

Calculated Oral or Dermal LD₅₀

Hazardous waste criteria

References:

Title 22 CCR §Section 66261.24(c)

25141.5 HSC oral LD₅₀ or LD_{LO} < 2500 mg/kg

66261.24 (a)(4) dermal LD₅₀ or LD_{LO} < 4300 mg/kg

Extremely hazardous waste criteria

References:

Title 22 CCR §Section 66261.110(b)

66261.110 (a)(1) oral LD₅₀ or LD_{LO} < 50 mg/kg

66261.110 (a)(2) dermal LD₅₀ or LD_{LO} < 43 mg/kg

The Equation

Calculated oral or dermal LD₅₀ =

$$\frac{100}{\frac{(\% \text{ chemical \#1})}{(\text{LD}_{50} \text{ or LD}_{\text{LO}} \text{ chemical \#1})} + \frac{(\% \text{ chemical \#2})}{(\text{LD}_{50} \text{ or LD}_{\text{LO}} \text{ chemical \#2})} + \frac{(\% \text{ chemical \#3})}{(\text{LD}_{50} \text{ or LD}_{\text{LO}} \text{ chemical \#3})}}$$

$$\text{Calculated oral or dermal LD}_{50} \text{ for a waste} = \frac{100}{\sum_{x=1}^n \frac{\%A_x}{T_{Ax}}}$$

Where:

%A_x = weight percent of each component in the waste

T_{Ax} = the acute oral or dermal LD₅₀ or LD_{LO} of the corresponding component

Σ = sum of all the math divisions for $\frac{\%A_x}{T_{Ax}}$

Example #1:

A waste contains 5% Ethylene Oxide and 95% water. The acute oral toxicity (rat) of ethylene oxide = 72 mg/kg.

$$\text{Calculated oral or dermal LD}_{50} = \frac{100}{\sum_{x=1}^n \frac{\%A_x}{T_{Ax}}}$$

$$\text{Calculated oral LD}_{50} = \frac{100}{\frac{5}{72}} = \frac{100}{0.069444} = 1,440 \text{ mg/kg}$$

Conclusion: The waste is hazardous since the calculated oral LD₅₀ is less than the regulatory threshold of 2,500 mg/kg.

Example #2

A waste contains 5% Ethylene Oxide, 45% 1,1,2-Trichloroethane and 50% water.

The acute oral toxicity (rat) of ethylene oxide = 72 mg/kg.

The acute oral toxicity (rat) of 1,1,2-Trichloroethane = 580 mg/kg

Using the calculated LD₅₀ equation:

$$\text{Calculated oral LD}_{50} = \frac{100}{\frac{5}{72} + \frac{45}{580}}$$

$$\text{Calculated oral LD}_{50} = \frac{100}{0.06944 + 0.077586} = 680 \text{ mg/kg}$$

Conclusion: The waste is hazardous since the calculated oral LD₅₀ is less than the regulatory threshold of 2,500 mg/kg.