

HOW CAN VAPOR INTRUSION & INDOOR AIR INHALATION AFFECT MY REAL ESTATE PURCHASE?

If your business has had a chemical release or if you have been involved in the transfer or purchase of commercial or industrial real estate, you have probably heard the terms “Vapor Intrusion” and “Indoor Air Inhalation.” Vapor intrusion (VI) is the migration of volatile chemicals from petroleum and industrial solvents, buried wastes, or contaminated soil or groundwater into an overlying or nearby building. VI can also occur from natural sources such as radon.

The presence of contaminants beneath or near a structure represents a potential for an unacceptable indoor air inhalation exposure to occur inside the structure. An unacceptable indoor air inhalation exposure occurs when contaminants are present in indoor air at concentrations that could cause a risk to human health through inhalation. The intrusion of vapors into a building may also cause risk to public safety through fire or explosion hazards. In addition to occurring on the property where a spill or release initially occurred, an unacceptable VI or indoor air inhalation exposure may also occur in a business or residence on neighboring properties hundreds of feet away from the source of contamination.

Regardless of whether the owner or operator of a building retains cleanup liability for any environmental contamination on site, Michigan’s environmental regulations require that the owner or operator take measures to ensure there are no unacceptable risks to occupants of a facility. Most risk associated with the presence of contamination beneath a property can be addressed with a relatively simple institutional control (e.g., prohibiting drinking water supply wells in order to prevent ingestion or providing a barrier above contamination to prevent direct contact or exposure to impacted dust). Institutional controls, however, cannot typically protect occupants of a building from an unacceptable indoor air inhalation exposure, and in most cases, some form of vapor mitigation is required if there is a potential unacceptable exposure.

The potential for an unacceptable indoor air inhalation exposure can sometimes be determined by reviewing existing environmental data for the site or neighboring properties. Soil, groundwater, and soil gas sampling may also be conducted to evaluate the risk. If an unacceptable indoor air inhalation exposure exists, an owner must undertake action to protect the occupants of a building. In many cases where a liable party is not available to conduct the cleanup, it may be possible to leave the contaminants in place and implement building controls to prevent the intrusion of vapors into the building. New buildings that require vapor mitigation are generally constructed with an underlying vapor barrier to prevent the intrusion of vapors and a venting system to allow the soil gas to exhaust outside/above the structure.

At a glance, indoor air sampling appears to be an ideal method for evaluating whether there is an unacceptable indoor air inhalation exposure; however, indoor sampling may not provide

sufficient information to eliminate the pathway, even if contaminants are not identified. Additionally, when contaminants are identified, it can be difficult to differentiate possible indoor sources of vapors from contaminants that could originate below the slab. Improper interpretation of indoor air data could lead to unnecessary mitigation.

Instead of conducting indoor air sampling, sub-slab soil gas sampling is typically used to evaluate the potential for an unacceptable indoor air inhalation exposure. Sub-slab soil gas sampling is conducted by installing a sampling device (typically a Vapor Pin®) through the slab of the structure and collecting a sample of the underlying soil gas for laboratory analysis.



Vapor Pin®

Soil gas sampling can be onerous if an owner needs affirmation from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) that the VI pathway is not complete. An EGLE determination is typically necessary when a responsible party is seeking approval of a remedial plan, closure of a release, affirmation of Documentation of Due Care Compliance, and brownfield funding or specialized loans. EGLE has determined that collection and laboratory analysis of up to nine sub-slab soil gas samples and quality assurance samples on four occasions (quarterly) throughout a one-year period, with results

below soil gas screening criteria, is required to make a determination that the indoor air inhalation exposure pathway is not complete for a structure less than 10,000 square feet. For larger structures, an additional soil gas sample would be required for each 2,500 square feet. Depending on the level of risk the building owner/operator is willing to undertake, fewer samples may be adequate in instances where an EGLE determination is not required.



SSD system – indoor piping.

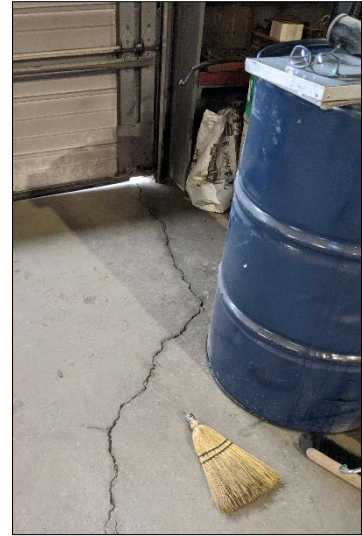


SSD system – outdoor piping and vent stack.

The best management practice to mitigate an unacceptable exposure in an existing structure is sub-slab depressurization (SSD), which was developed within the radon mitigation industry. SSD is implemented by generating a vacuum from a number of suction points placed beneath the building slab and venting the soil gas through a network of piping outside of the structure. A low wattage blower can generally be used on the top of the vent stack to generate a suitable vacuum.

A minimum sub-slab vacuum of -0.02 inches of water column is generally required beneath the entire structure to overcome conditions within the structure that tend to pull vapors into the structure. The number of suction points necessary to achieve adequate SSD depends on a number of factors including the condition of the slab; the soil type below the structure; and the presence of footers, sumps, utility trenches, and venting/HVAC systems. The sealing of floor cracks, penetrations, sumps, and other leakage points is a necessary component of an effective SSD system.

Once installed, an SSD system must be operated continuously and monitored frequently to verify that building occupants are protected from an unacceptable indoor air inhalation exposure.



Floor cracks to be sealed.



Chemically Resistant Barrier

A barrier system, which generally consists of a coarse aggregate and venting system beneath a sealed chemically resistant membrane below the building slab, may be utilized to prevent an unacceptable indoor air inhalation exposure for new construction.

Due to the costs associated with investigation and mitigation of VI issues — and more importantly, the risk to human health and public safety — it is imperative that you and/or your environmental professional have a thorough understanding of VI.

Failure to understand VI at your site may result in unnecessary costs to investigate or mitigate a potential VI issue or in an unacceptable exposure to your family, employees, or visitors.

Envirologic has comprehensive experience in all aspects of VI including:

- Soil and groundwater sampling
- Soil gas/sub-slab vapor sampling
- Indoor air sampling
- Pressure field extension (PFE) testing
- Design and installation of sub-slab/crawl space depressurization systems

If you have questions regarding VI testing, system design, or regulatory issues, please contact Project Manager Paul French by phone at (269) 342-1100 or by email at french@envirologic.com.