh air supply:
--Neighbors are closer together
--Stack effect- this dominates in cold weather

Find the exterior exhaust
Filter Heated and Cooled Air

Well sealed panel

Poorly sealed access panel

Keep It Pest-Free
Keep It Pest-Free

- Integrated Pest Management
  - 10 Elements per HUD Guidance
  - Housekeeping
  - Maintenance
  - Exclusion
  - Ongoing Monitoring
  - Pesticides when needed

How Common are Pests?

- Signs of rodents in last three months
  - Rats - 880,000 (0.8%) homes
  - Mice - 6.1 million (5.6%) homes
  - Not sure what kind of rodent – 309,000 (1.3%) homes
- Cockroaches and other pests not measured
  - 50% of public housing residents say they had cockroaches
  - 10% had them all of the time.

*From American Housing Survey – 2005 and HUD's Real Estate Assessment Center*
Why Pest Free?

Health effects associated with pesticides include:

- Eye, nose, throat irritation
- Skin rashes, stomach cramps, nausea
- Central nervous system damage
- Kidney damage
- Increased risk of cancers

Use of some pesticides associated with increased risk of childhood leukemia.

Spray paint and pesticide in a kitchen.
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

Colonizing organisms must be controlled by changing the carrying capacity of the building – intervening in food, water, shelter or dating bars.
Power cord on desk

Window sill

Mouse droppings
Holes in Wall
EPA Pesticide Product Label

- Product Name
- Ingredients
  - Active
  - Inert / Other
- “Keep Out of Reach of Children”
- Signal Work - Poison / Danger / Warning / Caution
- First Aid
- If Poison, then skull and crossbones
- Net contents.

EPA Registration Number is Key
Illegal and Risky Pesticides

- Pesticides that look like candy
- Insecticide chalk (aka Miraculous or Chinese chalk)
- “Tres Pasitos”

Keep It Safe
Keep It Safe

What are the most common causes of home injury deaths?

- Falls: 33%
- Poisoning: 27%
- Fires and Burns: 18%
- Choking and Suffocation: 6%
- Drowning: 5%
- Firearms: 3%
- Other: 8%

There are many ways to be injured in the home.
Safety Related Housing Issues

- 1 million homes have holes in floors
- 2.5 million multi-unit homes with common stairways have loose steps
- 2.1 million homes have light fixtures in public halls that do not work.
- Electrical Wiring
  - 50,000 have no wiring
  - 700,000 have exposed wiring
  - 1,500,000 have rooms without electrical outlets

*From American Housing Survey – 2005*

Which age groups are most susceptible?

Falls are leading cause of nonfatal home injury for children from birth through 14 and for older population.

The highest rate of injury death for infants is from \textbf{choking and suffocation}.

Adults 80+ years of age are at \textbf{20} times higher risk for death from injury than younger individuals.

Highest rate of injury death for 1-14 year olds is \textbf{fires and burns}.
Product Label

- Signal word
  - CAUTION
  - WARNING
  - DANGER
  - POISON
- Affirmative statement of principal hazard
  - e.g.: HARMFUL IF SWALLOWED, FLAMMABLE, CORROSIVE
- Statement to read other cautions on another panel if all labeling is not on Principal Display Panel

Temperature guidance for fridge, freezer, hot water

- Refrigerator - 40 degrees F
- Freezer - 0 degrees F
- Hot Water - 120 - 125 degrees F
- Do the appliances work? Present?
Keep It Contaminant-Free

- Lead and Lead-Based Paint
- Environmental Tobacco Smoke
- Radon
- Biologicals (see Keep It Dry)
- Combustion By-Products (see Keep It Ventilated)
- Pesticides (see Keep It Pest-Free)
- Asbestos
- Volatile Organic Compounds (VOCs)
- Sewer Gas
Why Avoid Lead?
Related Health Effects

- Reduced IQ
- Learning disabilities
- Impaired hearing
- Reduced attention spans, behavior problems
- Anemia
- Kidney damage
- Damage to central nervous system
- Coma, convulsions, death

Lead Sources

- Peeling, Chipping Paint / Deteriorated Paint
- Dust
- Soil
- Drinking water
- Consumer Products such Pottery, Cribs, Jewelry, Candle Wicks
- Cultural Items
- Contaminated Sites
Peeling paint outside
Lead: Age of Housing Matters

<table>
<thead>
<tr>
<th>Year House Was Built</th>
<th>Percent of Houses with Lead-Based Paint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1940</td>
<td>87 percent</td>
</tr>
<tr>
<td>1940-1959</td>
<td>69 percent</td>
</tr>
<tr>
<td>1960-1978</td>
<td>24 percent</td>
</tr>
<tr>
<td>All US Housing Stock</td>
<td>40 percent</td>
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</tbody>
</table>

Lead Disclosure

- At property transfer, provide buyer/renter:
  - Lead warning statement
  - Summary of information on lead hazards (yes, no, don’t know)
  - Documents on specific information about lead-based paint and lead hazards.
  - Tenant signature
- Rentals
  - Common Area results must be disclosed to all tenants.
  - At lease signing
  - Applies to oral leases.
  - Federal courses teach:
Asbestos: What is it?

Asbestos: Health Effects

- Lung Cancer
- Mesothelioma
- Asbestosis

Smokers are at greater risk!
Environmental Tobacco Smoke

Contains over 4,000 substances including more than 50 compounds known to cause cancer.

Health effects include:
- In non-smoking adults: lung cancer, heart disease.
- In children: asthma, sudden infant death syndrome, bronchitis, pneumonia, ear infections.

Smoke-Free Home Rules: State Performance

<table>
<thead>
<tr>
<th></th>
<th>92-93</th>
<th>98-99</th>
<th>2003</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>43.2%</td>
<td>60.2%</td>
<td>72.2%</td>
<td>67.1%</td>
</tr>
<tr>
<td>Max.</td>
<td>69.6%</td>
<td>81.1%</td>
<td>88.8%</td>
<td>107.9%</td>
</tr>
<tr>
<td>Min.</td>
<td>25.7%</td>
<td>38.9%</td>
<td>53.4%</td>
<td>27.6%</td>
</tr>
</tbody>
</table>
What Can You Do About Tobacco Smoke in Homes and Cars?

- Quit, if you’re ready there’s help
- Don’t smoke around children
- Smoke outside
- Exhaust vent the places where people smoke

Volatile Organic Compounds

- Environmental Tobacco Smoke
- Paints
- Cleaning chemicals
- Carpets
- Pressed wood furniture
- Air fresheners
- Vinyl floors
VOC concentrations are 2-5 times greater in the home.
During or immediately after paint stripping activities, VOC levels can be 1,000 times higher than outdoors.

Why Avoid VOCs?

Potential Health Effects:

- Eye, nose, throat irritation
- Headache, nausea, loss of coordination
- Liver, kidney, and brain damage
- Cancer
- Child developmental problems
**VOC Solutions**

- **Control the source**
  - Avoid using products that contain VOCs
  - Use lower VOC options (i.e. paints)
  - Keep containers sealed
  - Store away from air draw sources
  - Remove unwanted products from home
- **Ventilate**
  - Open doors and windows
- **Don’t use what you don’t have to**

**Radon**

- 2\textsuperscript{nd} leading cause of lung cancer with more than 20,000 deaths annually (smoking is #1)
- Leading cause of lung cancer in nonsmokers and people who have never smoked.
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

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**Estimated Lung Cancer Cases In a Population of 1,000**

- Lung Cancer Cases
- Radon Exposure
- Non-Smokers
- Smokers

<table>
<thead>
<tr>
<th>Radon Exposure</th>
<th>Lung Cancer Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 pCi/L</td>
<td>40</td>
</tr>
<tr>
<td>8 pCi/L</td>
<td>100</td>
</tr>
<tr>
<td>10 pCi/L</td>
<td>150</td>
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</tbody>
</table>

[Image of chart showing lung cancer cases for different radon exposure levels.]
Radon Reduction Systems

<table>
<thead>
<tr>
<th>Type of System</th>
<th>Average Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction</td>
<td></td>
</tr>
<tr>
<td>Passive Sub-Slab Depressurization System</td>
<td>$350-500</td>
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<tr>
<td>New Construction</td>
<td></td>
</tr>
<tr>
<td>Active Sub-Slab Depressurization System</td>
<td>$650-800</td>
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<tr>
<td>Existing Housing</td>
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</tr>
<tr>
<td>Active Sub-Slab Depressurization System</td>
<td>$800-2,500</td>
</tr>
</tbody>
</table>

Sewer Gas

- A mixture of gases generated by bacteria and fungi while digesting wastes
- Sources: dried out traps in sinks and toilets, public sewers, septic systems, swamps, and ponds
- Often contains methane, hydrogen sulfide, ammonia, carbon dioxide, and carbon monoxide
- Causes asphyxiation, leading to unconsciousness, brain damage, and death.
Keep It Maintained

- Inspect
- Clean
- Lubricate
- Replace
- Repair
- Organize