TCLP- Toxicity Characteristic Leaching Procedure

Waste determination testing

Many products are classified as hazardous waste when they are disposed at the end of their useful life. These products contain materials that are corrosive, flammable, reactive or toxic. Some toxic chemicals, such as lead and mercury are persistent and bioaccumulative, meaning they remain in the environment indefinitely and accumulate in and harm living things. When products containing these toxic compounds are disposed in landfills, the toxic chemicals can leach into underground drinking water supplies.

Waste codes listed in 40 CFR 261.24

TCLP Metals and Volatile Organic Compounds, Pesticides, Semi-Volatile Organic Compounds and Herbicides

Metals			Volatile Organic Compounds		
Contaminant	**EPA HW #**	**Regulatory Level**	**Contaminant**	**EPA HW #**	**Regulatory Level**
Arsenic	D004	5.0 mg/L	Benzene	D018	0.5 mg/L
Barium	D005	100.0 mg/L	Carbon tetrachloride	D019	0.5 mg/L
Cadmium	D006	1.0 mg/L	Chlorobenzene	D021	100.0 mg/L
Chromium	D007	5.0 mg/L	Chloroform	D022	6.0 mg/L
Lead	D008	5.0 mg/L	1,2-Dichloroethane	D028	0.5 mg/L
Mercury	D009	0.2 mg/L	1,1-Dichloroethylene	D029	0.7 mg/L
Selenium	D010	1.0 mg/L	Methyl ethyl ketone	D035	200.0 mg/L
Silver	D011	5.0 mg/L	Tetrachloroethylene	D039	0.7 mg/L
			Trichloroethylene	D040	0.5 mg/L
			Vinyl chloride	D043	0.2 mg/L
Pesticides			**Semi-Volatile Organic Compounds**		
Contaminant	**EPA HW #**	**Regulatory Level**	**Contaminant**	**EPA HW #**	**Regulatory Level**
Chlordane	D020	0.03 mg/L	o-Cresol	D023	200.0 mg/L
Endrin	D012	0.02 mg/L	m-Cresol	D024	200.0 mg/L
Heptachlor (and its epoxide)	D031	0.008 mg/L	p-Cresol	D025	200.0 mg/L
Lindane	D013	0.4 mg/L	Cresol	D026	200.0 mg/L
Methoxychlor	D014	10.0 mg/L	1,4-Dichlorobenzene	D027	7.5 mg/L
Toxaphene	D015	0.5 mg/L	2,4-Dinitrotoluene	D030	0.13 mg/L
			Hexachlorobenzene	D032	0.13 mg/L
			Hexachlorobutadiene	D033	0.5 mg/L
			Hexachloroethane	D034	3.0 mg/L
Herbicides			Nitrobenzene	D036	2.0 mg/L
Contaminant	**EPA HW #**	**Regulatory Level**	Pentachlorophenol	D037	100.0 mg/L
2,4-D	D016	10.0 mg/L	Pyridine	D038	5.0 mg/L
2,4,5-TP (Silvex)	D017	1.0 mg/L	2,4,5-Trichlorophenol	D041	400.0 mg/L
			2,4,6-Trichlorophenol	D042	2.0 mg/L

The U.S. Environmental Protection Agency (EPA) has identified 40 toxic chemicals that can cause harm when products containing them are disposed in landfills and the chemicals leach out (40 CFR part 261). To determine the potential of specific wastes to leach dangerous concentrations of toxic chemicals into groundwater, the EPA developed a protocol known as the Toxicity Characteristic Leaching Procedure (TCLP).

Products containing one or more of the listed toxins are assessed using the TCLP to estimate how much of their toxic contents would be released into landfill leachate under ordinary conditions. If the amount of a particular chemical released under test conditions exceeds regulatory limits, the waste qualifies as hazardous and must be handled according to regulations governing hazardous waste, such as handling by certified disposal agents and recycling or disposing in specially designated landfills and incinerators. Products that do not leach toxic materials at levels exceeding regulatory limits are termed TCLP compliant.

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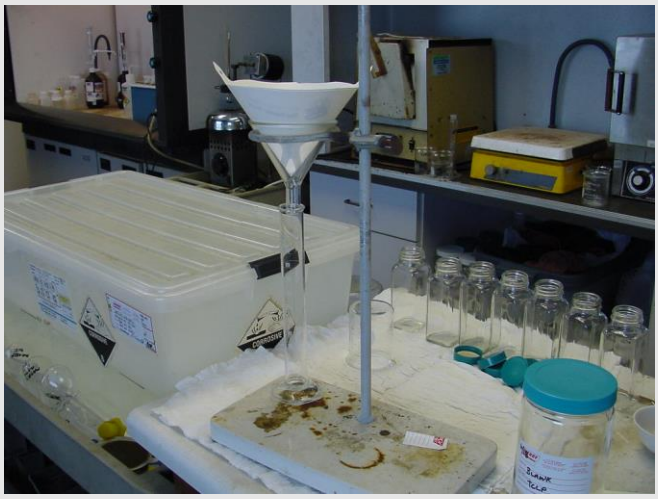
It is the generator's responsibility to make this determination, but generators often contract outside labs to perform the TCLP test.



The following questions and answers may be helpful to generators.

Question: What is the effect on the TCLP results if we miss any of the holding times specified in the method, or if we do not perform the procedure exactly as written?

Answer: The TCLP is a method-defined parameter and, therefore, it must be performed as written. This includes meeting all specifications for holding and tumbling times. If the method is not performed as written, the results are not valid for the purposes of determining whether the waste is hazardous based on the toxicity characteristic.

However, if the holding times are not met *and* the results for the analyses are *over* the numerical limits in the toxicity characteristic (40 CFR 261.24), the data can be used by the generator to demonstrate that the waste failed the toxicity characteristic and therefore *must* be managed as a hazardous waste.

Question: What are the holding times for the samples before leaching, the leachates before extraction, and the extracts before analysis?

Answer: Three types of holding times are summarized in Sec. 8.5 of Method 1311. For the leachate that will be analyzed for:

- Organics (including volatiles, semivolatiles, and the herbicides), you have 14 days from the collection of the original sample until you have to start the leaching (extraction).
- For metals, you have 180 days from collection until leaching, except for mercury, where leaching must start within 28 days.
- Herbicides are grouped with the "semivolatiles" in Sec. 8.5 of the method, since both types of analytes are extracted with an organic solvent. Extraction of semivolatiles and herbicides from the leachate must start within seven days of completion of the leaching procedure.

The instrumental (determinative) analyses for:

- Semivolatiles and herbicides must be completed within 40 days of the completion of the solvent extractions. The determinative analyses for the volatiles must be completed within 14 days of the completion of the leaching procedure.
- Metals must be completed within 180 days of the completion of the leaching procedure, except for mercury, where analyses must be completed within 28 days of the completion of the leaching procedure.

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It passes lab testing, now what?

Question: My waste passes the TCLP, does that mean my waste is not hazardous?
Answer: The waste could still be hazardous due to another characteristic (flammable, corrosive, reactive), or it may be a listed hazardous waste. To find step-by-step assistance on how to make a waste determination, see ***www.fedcenter.gov/assistance/facilitytour/hazardous/whatis/flowchart/***

Total Constituent Analysis instead of TCLP Analysis

Question: Is it acceptable to perform a total constituent analysis instead of a TCLP analysis and then divide the total concentration by 20 to determine if a waste is non-hazardous, as is implied in Section 1.2 of Method 1311, TCLP?

Answer: Section 1.2 of the TCLP *does* allow for a total constituent analysis in lieu of the TCLP extraction. If a waste is 100 percent solid, as defined by the TCLP method, then the results of the total constituent analysis may be divided by 20 to convert the total results into the maximum leachable concentration. This factor is derived from the 20:1 liquid-to-solid ratio employed in the TCLP. If a waste has filterable liquid, then the concentration of the analyte in each phase (liquid and solid) must be determined. The following equation may be used to calculate this value:

$$\frac{[A \times B] + [C \times D]}{B + [20\ (L/kg) \times D]} = E$$

Where:

- A = Concentration of the analyte in liquid portion of the sample (mg/L)
- B = Volume of the liquid portion of the sample (L).
- C = Concentration of the analyte in solid portion of the sample (mg/kg)
- D = Weight of the solid portion of the sample (kg)
- E = Maximum theoretical concentration in leachate (mg/L)

The value obtained (E) can be used to show that the maximum theoretical concentration in a leachate from the waste could not exceed the concentration specified in the toxicity characteristic (TC) (40 CFR 261.24). In addition, if the total constituent analysis results are below the TC limits without dividing by 20, then the same argument holds true, i.e., the maximum theoretical concentration in the leachate could not exceed the TC limits.

Do I have to test for all the chemicals listed in 40 CFR 261.24?

Waste streams should be tested for constituents that are reasonably expected to be present. For example, if a facility had a parts washer, the parts washer may reasonably be expected to contain leachable metals. (Chromium or cadmium is often a coating or constituent from bearings, pistons, or other metal products.) Since pesticides would not reasonably be expected to be present in normal parts washer operations, do not test for any of the pesticides that are in 40 CFR 261.24.

If you have a waste that is absolutely unknown, you will need to test for all the TC constituents listed in 40 CFR 261.24. This situation could occur, for example, if a 55 gallon drum of unknown liquid was abandoned on your property and you could not find the original owner. This waste would need a full determination for the TC constituents and other characteristics.