Health and Indoor Air Quality Presentation
Health and Indoor Air Quality Subcommittee

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Health and Indoor Air Quality

Everything IN the House

• Planning and design to promote the health of the residents living in the home
• Reduce indoor pollutants and protect from hazardous materials
• Prevent mold growth by managing mold growth
• Improve indoor air quality for occupants by increasing ventilation and air purification
Healthier People/Pets/Families of All Ages

- Most people spend 90% of their time indoors
- Homes built green can be better for your health
- People with allergies and asthma generally have less symptoms
- Infants, elderly and infirm spend most of their time indoors
- Homes now are built “tight” and are usually constructed with toxic materials
How We Breathe

We breathe about 35 gallons of air each day, that's over **20,000 breaths**. We are breathing air at home, work, and play. Some of it is filled with tiny fine particles or gases. Some are toxic to our health.
# Indoor Air Quality Health Effects

## Major Indoor Pollutants

<table>
<thead>
<tr>
<th>Lethal</th>
<th>Serious Impairments</th>
<th>Irritation, Discomfort</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tobacco</strong> *</td>
<td><strong>Lead</strong> *</td>
<td><strong>Formaldehyde</strong> *</td>
</tr>
<tr>
<td>* 430,000 deaths per year, US Residential</td>
<td>* 3,000,000 mild elevated levels</td>
<td>* strong irritant</td>
</tr>
<tr>
<td><strong>Radon</strong> *</td>
<td><strong>250,000 serious elevated levels</strong></td>
<td><strong>Mold, Mildew</strong> *</td>
</tr>
<tr>
<td>* 15,000 to 20,000 deaths per year</td>
<td><strong>Dust Mites</strong> *</td>
<td>* Allergens, toxic particles, VOC's</td>
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<tr>
<td><strong>Carbon Monoxide</strong> *</td>
<td><strong>Mold</strong> *</td>
<td><strong>Volatile Organic Compounds (VOC's)</strong> *</td>
</tr>
<tr>
<td>* 500 deaths per year</td>
<td>* Allergens, toxic particles, VOC's</td>
<td>* Irritants, possible or known carcinogens</td>
</tr>
</tbody>
</table>

**Source:** USEPA, CDC

J. Ponessa, Rutgers Cooperative Extension 3/01

Modified from Original
Effects of Common Air Pollutants

**Respiratory Effects**

**Symptoms:**
- Cough
- Phlegm
- Chest tightness
- Wheezing
- Shortness of breath

**Increased sickness and premature death from:**
- Asthma
- Bronchiitis (poor or chronic)
- Emphysema
- Pneumonia

**Development of new disease:**
- Chronic bronchitis
- Premature aging of the lungs

**How Pollutants Cause Symptoms**

**Increased Susceptibility to Respiratory Infection**
- Inflamed airways
- Inflamed lungs

**Airway Inflammation**
- Influx of white blood cells
- Abnormal mucus production
- Fluid accumulation and swelling of tissues
- Death and shedding of cells that line airways

**Lung Function**
- Narrowing of airways
- Decreased air flow

**Vascular Inflammation**
- Increased risk of blood clot formation
- Narrowing of blood vessel walls
- Increased risk of asthma attacks

**Cardiovascular Effects**

**Symptoms:**
- Chest tightness
- Chest pain (angina)
- Palpitations
- Shortness of breath
- Unusual fatigue

**Increased sickness and premature death from:**
- Coronary artery disease
- Abnormal heart rhythms
- Congestive heart failure

**How Pollutants May Cause Symptoms**

**Effects on Cardiovascular Function**
- Low oxygenation of red blood cells
- Abnormal heart rhythms
- Affect autonomic nervous system control of the heart

**Effects on Lung Function**
- Narrowing of airways
- Decreased air flow

**Normal Heart Rhythm**

**Abnormal Heart Rhythm**

**Normal Pulmonary Artery**

**Pulmonary Artery with Atherosclerotic Plaque**
What are some types of Indoor Air Quality (IAQ) contaminants?

- Biological Contaminants
  - Mold and Mildew
  - Dust
- Chemical Contaminants
  - Carbon Monoxide (CO)
  - Volatile Organic Compounds (VOCs)
  - Radon
- Respirable Particles
Biological Contaminants

- Mold and Mildew are everywhere in the environment
- Growth due to humidity and temperature
- Moisture problems can be caused by “tight homes”, and common household activities such as cooking, cleaning, and bathing
- How much moisture? Average household of 4 creates 3-6 gallons of water/day into the air; ~3 pints breathing, cooking and dishwashing ~1 pint/meal; and ~½ pint from taking a shower.
Mold and Mildew

Molds can gradually destroy the things they grow on. You can prevent damage to your home and furnishings, save money, and avoid potential health problems by controlling moisture and eliminating mold growth.
Chemical Contamination Gases

- Combustion Products-CO (Carbon Monoxide)
- Organic Gases—such as Volatile Organic Compounds (VOCs)
- Radon gas—Found naturally in the earth’s crust. Clallam County has a low potential for elevated indoor radon levels, homeowners should still test for radon
Carbon Monoxide (CO)

• Carbon monoxide (CO) is a colorless, practically odorless, and tasteless gas or liquid. It results from incomplete oxidation of carbon in combustion.
• Sources include unvented fuel-fired appliances and, respirable products such as particles in the air from tobacco, wood, gas, and oil.
• Health effects associated with CO include, fatigue at low concentrations, to impaired vision and coordination; headaches; dizziness; confusion; nausea. It is fatal at very high concentrations.
Volatile Organic Compounds (VOCs)

- Many VOCs are present in household products, and many are known or suspected carcinogens.
- Common sources of VOCs include paints, paint strippers and other solvents, aerosol sprays, cleansers and disinfectants, moth repellents, air fresheners, stored fuels, automotive products, hobby supplies, and dry-cleaned clothing.
Some ways homeowners can reduce exposure to VOCs include:

1. Use household products according to manufacturers' directions
2. Use household products outdoors or in well-ventilated places
3. Dispose unused or little-used containers safely
4. Purchase in quantities you will use soon (within 6 months)
VOC-Formaldehyde

- Formaldehyde has a strong odor which is emitted from various construction materials, including plywood wall paneling, particle board, fiberboard, and furniture and cabinetry. It is also used as a component of some glues and adhesives, and as a preservative in some paints and coating products.
- Exposure to formaldehyde can cause watery eyes; nose, throat, and eye irritation; and breathing difficulties. High concentrations may trigger asthma attacks in certain people as well. May be a carcinogen.
Chemical Gas - Radon

Radon is a natural radioactive gas that you can’t see, smell or taste. Its presence in your home can pose a danger to your family's health. Radon is the leading cause of lung cancer among non-smokers. Radon is the second leading cause of lung cancer in America and claims more than 20,000 lives annually.

Zone 1 counties have a predicted average indoor radon screening level greater than 4 pCi/L (pico curies per liter) (red zones) Highest Potential

Zone 2 counties have a predicted average indoor radon screening level between 2 and 4 pCi/L (orange zones) Moderate Potential

Zone 3 counties have a predicted average indoor radon screening level less than 2 pCi/L (yellow zones) Low Potential
Respirable Particles

• Sources of Respirable Particles
  Fireplaces, wood stoves, kerosene heaters, and environmental tobacco smoke.

• Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system.

• Health Effects
  Eye, nose, and throat irritation; respiratory infections and bronchitis; lung cancer.
To put this size in perspective, the width of a human hair is about 50 to 200 microns. Most of us can’t see particles smaller than 10 microns.

http://www.abatement.com/residential/air_quality.htm
Typical Homes

- New homes are required to be air-tight and do not “breathe”
- There may be increased CO due to incomplete combustion of fireplaces or combustion appliances, or coming from an attached garage
- Inadequate moisture control increases mold growth
- Fewer windows creating less cross ventilation
- Water piping materials that the piping is made out of PVC/CPVC
- Dust, dirt, and chemicals can be tracked into the house
- Volatile Organic Compounds (VOCs) are in many glues and paints, such as formaldehyde in cabinets
- Many household items are put together with toxic glues
- Synthetic carpets are installed with rubber pads
- Oil based (more toxic) paints and finishes are used on walls and other surfaces
- Formaldehyde insulation in the walls
Characteristics of “Good” Indoor Air to reduce mold growth

• Temperature: 72°-78°F
• Humidity: 40%-60% Relative Humidity (RH)
• Air Velocity: 20-30 fpm in ducts
• Dilution ventilation: 20 cfm/person
• In a “wet” room, like a bathroom, there should be 8 air exchanges/hour
The most effective air quality control measure is “source control.”

Source control means you control the source of the indoor air pollution by not allowing the sources of pollutants in your home in the first place. Limit the chemicals you bring into your home and reduce the biological contaminants.
The Clallam County Checklist
Health and Indoor Air Quality

Non-toxic Material Selection ♦ Moisture Control ♦ Air Distribution, Venting, and Filtration ♦ Emissions ♦ Water Filtration ♦ Reducing Electromagnetic Fields
Checklist: Jobsite Operations

- Involve Subcontractors in healthy job site plan
- No smoking in or within 25’ of any building
Healthy Jobsite Plan

Each sub and every employee should sign the healthy jobsite plan which partially consists of:

• No smoking on the jobsite
• Use less or non toxic materials
• Provide employees with proper PPE
• Prevent vehicle fumes near home
• No use or storage of hazardous materials on site
• Have handwash facilities available
• Clean out all air ducts
• Keep animals and food out of the home
• Prevent spilling of hydraulic fluid
• Contain garbage and dispose properly
Checklist: Non-toxic Materials Selection

- Use low or non-VOC products
- Use Green Seal Products
- Limit carpet, better yet, no carpet
- No added formaldehyde products
Checklist: Moisture Control

• Proper drainage plane on walls and around windows and doors using felt/housewrap and flexible flashing, with rigid head flashing
• Slope crawlspace grade toward perimeter
• Third party moisture test performed before insulating
Proper Drainage Plane
According to Energy & Environmental Building Association (EEBA)™
Checklist: Air Distribution, Venting, and Filtration

- Install ductless in-floor or under-floor heating system
- Install state-of-the-art integrated whole house ventilation systems
- Central vacuum
- Cross ventilation
- HEPA filter
Checklist: Emissions, Water Filtration, and Electromagnetic Fields (EMFs)

• Detach the garage away from all living areas
• Install whole house water filtration system
• Design for reduced EMFs
Checklist: Bonus Items

- Building meets American Lung Association Health House Standards or Bau-biologie advisory
- Use safer alternative materials
- Work with chemically sensitive homeowners
These Green Products are Available - Floor Products

A water-based 1-component finish for commercial and heavy traffic residential applications
- Provides a clear, natural and colorless finish with a special UV protection.
- Environmentally friendly, very limited odor release during the application process.
- Fast drying and fast curing with exceptional build and leveling properties.
- Easy to use / uncomplicated to apply, very durable and wear resistant.

Does not contain biocides nor preservatives
Safe for man, animal and plant when dry
Suitable for children's toys
EN 71, DIN 53 160
These Green Products are Available-
Formaldehyde Free Insulation

Thoroughly Tested
Thoroughly Tested safe, Non-corrosive, Non-toxic, Environmentally responsible, Contains no CFC, HCFC, or Formaldehyde.

INSECT RESISTANT RIGID INSULATION
These Green Products are Available-Low VOC Paint
These Green Products are Available-No Added Formaldehyde Panels

PureBond.®
A breath of fresh thinking.
Formaldehyde-free hardwood plywood from Columbia Forest Products.

NAF
These Panels Contain No Added Urea Formaldehyde

1 - Per LEED™ B.1 EQ.4.4.

LEED™ stands for Leadership in Energy and Environmental Design and is administered by the United States Green Building Council (USGBC). For more information on LEED™ visit www.USGBC.org.
Other Resources

- Healthy Indoor Air for America’s Homes  
  www.healthyindoorair.org
- U.S. Environmental Protection Agency  
  www.epa.gov/iaq
- American Lung Association  
  www.lungusa.org
- Built Green  
  www.builtgreenwashington.org/
- Ecology  
  www.ecy.wa.gov/programs/swfa/greenbuilding/
- Home Builder’s Association  
  www.nbpa.org
Any Questions?