Improving the quality of life

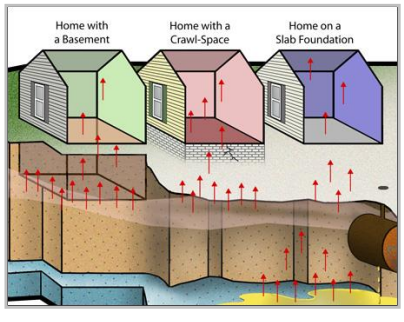
VAPOR INTRUSION: THE BASICS

OHIO COMMUNITY DEVELOPMENT CONFERENCE

JENNIFER MILLER NOVEMBER 20, 2014

VAPOR INTRUSION

- Vapor intrusion is the movement of soil gases, or vapors, into the air inside a building from the soil formation, through cracks or openings in the building foundation or basement.

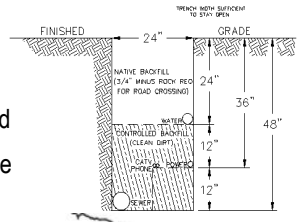


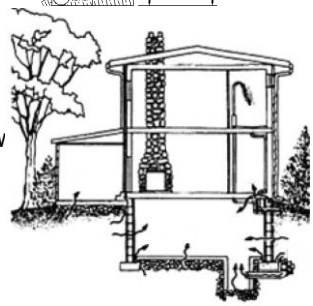
VAPOR INTRUSION

- How does vapor move?
  - Unsaturated soil is porous, allowing vapor to diffuse through it just as it would through room air
  - Some soils and bedrocks, like clay and limestone, have seams or cracks along which vapor can move

VAPOR INTRUSION

- How does vapor move?
  - Man-made porous areas (utility lines, old canals, building foundations) can also be preferential pathways for movement
  - Where soil meets basements, building slabs and crawl spaces, openings such as cracks, joints, sumps and utility penetrations can allow the vapor to move from the soil into the structure



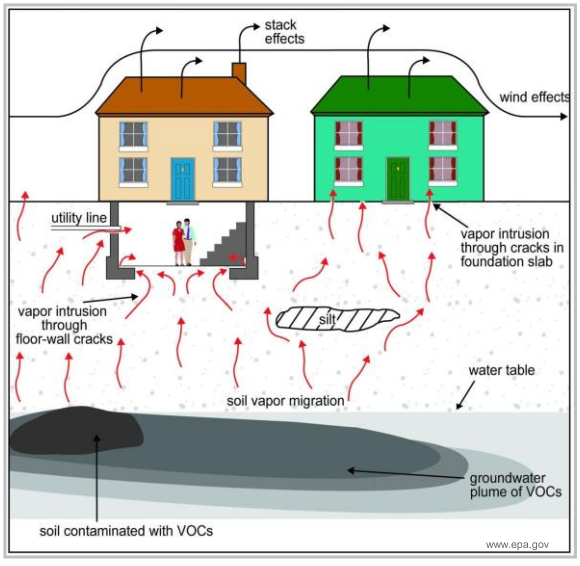


VAPOR INTRUSION

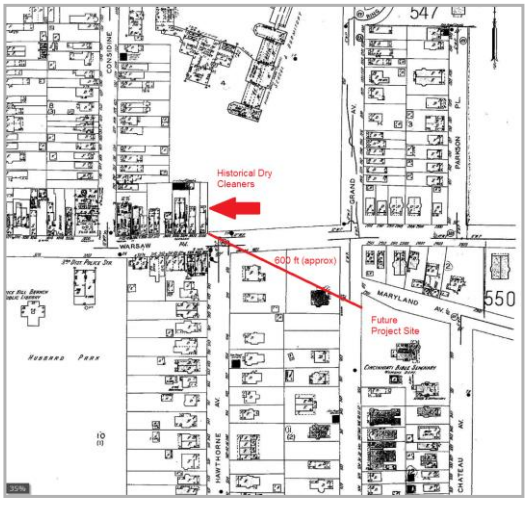
- Vapor intrusion is aided by the stack effect, which can cause an upward air flow as warm air escaping through openings in the upper reaches of the building pulls in cooler make-up air in the lower reaches of the building. This can create a slight vacuum that pulls in additional soil vapor.

VAPOR INTRUSION

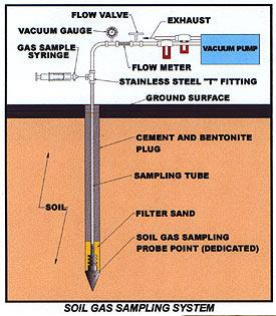
- The soil vapor can contain chemicals that are harmful when they accumulate in the building's airspace:
  - Volatile/semi-volatile organic compounds and mercury from spills
  - Radon from soil minerals
  - Methane or hydrogen sulfide from buried decomposing wastes
- Effects can be near-term (e.g., explosion from accumulated methane) but are usually longer-term (e.g., cancer from exposure to a carcinogenic chemical)



EXAMPLE SITES



SOIL GAS SAMPLING



SOIL GAS SAMPLING SYSTEM

- If a potential man-made source of soil vapor is identified, soil vapor samples are sometimes collected, usually using hand-driven or hydraulically-driven rods and a vacuum pump

INDOOR AIR SAMPLING

- Radon can be sampled using long-term canisters or continuous monitoring
- Explosive gases such as methane can be measured directly, but should be monitored over time as levels can vary
- Other chemicals require laboratory sampling; household chemicals can interfere with the results

Courtesy MI DEQ

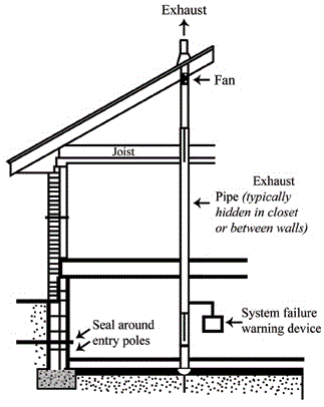
www.nachi.org

www.leakdetector.org

Courtesy NJDEP SRP

MITIGATION

- Options for correcting vapor intrusion
  - Remediate source
  - Sub-slab vapor removal system
    - Passive
    - Active
  - Basement or crawl space venting
  - Air exchange ventilation system
  - Sealing of basement/foundation

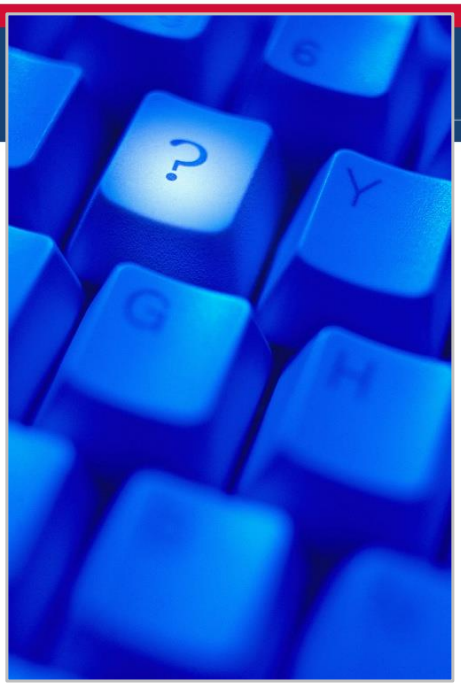


MITIGATION

- Vapor removal system – points to consider
  - Can be installed as passive system (relies on stack effect to lift vapors to exhaust point) with the option to convert to active system by adding a fan to assist exhaust
  - Materials used to construct system should be compatible with gas(es) being removed
    - Radon and other relatively inert gases can use PVC
    - High concentrations of solvent gases or petroleum may cause PVC to deteriorate and other materials should be considered in these cases
  - If renovations will make building more air-tight, sampling should be performed after renovations are complete

MITIGATION

- Confirm that mitigation is successful
  - Confirmation samples in soil/groundwater if source remediation is selected
  - Indoor air sampling if building modifications are selected
    - At least two samples: one during hot weather and one during cold weather
    - Also wise to plan for system maintenance and repair: O&M manual and tenant education is advisable



- Questions?

FOR MORE INFORMATION

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