This document references Chapters and Sections from the ITRC Vapor Intrusion Technical and Regulatory Guidance, and Fact Sheets and Technology Information Sheets from the ITRC Vapor Intrusion Toolkit, published January 2026. These resources can be accessed at: **https://itrcweb.org/vapor-intrusion-toolkit**.

FLUX CHAMBER AND OTHER FLUX MEASUREMENT DEVICES FACT SHEET

Flux chambers are enclosures placed in sealed contact with the surface (e.g., ground, floor) for a period of time, and the contaminant concentration in the enclosure is measured (**Figure 1** and **Figure 2**). In theory an effective room concentration can be calculated from the measured flux by assuming the flux is constant over time and over the floor area of the room and assuming a room ventilation rate. The calculated room concentration can be compared directly to allowable room concentrations for the volatiles of interest. This method offers advantages in some cases because it yields the actual flux of the contaminant out of the ground, which eliminates some of the assumptions required when using other types of subsurface data. The method has long been used by regulatory agencies at hazardous waste sites, and it is widely used for measuring trace emissions from natural soils, but its application to vapor intrusion assessments is relatively limited.

Figure 1. Photographs of mass-flux chambers.

Source: Eosense Inc, used with permission.

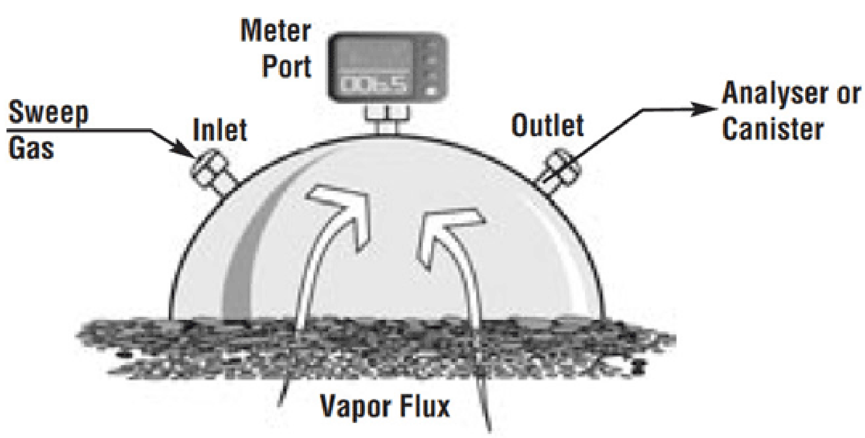

Figure 2. Diagram showing the various parts of a typical mass flux chamber.

Source: Hawaii State Department of Health's Hazard Evaluation and Emergency Response Office.

The testing is typically conducted in one of two modes: dynamic or static. In dynamic systems, a sweep gas is introduced into the chamber to maintain a large concentration gradient across the emitting surface. The effluent air from the chamber is collected using canisters and analyzed for vapor-forming chemicals (VFCs). This method is best suited for situations where large fluxes are anticipated. In static systems, a chamber is emplaced, and the contaminant concentration buildup is measured over time. This method is best suited for situations where lower fluxes are anticipated.

Flux chambers are not well suited for buildings with covered floor surfaces such as single-family residences because the primary entry points of soil vapor into the building (cracks, holes, sumps, etc.) are often concealed by floor coverings, walls, stairs, etc. For buildings, the method has more application to larger industrial and commercial buildings with slab-on-grade construction where the slab is mostly uncovered. A building survey using a real-time analyzer or on-site gas chromatograph can be used to attempt to identify the primary locations of vapor intrusion.

Flux chambers are best suited for situations where measurement from bare soils is desired, such as the following:

- Homes with dirt basements or crawl spaces
- Mobile homes above unfinished slabs or soil
- Evaluation of future-use scenarios at sites without existing buildings
- To demonstrate the occurrence of bioattenuation from areas with shallow soil vapor contamination (less than 5 feet below ground surface)

Flux chambers can also be used as a qualitative tool to locate surface fluxes of VFC contamination and entry points into buildings.

Regardless of the method used, enough chamber measurements should be collected to get a representative value under the footprint of the building (analogous to placing enough borings on a typical site), near edges where the slab meets the footing, over any zones with cracks or conduits, and over the center of the contamination if known. A sample at a given time represents the emissions over the previous change-outs of the chamber. In all cases, it is recommended that chambers be deployed for long-enough periods to enable temporal variations to be assessed, similar to indoor air measurements. According to the San Diego County Department of Environmental Health **Site Assessment and Mitigation Manual**, this can be 8–24 hours depending upon the conditions and 24 hours if large temperature differences exist between day and night (San Diego County Department of Environmental Health and Quality 2004). It should be noted that barometric pressure fluctuations can lead to biased results and conclusions. Additionally, elevated wind speeds can result in underestimates (Feng et al. 2024; Jiang et al. 2022; Maier et al. 2019).

More details on the flux chamber method can be found in Klenbusch (1986); Eklund (1992); Hartman (2003); Gao and Wang (2011); USEPA (2015); and Ma, McHugh, and Eklund (2020).

An alternative approach is the use of passive adsorptive diffusion samplers (PADS) to directly measure the diffusive flux of chemicals through the concrete slab (Niemet et al. 2025). The patented PADS technology consists of an adsorptive disc that is temporarily applied to the concrete surface for multiple days to adsorb VFCs diffusing through the concrete slab. The PADS are placed directly on the concrete surface and are isolated from the indoor air, hence eliminating the upper chamber element of a typical flux chamber. Following the sampling period, the adsorptive discs are removed and returned to the laboratory for analysis following U.S. Environmental Protection Agency Method TO-17 to quantify target chemicals adsorbed. No ice or preservatives are required during transport or storage. PADS can also be used for high-resolution screening of sub-slab concentrations over an entire building slab without drilling holes, thus providing targeted guidance on where subsequent sub-slab samples should be collected.

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