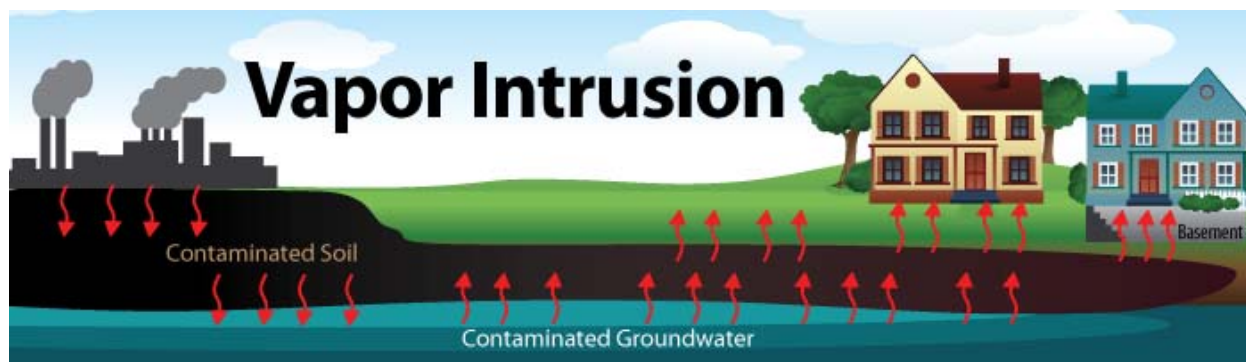




Soil Vapor Intrusion (SVI) Tube



Introduction



Soil vapor intrusion happens when VOC/SVOC in the air matrix space of soil find their pathway into a buildings, whether residential or commercial. And the measurement of SVI exposure is an evaluation of potential impact to human health.

The vapors, which come from chemicals in contaminated soil or groundwater, migrate through foundation cracks, fractures in basement floors or walls, crawl spaces and small gaps around pipes and utility lines. The target compounds of SVI study often include, but are not limited to: Polychlorinated Biphenyl (PCB), Polycyclic Aromatic Hydrocarbon (PAH), Diesel Range Organics (DRO), Pesticides, Phthalates, and some Halogenated non-Aromatics.

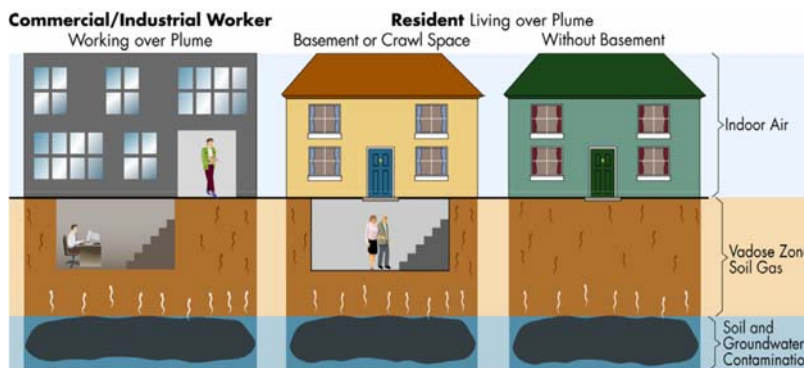


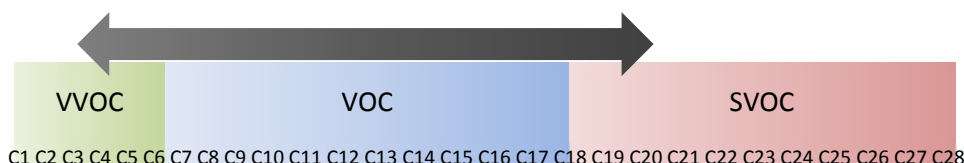
Figure 1 Typical Conceptual Model of Soil Vapor Intrusion

The SVI tube has to reversibly capture a wide volatility range of compounds, and the high moisture from soil vapor further limits the selection of sorbents. Camsco offers a tube solution (Camsco Part Number **SU60519**) specifically designed to address these challenges.

SVI Tube Configuration

- 125 mg Carbograph™ 2, 125 mg Carbograph™ 1 plus 65 mg of Carboxen™ 1003
- Sorbents are separated by 3 mm plugs of glass wool.
- Carbograph™ 2 is equivalent to Carbopack™ C; Carbograph™ 1 is equivalent to Carbopack™ B

Volatility Range C2~C20



- C3 ~ C20 for air volumes of 1 ~ 10 L for indoor air quality.
- Air volume is often less than a liter for micro chamber containing heated soil samples.

Temperatures

Maximum Temperature:	400°C
Conditioning Temperature:	350°C
Desorption Temperature:	325°C

Pros

- Covers a wide range of compounds including all the VOCs and some WOCs
- All sorbents are highly hydrophobic and well suited for moisture-containing soil vapor
- Very low background suitable for trace analysis

Cons

- Doesn't cover SVOC/DRO range very well

Technical Guide

Soil Vapor Intrusion (SVI) Tube



- As its name suggests, the SVI Tube is a tri-bed tube suitable for active/pumped sampling aimed at soil vapor intrusion. This tube has a modified version that is more specific for petroleum contaminated soil, called the Soil Gas Tube.
- SVI tubes come standard with stainless steel tubes, but many users prefer inert-coated stainless steel tubes.
- Halogenated non-Aromatics that can be analyzed by SVI tube include Vinyl Chloride, Bromomethane, Chloroethane and Trichlorofluoromethane, but not Chloromethane and Dichlorodifluoromethane
- Soil vapor often contains high moisture, thus a dry purge should be considered mandatory for SVI tubes before sample introduction.
- Hayes et al. (2007) demonstrated that sorbent tubes can be successfully applied to soil gas measurements and that, if sites were contaminated with middle distillate fuels (e.g No.2 diesel), more accurate/representative fuel fingerprints were obtained using sorbent tubes compared to Method TO-15 canisters (Figures 2)

Comparison to other Tubes

- The SVI Tube is similar to "TO-17 Tube Style 3" but Carboxen™ 1003 is more hydrophobic than both Carbosieve™ SIII or Carboxen™ 1000, and retains even less water in humid sampling environment.
- Compared to the Soil Gas Tube (see next page), the SVI tube has the advantage of lower background, thanks to its use of all carbon-based sorbents. However, the disadvantage of covering only the light end of the DRO may be an issue for some investigations.

From top to bottom, soil spiked with: gasoline, diesel, and jet fuel.

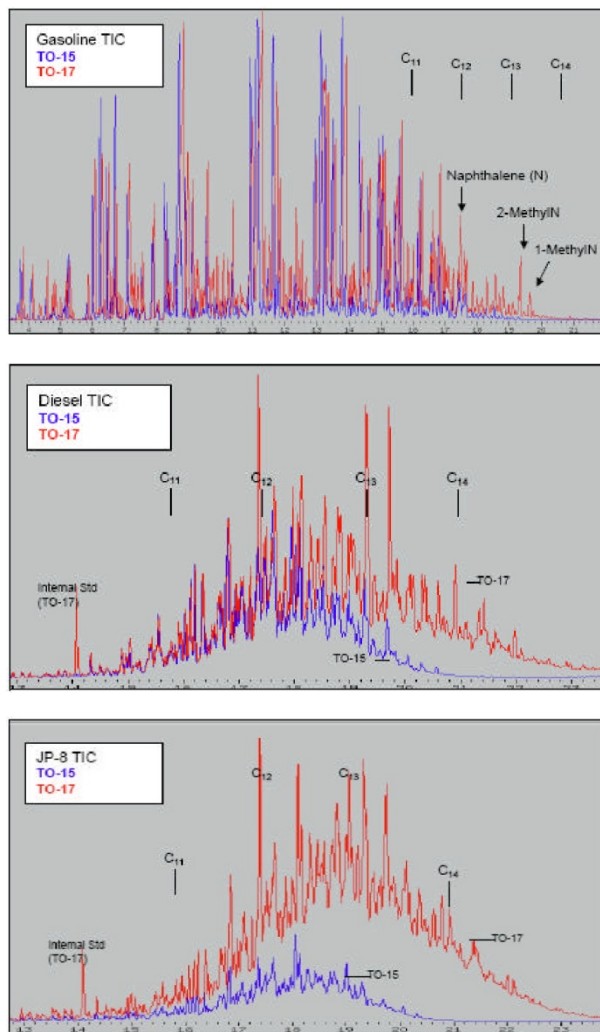


Figure 2, Sand soil vapor study, TO-15 Canisters versus TO-17 TD tubes. From top to bottom, soil spiked with: gasoline, diesel, and jet fuel.

References

US EPA Method TO-17: Determination of volatile organic compounds in ambient air using active sampling onto sorbent tubes. EPA/625/R-96/010b, 1999

US EPA, Vapor Intrusion website, <http://www.epa.gov/oswer/vaporintrusion/>

UK Health and Safety Executive MDHS 72 (Volatile Organic Compounds in Air), "Laboratory Method Using Pumped Solid Sorbent Tubes, Thermal Desorption and Gas Chromatography," Methods for the Determination of Hazardous Substances (MDHS), Sheffield, UK.

ITRC, Vapour Intrusion Pathway: Practical Guide VI-1, Jan. 2007.

Hayes, H.C. et al., Evaluation of sorbent methodology for petroleum impacted site investigations: Proceedings of the Air and Waste Management Association conference on vapor intrusion, Sept 2007

