Evaluation of Flux Chamber Test Procedures for Management of Contaminated Areas

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Background/Objectives. Given the absence of national procedures and few international flux chamber studies for management of contaminated areas, this study presents procedures, adaptations and lessons learned in the flux chamber test conducted in a GEOKLOCK's project. In order to evaluate the vapor intrusion in a residential site built above an industrial landfill, dozens of sampling campaigns of outdoor air, sub slab, and soil vapor were carried out. However, it was not possible to establish a correlation between the outdoor air and the subsurface contamination. Therefore, four flux chamber test campaigns were executed to evaluate the soil vapor migration to surface without contribution of background, since this method minimizes the influence of the background in the results.

Approach/Activities. These tests were executed by two methods: 1) Static: the chamber was placed on the floor, sealed with bentonite and samples were collected during the incubation period; 2) Inert: after installation, simultaneously helium injection and air extraction were carried out to remove entrapped air and minimize the influence from background. Adaptation of the test procedures and chamber design were carried out through each campaign in order to answer questions and obtaining more reliable data. Therefore, multiple approaches were taken: simultaneous tests with and without inertization were performed; variation in helium injection flow during inertization; simultaneous samples of the chamber and soil vapors; variation in test time and quantitative samples; addition of in situ parameter measurements (humidity, temperature, relative pressure).

Results/Lessons Learned. The findings of this study lead to the following conclusions: 1) The complete chamber inertization is difficult and expensive, since it is not possible to reach 100% of helium in the chamber. Therefore, natural background compound may remain inside the chamber at the end of the process; 2) the helium, used as inertization gas, cause air stratification inside the chamber and affect tests results; 3) using bentonite as seal may increase humidity inside the chamber, because it needs to be humidified to not cause clay cracking. This humidity might interfere in the analytical results; 4) remaining of cleaning products on the floor may contribute with contaminant concentrations inside the chamber. Since the distinct compound were observed between sub slab and chamber samples, possible sources were evaluated, and thus a sample of the cleaning product used in the floor was collected.