Characteristics of Hazardous Waste and Some Key Federal and California Differences

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Environmental Law Institute
Summer School 2018

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July 17, 2018

All “Hazardous Wastes” Are Based on Four Types of Hazards

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Overview

- Characteristics of Reactivity
- Characteristics of Corrosivity
- Characteristics of Ignitability
- Characteristics of Toxicity

Characteristics of Reactivity

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- Reacts violently with water
- Forms explosive mixtures with water
- When mixed with water, forms toxic gases
- Normally unstable and violent change without detonation
- Cyanide or sulfide-bearing waste that can generate toxic gases when mixed with non-corrosive liquids
- Capable of detonating under a strong initiating source or heat with confinement
- Explosive under normal conditions
- Forbidden Explosive, Class A or Class B Explosive per DOT definition

Characteristics of Corrosivity

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- Liquid
  - An aqueous liquid with a pH </= 2 or >/= 12.5
  - A liquid that corrodes steel (SAE 1020) at a rate greater than 6.35 mm per year
- Solid
  - Produces a solution of a pH </= 2 or >/= 12.5 when mixed with equivalent weight of water

Characteristics of Ignitability

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- A solid capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes and burns vigorously to create a hazard
- A liquid with a flash point less than 140°F
- Ignitable gas as defined by 49 CFR 173.300
- Oxidizer as defined in 49 CFR 173.151

Characteristics of Toxicity

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- Waste that is harmful or fatal when ingested or absorbed
- Initially based on **Chronic Toxicity** from the Safe Drinking Water Standards set in the 1970s
- 8 metals
- 4 pesticides
- 2 herbicides
- 26 organic compounds (added in 1990)
- Listed as D004 to D043 Waste ID Codes

Federal Toxicity Determination

- Liquids can be tested using any method as long as it has documented quality control
- By definition, liquids contain less than 0.5% solids
- Solids must go through a procedure that mimics landfill conditions called a Toxic Characteristic Leaching Procedure (TCLP) prior to testing

The TCLP

- Promulgated in 1990 replacing the old Extraction Procedure (EP) Toxicity test
- Solid/liquid samples are separated; the solids are processed, then re-combined with the liquid portion for analysis
- Involves 20-fold dilution of the solid portion of the waste to extractant fluid
- Uses acetic acid as extractant
- 18 hours extraction
- Then filtered and the leachate is analyzed (solids are discarded)

TCLP Results

- The test results are compared to the numbers listed in Table I of CCR, Title 22 66261.24 as the Regulatory Level (mg/L)

- Equal to or greater than makes the waste material an RCRA Hazardous Waste for toxicity

Federally Regulated Metals

- Arsenic
- Barium
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Silver

CA Toxicity Criteria – 22 CCR 66261.24

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- 20 Metals/Inorganics (Table II)
- 18 Persistent/Bioaccumulative Toxic Substances (Table III)
- Oral LD50 less than 2,500 mg/kg
- Dermal LD50 less than 4,300 mg/kg
- Inhalation LC50 less than 10,000 ppm
- 96 hour Aquatic Bioassay (LC50 less than 500 mg/L)
- 0.001% weight listed constituents (16 OSHA carcinogens)
- Been shown to cause hazards to health/environment

CA's Version of Toxic Constituents

- Table II of 66261.24(a) for metals and inorganics
- Table III of 66261.24(a) for bio-accumulative or persistent organics
- Both tables have a liquid threshold and a solid threshold for being a hazardous waste (federal only has liquid threshold)

CA Replaces TCLP with the TTLC and the STLC (WET Test)

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- TTLC = Total Threshold Limit Concentration
- No sample dilution and doesn't consider landfill conditions
- STLC = Soluble Threshold Limit Concentration (WET Test)
- Same concept as the TCLP, but uses a different acid and digests for a greater time

California WET Procedure

- Uses procedure from 22CCR Div.4.5, CH.11, Appendix II
- Used for 17 metals, 2 inorganics, asbestos, 10 pesticides, and 8 other organics
- Solids milled to 0.45 microns
- Involves a 10-fold dilution of the solid waste to extractant fluid
- Citric acid extractant
- 48 hours extraction
- Leachate is analyzed

66261.24 Table II Metals

Bold = CA only metals

- Arsenic
- Barium
- Lead
- Mercury
- Cadmium
- Chromium
- Selenium
- Silver
- **Antimony**
- **Molybdenum**
- **Nickel**
- **Thallium**
- **Vanadium**
- **Zinc**
- **Beryllium**
- **Cobalt**
- **Copper**

Chromium

- California differentiates chrome VI and chrome III
- California has a STLC limit for chrome III of 560 mg/L (only if the waste passes the TCLP process)

Asbestos

- Only applies to substances that are in a friable, powdered, or finely divided state
- There is no STLC for asbestos
- Tested using a microscope and based on percentage of waste
- Includes all six types of asbestos

Determination of HW in CA (Solids w/Metals)

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- Always run the TTLC first (test name is a CAM-17)
- The test is inexpensive and gives valuable information for both RCRA and CA
- See if results are > TTLC levels
  - If yes, it is at least a CA Hazardous Waste
- See if results are 20 times greater than the TTLC values
  - If yes, you must run a TCLP
- If results are less than the TTLC numbers, see if they are greater than 10 times the STLC numbers in Table II and Table III
  - If yes, you must run a STLC
- If the results of the STLC are below the numbers listed in Table II, then the waste is not a hazardous waste for toxicity per CCR 66261.23(a)(1) and (2)
- However, in CA there are still 6 more toxicity criteria to check for

TCLP Vs STLC (Lead Example)

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- Federal TCLP
- Solid waste with 100 mg/kg of lead
- 50% leaches
- 20 to 1 dilution
- 50 mg/L divided by 20
- Results = 2.5 mg/L

Not an RCRA Hazardous Waste

- CA STLC
- Solid waste with 100 mg/kg of lead
- 50% leaches
- 10 to 1 dilution
- 50 mg/L divided by 10
- Results = 5 mg/L

A Non-RCRA but CA Hazardous Waste

Scrap Metal Exemption
Title 22, Section 66261.6(a)(3)(B)

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Scrap Metal Recycling Exemption

- Both the federal government and the CA state government allow for recycled scrap metal to be excluded from hazardous waste requirements. The definition for the exemption is not the same
- CA's exclusions are more stringent than the federal

CA Excludes From Scrap Metal (Title 22, Section 66260.10)

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- Lead acid batteries
- Magnesium borings…. capable of independent combustion
- Beryllium borings…. capable of producing adverse health effects
- Any metal contaminated with hazardous waste
- Any metal with free flowing oil that is a hazardous waste and
- Sludges, fine powders (<100 microns), semi-liquids and liquid solutions that are hazardous wastes

ACUTELY HAZARDOUS WASTE
VERSUS
EXTREMELY HAZARDOUS WASTE

RCRA Acutely Hazardous Waste

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- P listed wastes (205 materials)
- 1 kg threshold in any given month for LQG status
- Can require Biennial Report
- Containers must be triple rinsed to be considered “empty”
- Must be from an un-used, single ingredient material
- Watch laboratory clean-outs and pharmaceuticals

CA Extremely Hazardous Waste

- Criteria found in 66261.107
- Oral LD50 of less than or equal 50 mg/kg
- Dermal LD50 less than or equal 43 mg/kg
- Inhalation LC50 less than or equal to 100 ppm of gas or vapor
- Substance listed in 66261.24(a)(7) in concentration of 0.1 or greater
- Water reactive

CA Extremely Hazardous Waste

- LQG status if generate 1 kg or more in any given month
- SB 14, Pollution Prevention Plan required if generate 12 kg or more per year
- No triple rinsing requirement, does not affect empty containers

Acknowledgements:

Steve Koester, El Segundo Fire Department, CA

Mital Desai, Geosyntec Consultants, Pasadena, CA

Richard Montevideo, Rutan and Tucker, Costa Mesa, CA

Thank You