

TCLP AND SPLP

Toxicity Characteristic Leaching Procedure

(TCLP US-EPA 1311)

TCLP is the US-EPA Method 1311 used for evaluating whether a waste material is hazardous or non-hazardous under municipal landfill conditions. The results of the TCLP then dictate the type of landfill the waste material is disposed into. Please contact the landfill for specific testing required.

The TCLP procedure is a sample processing procedure that precedes any analytical procedure (e.g. Organic or In-organic analyses).

Semi-Volatile Organic and Inorganic Parameters

A sample of waste must first have any associated liquid phase separated. This liquid phase is later combined with the TCLP extract. The separated solids are then subjected to particle size reduction to less than 1 cm then a 100 gram portion weighed out and extraction buffer added.

The buffer chosen for the extraction depends on the pH of the sample. For acidic or neutral samples an acetic acid – sodium acetate buffer (pH of 4.93 +/- 0.05) is used while for basic materials, an acetic acid solution (pH 2.88 +/- 0.05) is used.

The extraction involves a rotating extraction at $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 18 ± 2 hr at 30 ± 2 rpm (see figure 1). Following the extraction the TCLP extract is separated from the solids by filtering through a glass fibre filter paper with a pore size of 0.6 to 0.8 μm . It is this extract that is then analysed as a water sample for the parameters of interest.

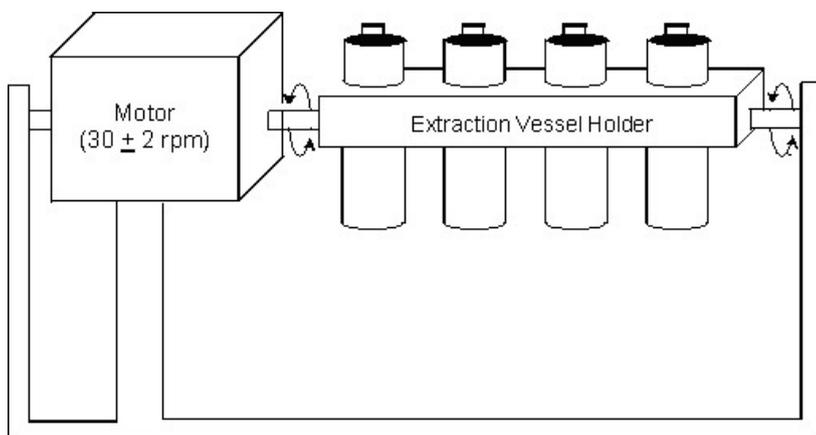


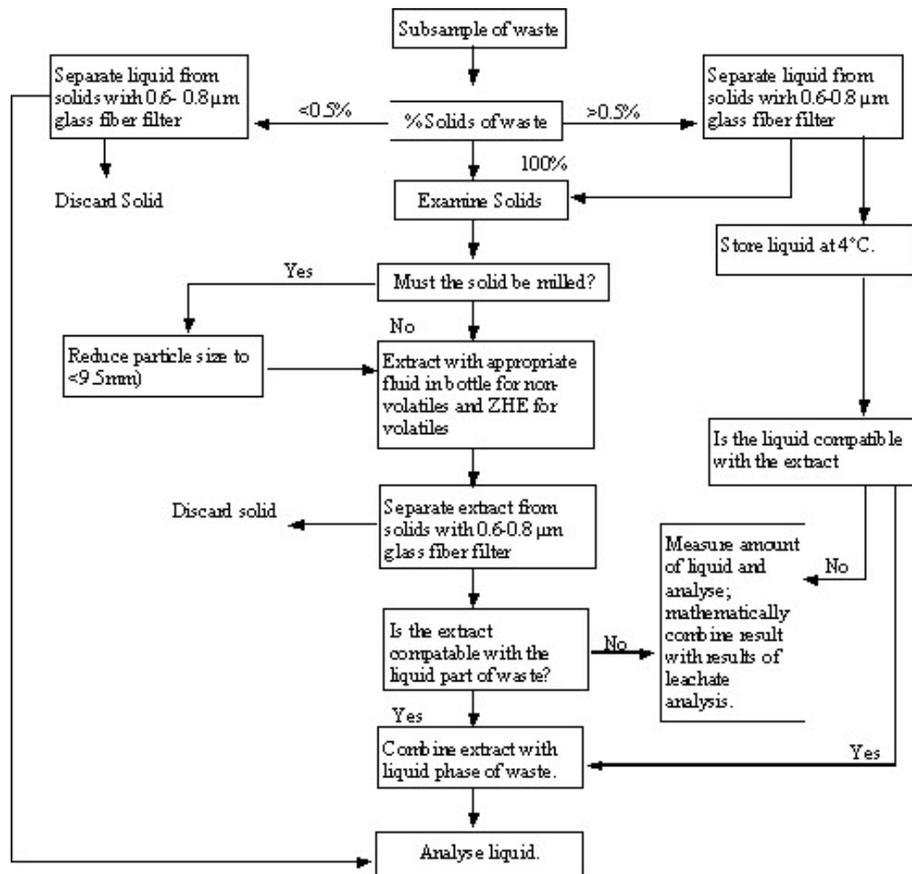
Figure 1 Rotary Agitation of TCLP

The procedure sounds simple enough, but in practice there are three complications that can arise. Firstly, the method is very dependent on the sample matrix. Secondly, obtaining a representative sample from a pile of assorted waste material can be very challenging (soils are normally not a problem) and thirdly, the method is very dependent on the exact conditions during the extraction. Inter-laboratory comparison sample results demonstrate notoriously poor precision.

Samples that are multi-phasic such as a solid waste with associated water and oil phases, present many complications and require analysis of the TCLP extract and separate analysis of the oil phase. The final TCLP is reported as a mathematical recombination of both sets of results.

A flow diagram of the method is presented in figure 2 below.

Figure 2 TCLP Extraction Procedure



Volatile Organic Compounds by TCLP

In the case of volatile organic compounds (VOCs) a special type of extraction apparatus is required in order to minimise loss of the volatile compounds during the extraction procedure. This extraction apparatus is referred to as a Zero Headspace Extractor (ZHE, see figure 3) and the only buffer that is used is the acetic acid – sodium acetate buffer (pH of 4.93 +/- 0.05).

The extraction process is the same as for the usual procedure and the final filtering is done via the ZHE and under gas pressure. The extract is collected directly into a VOC vial ready for analysis.

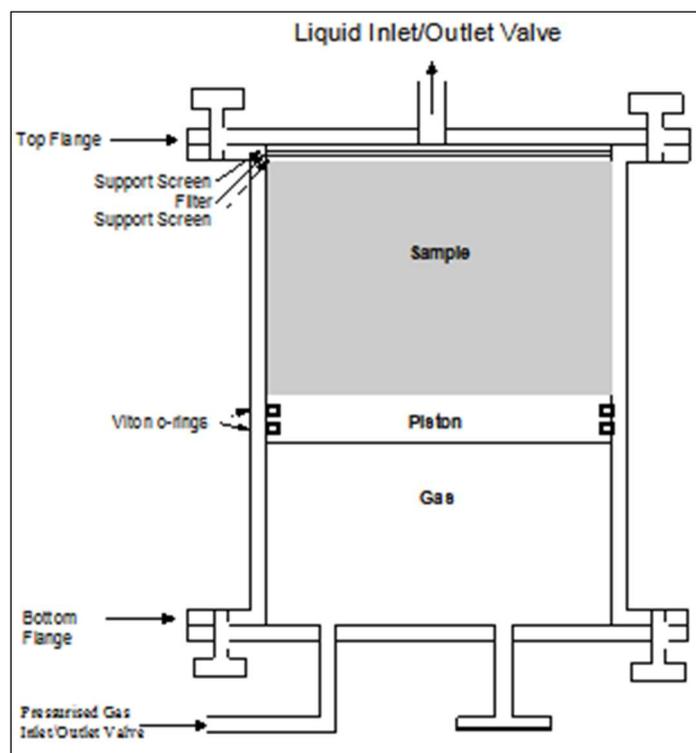


Figure 3 Zero Headspace Extractor

Synthetic Precipitation Leaching Procedure

(SPLP, US-EPA Method 1312)

This method is designed to mimic the effect of acidic rainfall on wastes and soils. Operationally it is very similar to the TCLP procedure except the extraction fluids are;

- #1 is pH 4.20 (made of sulfuric/nitric acid in reagent water) for soil samples east of the Mississippi river and for all wastes and wastewaters.
- #2 is pH 5.00 (made of sulfuric/nitric acid in reagent water) is for testing leachability of soils west of the Mississippi river
- #3 is reagent water for extraction of volatile organics and cyanide.

In NZ many people are choosing to use reagent water as the extractant for all analytes.

Contact

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