

Public Health Concerns from Vapor Intrusion

Minnesota Brownfields
Vapor Intrusion Forum
December 11, 2014

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Minnesota Department of Health

MDH's Mission

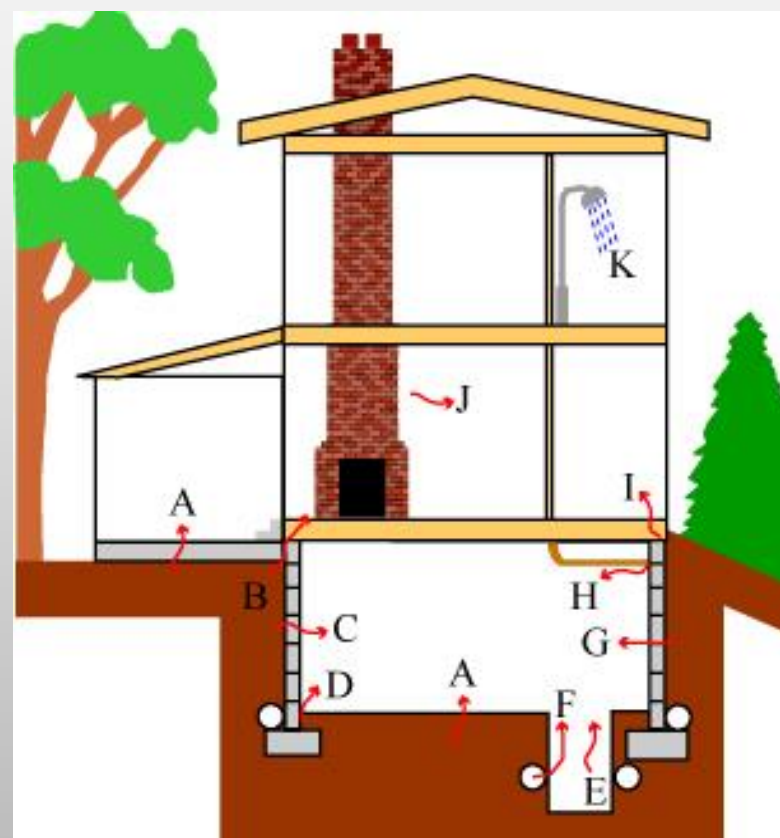
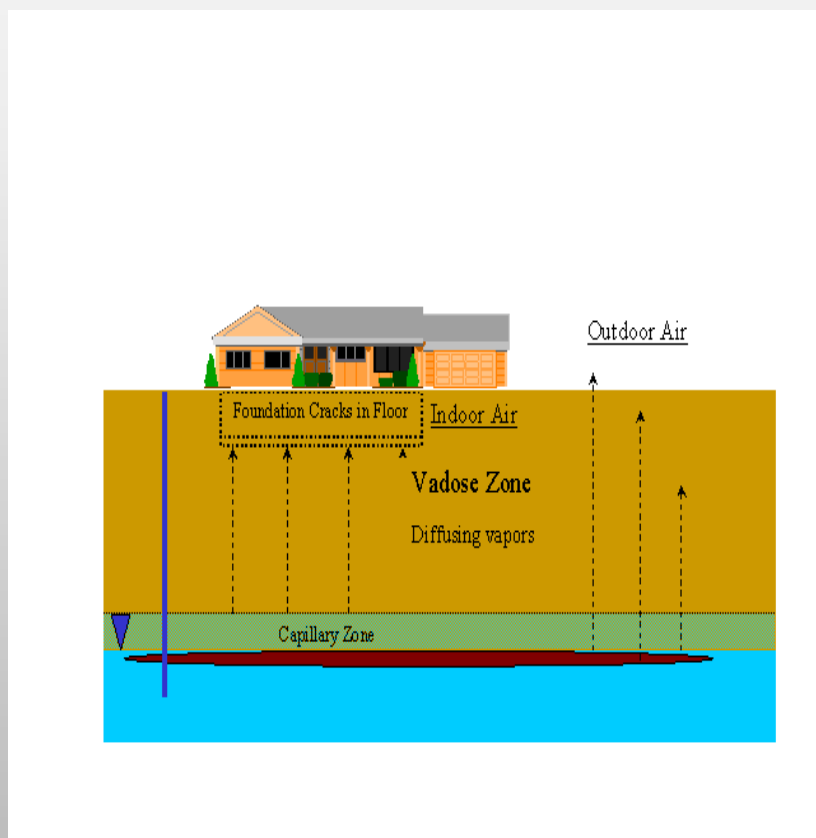
To protect, maintain and improve
the health of all Minnesotans



MPCA vs. MDH Roles

Outside: MPCA

Inside: MDH



What are Volatile Organic Compounds (VOCs)?

- Chemical solvents used for cleaning and degreasing
- Common in consumer products and frequently found at waste disposal sites
- Easily evaporate from products, or soil and water if spilled or disposed
- Petroleum products contain many VOCs
- Toxicity to people varies widely

Why is Vapor Intrusion a Possible Public Health Concern?

- Studies show people spend about 85 - 90% of their time indoors (even children).
- There has been a growing interest in indoor air quality.
- The science of indoor air assessment has grown tremendously in recent years.
- Radon Awareness Act:

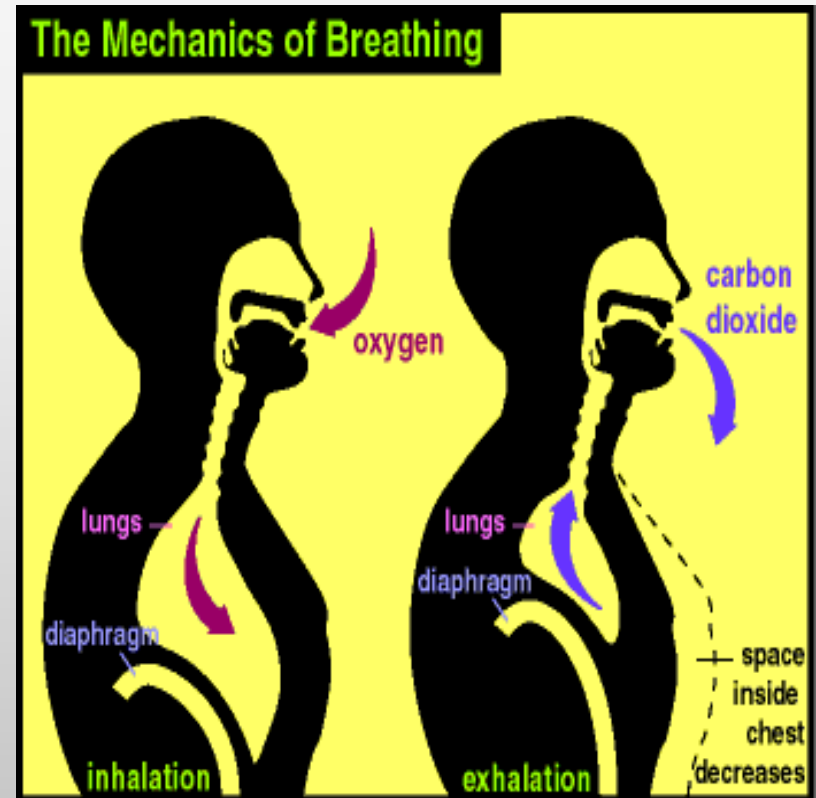
Effective January 1, 2014, the Minnesota Radon Awareness Act requires additional disclosure and education be provided to potential home buyers during residential real estate transactions in Minnesota. **Before signing a purchase agreement to sell or transfer residential real property**, the seller shall disclose in writing to the buyer any knowledge the seller has of radon concentrations in the dwelling.

Vapor Intrusion Health Risks

- Fire and explosion risks: buildup of methane gas, petroleum products.
- Acute health risks: short-term exposure resulting in headaches, nausea, eye and throat irritation, etc.
- Sub-chronic health risks: weeks to months; can be critical during pregnancy or other periods of rapid development.
- Chronic health risks: long-term exposure resulting in an increased risk of adverse effects in specific organ systems, or an increased lifetime cancer risk.

Inhalation Exposure Uncertainties

- Difficult to estimate how much is absorbed
- Behavior driven
- Large differences between individuals
- Thus, exposures vary between people



MDH health based criteria protect vulnerable people

Example: Tetrachloroethylene

- MDH 2014 Guidance: 2 $\mu\text{g}/\text{m}^3$ (cancer risk);
15 $\mu\text{g}/\text{m}^3$ (non-cancer)
- MDH Acute HRV: 20,000 $\mu\text{g}/\text{m}^3$
(Eye, respiratory irritation, nervous system effects)
- MN OSHA PEL: 170,000 $\mu\text{g}/\text{m}^3$
(workplace exposure, acute effects)

Example: Trichloroethylene

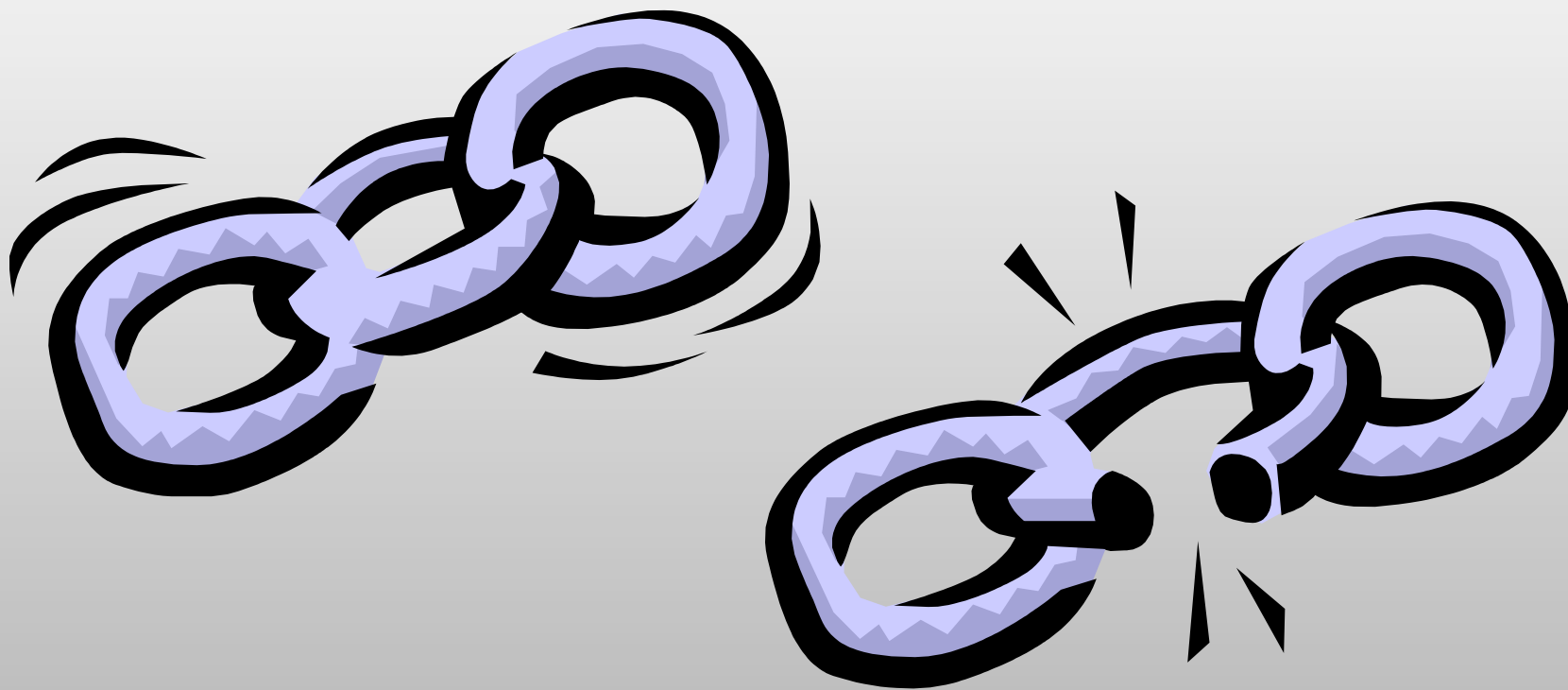
- U.S. EPA and MDH (2013) recently completed a new TCE toxicological review.
 - An increased risk of heart defects in newborns and immune effects were found in recent studies.
 - We now calculate exposure values based on exposures that occur *in utero*, infancy, or early childhood, to ensure values protect everyone's health.
- Non-cancer effects became the primary driver of new guidance of 2 $\mu\text{g}/\text{m}^3$ TCE in air.

Evaluating Vapor Intrusion – A Public Health Perspective

- The process is geared towards eliminating vapor intrusion as an exposure pathway.
- Begins at the source (often groundwater), works towards potential receptors (people).
- If contaminants are not found (or are below health protective screening values), health risk is minimal and no further action may be needed.
- If vapor intrusion is occurring, remediation or mitigation can break the exposure pathway.

Exposure Pathway

Groundwater → Soil Vapor → Sub-slab Vapor → Indoor Air



What if Vapor Intrusion is Confirmed?

- Screening values are very protective – even if exceeded the risk is still low.
- Mitigation systems are effective and easy to install.
- Mitigation also prevents infiltration of naturally occurring radon gas – 2nd leading cause of lung cancer in the U.S.

Vapor Intrusion Challenges: New Sites vs Old Sites

New Sites:

- Chance to introduce the concept of vapor intrusion at the beginning of the process.
- Vapor intrusion bundled with all other phases of investigation.

Old Sites:

- Adding another investigation at “mature” sites can cause mistrust: Why was this not considered at the beginning?
- Residents who were initially not affected may be pulled into a “new” investigation.

In all cases community engagement is critical!

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<http://www.health.state.mn.us/divs/eh/hazardous/index.html>