

SOIL VAPOR INTRUSION

Frequently Asked Questions

What is soil vapor intrusion?

The phrase "soil vapor intrusion" refers to the process by which volatile chemicals move from beneath the ground into the indoor air of overlying buildings.

Soil vapor, or soil gas, is the air found in the spaces between soil particles. Because the air pressure inside may be lower than in the soil, this vapor may enter buildings through cracks in slabs or basement floors and walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation. Heating, ventilation or air-conditioning systems may reduce the air pressure inside, drawing soil vapor into buildings.

Chemicals that readily evaporate or vaporize are called "volatile chemicals." Volatile chemicals include volatile organic compounds (VOCs). Subsurface sources of volatile chemicals may include contaminated soil and groundwater, broken pipes, or buried wastes. If soil vapor is contaminated and enters a building as described above, the air quality inside the building may be affected.

When contaminated vapors are present nearby or under the foundation of the building, vapor intrusion is possible. Soil vapor can enter a building whether the building is old or new, and whether the building has a basement, a crawl space, or is on a slab (as illustrated in the figure below).

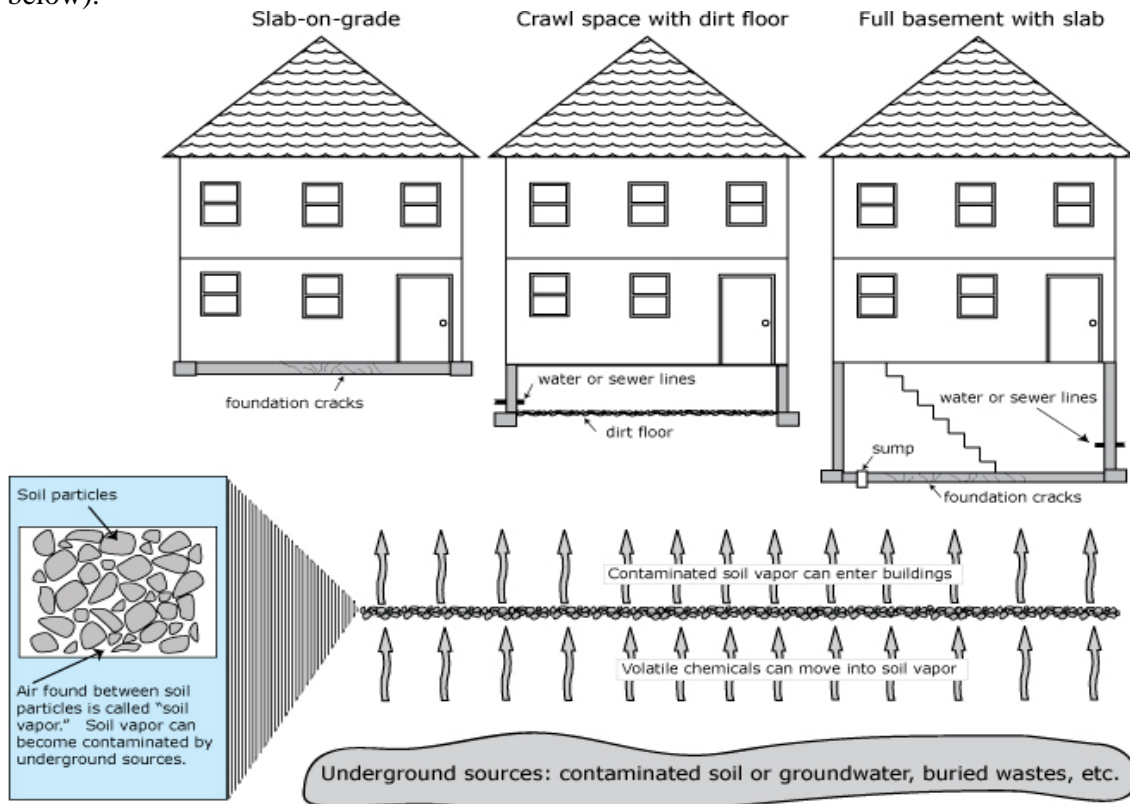


Figure courtesy NYSDOH October 2006

How could I be exposed to chemicals through soil vapor intrusion?

Humans can be exposed to contaminated soil vapor when vapors from beneath a building are drawn through cracks and openings in the foundation and mix with the indoor air. These vapors may be inhaled along with the indoor air.

Both vapor intrusion that is documented in an occupied building and potential future vapor intrusion (when volatile chemicals are present, or are accumulating, in the vapor phase beneath a building but have not affected indoor air quality) must be evaluated. Potential vapor intrusion may also exist when there is a chance that contaminated soil vapors may move to existing buildings not currently affected or when there is a chance that new buildings will be built over existing subsurface vapor contamination.

In general, inhaling a volatile chemical does not necessarily mean that a person will experience health effects. Whether or not a person experiences health effects depends on several factors, including the length of time a person is exposed, the number of times a person is exposed, the toxicity of the volatile chemical, and person's sensitivity to the chemical.

Is contaminated soil vapor the only source of volatile chemicals in my indoor air?

No. Volatile chemicals may also be found in certain household products such as paints, paint strippers and thinners, mineral spirits, glues, solvents, cigarette smoke, aerosol sprays, mothballs, air fresheners, new carpeting or furniture, hobby supplies, lubricants, stored fuels, refrigerants and recently dry-cleaned clothing.

Indoor air may also become affected when outdoor air containing volatile chemicals enters your home. Volatile chemicals may be present in outdoor air due to their widespread use. Gasoline stations, dry cleaners, and other commercial/industrial facilities are also potential sources of VOCs to outdoor air.

How is soil vapor intrusion investigated at sites contaminated with volatile chemicals?

The process of investigating soil vapor intrusion typically requires more than one set of samples to determine the extent of vapor contamination. Several different types of environmental samples may be collected: soil vapor samples, sub-slab vapor samples, samples from the air found in crawl spaces, indoor air samples, and outdoor air (sometimes referred to as "ambient air") samples.

Soil vapor samples are collected to characterize the nature and extent of vapor contamination in the soil in a given area. They may be collected before sub-slab vapor and/or indoor air samples to help identify buildings or groups of buildings that need to be sampled. Soil vapor samples are used to determine the potential for vapors to accumulate beneath buildings. Soil vapor samples are not the same as soil samples.

Sub-slab vapor samples are collected to characterize the nature and extent of vapor contamination in the soil immediately beneath a building with a slab. In buildings without a slab, crawl space air and/or soil gas samples may be collected below the building. Sub-slab vapor results are used to determine the potential for vapor intrusion.

Indoor air samples are collected to characterize the nature and extent of vapors within a building. Indoor air sample results help to evaluate whether vapors are currently migrating in to a building. They are also compared to sub-slab vapor and outdoor air results to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).

Outdoor air samples are collected to characterize site-specific background air conditions. Outdoor air results are used to evaluate the extent to which outdoor sources, such as automobiles, lawn mowers, oil storage tanks, gasoline stations, commercial/industrial facilities, and so forth, may be affecting indoor air quality. However, the presence of a contaminant in the outdoor air does not necessarily mean that the contaminant will be present in indoor air.

What should I expect if indoor air samples are collected in my home?

You should expect the following:

- Indoor air samples are generally collected from the lowest-level space in a building, such as a basement. They are often collected during cold weather when the building is heated and the ground is frozen. Indoor air samples may also be collected from the first floor of living space, or any other area of potential concern. Indoor air samples are used to determine if vapors are inside buildings.
- Sub-slab vapor and outdoor air samples are usually collected at the same time as indoor air samples to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).
- Some sampling may be performed during warmer weather. For example, soil gas or sub-slab vapor samples without indoor air or outdoor air samples may be collected to identify buildings and areas where comprehensive sampling is needed during the heating season.
- An indoor air quality questionnaire and building inventory will be completed with your input. The questionnaire includes a summary of the building's construction characteristics; the building's heating, ventilation and air-conditioning system operations; and potential indoor and outdoor sources of volatile chemicals. The building inventory describes products present in the building that might contain volatile chemicals. These products may be temporarily removed from the building while it is being sampled with homeowner consent.

Should I do anything differently than normal at home during or before the sampling?

At least 48 hours prior to and during the collection of the indoor air sample (which takes 24 hours), please take the following actions to minimize background concentrations of VOCs:

- Try to avoid opening windows or keeping doors open
- Avoid operating ventilation fans or air conditioning if possible
- Please avoid using air fresheners or odor eliminators
- Please do not smoke indoors
- Please do not use paint, solvents, or varnishes
- Please do not use cleaning products such as bathroom cleaners, furniture polish, appliance cleaners, all-purpose cleaners, floor cleaners, or gun cleaners
- Please try to minimize the use of cosmetics such as hair spray, nail polish, nail polish remover, perfume, cologne, etc.
- Please do not apply pesticides
- Please do not store containers of gasoline, oil, petroleum-based or other solvents within the house or use them in an attached garage
- Please do not operate or store automobiles in an attached garage if possible

It is important to note that many building materials contain VOCs, such as plywood flooring, latex paint, sheet vinyl flooring and new carpeting, among others. Obviously, it is not practical to remove these potential indoor sources of VOCs from homes. However, removing all identified household products which may contain VOCs and adhering to this list of steps to take prior to and during sampling will help minimize the background levels of VOCs in your house or business.

What happens if soil vapor contamination or soil vapor intrusion is identified during investigation of a site?

Depending on the investigation results, DEQ may require additional sampling or mitigation, in addition to requiring cleanup of the subsurface sources. Additional sampling would be performed to determine the extent of soil vapor contamination and to verify questionable results. Mitigation is action that is taken to minimize exposures to indoor air contamination while cleanup is occurring. Mitigation may include sealing cracks in the building's foundation and installing a sub-slab depressurization system beneath the building (similar to a radon mitigation system).

What is a sub-slab depressurization system (also known as a mitigation system)?

A sub-slab depressurization system essentially prevents vapors beneath a slab from entering a building. A low amount of suction is applied below the foundation of the building and the vapors are vented to the outside (see figure below). Mitigation systems

are inspected to ensure that they are effective and that they do not cause any “back-drafting.” The system uses minimal electricity and should not noticeably affect heating and cooling efficiency.

Sub-Slab Depressurization System (commonly called a radon mitigation system)

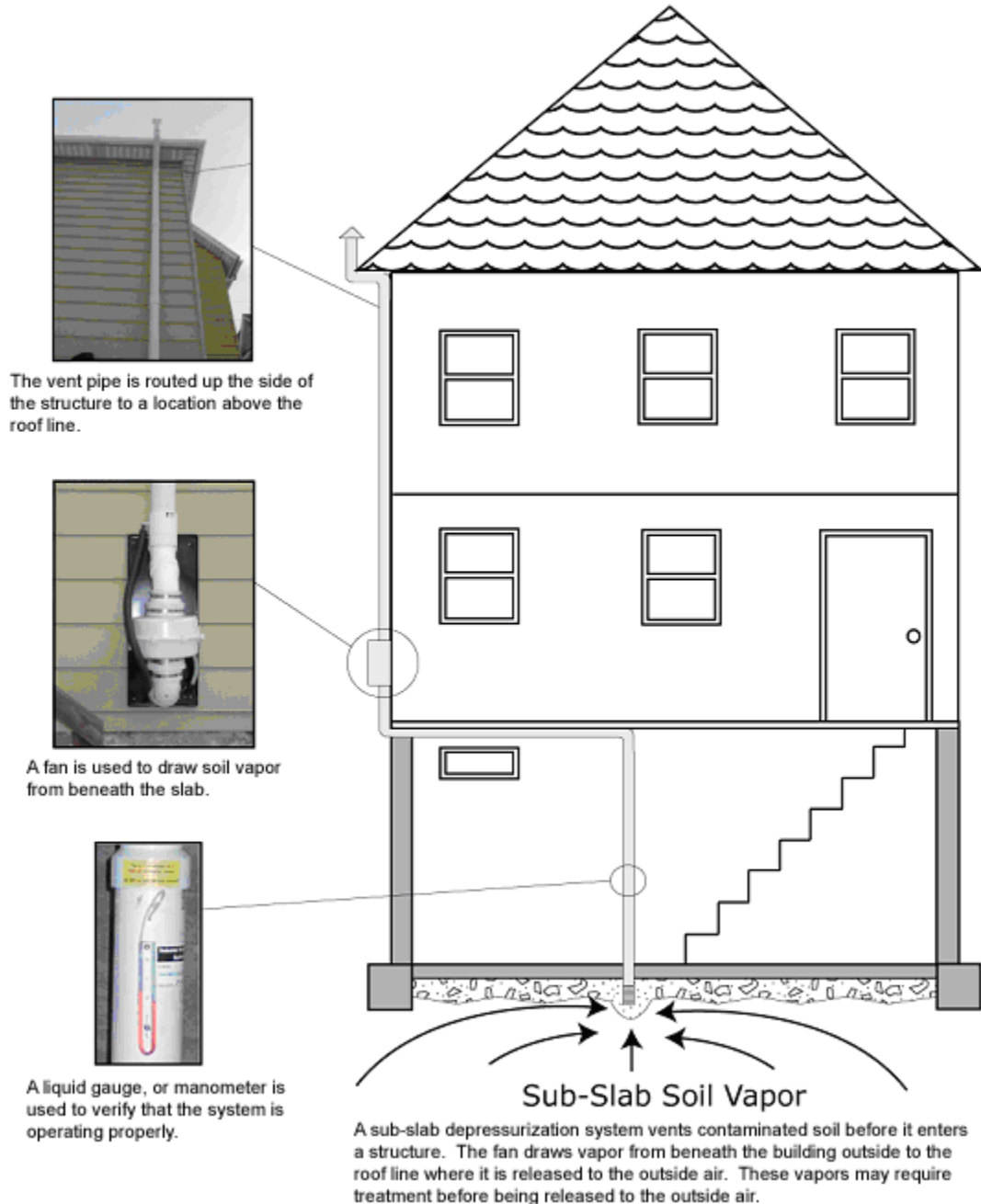


Figure courtesy of NYSDOH October 2006

Note: DEQ may also require treatment of vapors before they are released to the outside air

What happens after the samples have been collected?

After samples have been collected and analyzed in a laboratory, DEQ will provide property owners with the sample results and an explanation of the data. If sample results indicate that vapor intrusion may be occurring, DEQ may require additional testing or the installation of mitigation systems, in addition to requiring cleanup of the subsurface sources.