



Risk Evaluation Determining Whether Environmental Emergency Planning is Required Under the *Environmental Emergency Regulations* set under the *Canadian Environmental Protection Act, 1999* (CEPA 1999)

Trichloroethylene (CAS #: 79-01-6)
(TCE)
(CEPA 1999 – Schedule 1, #45)

Summary of Risk Evaluation Analysis

The Risk Evaluation Framework (REF), developed by Environment Canada, is applied to chemical substances in order to determine whether or not an environmental emergency (E2) plan should be required. For those substances that are evaluated as requiring an E2 plan, the next step is to determine a threshold quantity for the total quantity of the substance and the maximum storage container size on site. Within the REF, three categories are used to evaluate chemicals and assign threshold quantities. Shown below are the details within the three categories for *trichloroethylene*:

1. Environmental Hazard

(Persistence, Bioaccumulation and Aquatic Toxicity Analysis)

- *Trichloroethylene* is classified as highly persistent (half-life greater than or equal to 2 days) in air (ATSDR, 1997; HSDB, 2004) and moderately persistent (half-life between 60 and 182 days) in water (Yeh *et al.*, 1991). It is also slightly persistent (half-life between 30 and 60 days) in sediment (Yeh *et al.*, 1991) and practically non-persistent (half-life less than 14 days) in soil (Yeh *et al.*, 1991).
- According to the most sensitive species, rainbow trout, *trichloroethylene* is practically non-bioaccumulative (BCF less than 50) (HSDB, 2004).
- For aquatic toxicity, it was determined that *trichloroethylene* is slightly toxic (LC₅₀ at 96 hrs between 10 and 100 mg/L) based on the most sensitive species, fathead minnow (Walbridge C.T., 1983).

2. Human Hazard

(Inhalation Toxicity and Carcinogenicity Analysis)

- Since *trichloroethylene* has a vapour pressure above 1.33 kPa at 20°C (Verschuere, 2001; CHEMInfo, 2004), there is sufficient vapour from the substance to cause an inhalation problem. There is an Immediately Dangerous to Life and Health (IDLH) value of 1000 ppm (NIOSH, 2003).
- *Trichloroethylene* is categorized as a United States Environmental Protection Agency (US EPA) carcinogen with a classification rating of 'B2' (RAIS, 1998) and as an International Agency for Research on Cancer (IARC) carcinogen with a classification rating of '2A' (IARC, 1995).

3. Physical Hazard

(Flammability and Combustibility Analysis)

- *Trichloroethylene* is a substance normally stable, even under fire exposure conditions, and is not reactive to water (NFPA, 2002; CHEMInfo, 2004; Genium, 2004).

Flammability and Combustibility Analysis Table

	Value	Vapour Cloud Explosion (Yes/No)	Combustible (Yes/No)	References
Boiling point (°C)	87	No	No	(NFPA, 2002; Verschuere, 2001, CHEMInfo, 2004; CHRIS, 1999)
Flash point (°C)	No data			(NFPA, 2002; CHEMInfo, 2004)

Threshold

The data from the above mentioned categories were used to determine the various environmental/human thresholds. The threshold quantities relate to: carcinogenicity, aquatic toxicity, inhalation toxicity, vapour cloud explosion, combustibility, and reactivity.

The threshold quantity for carcinogenicity is defaulted to 0.22 tonnes, if it meets the following criteria:

- 1) have an IARC rating of 1, 2A or 2B, or have a US EPA rating of A, B1, or B2;
- 2) be persistent in any media for greater than 5 years.

Threshold quantities assigned as a result of aquatic toxicity are based on the following table:

Threshold Quantities Assigned as a Result of Aquatic Toxicity

Criteria	Extremely Toxic	Highly Toxic	Moderately Toxic	Slightly Toxic
Persistence (water)	≥ 6 months	≥ 2 months to < 6 months	N/A	N/A
Bioaccumulation	BCF ≥ 5000 or Log Kow ≥ 5	BCF ≥ 500 to < 5000 or Log Kow ≥ 4 to < 5 (unless BCF < 500)	N/A	N/A
Acute Aquatic Toxicity (96 hrs LC ₅₀ – mg/L)	≤ 0.1	> 0.1 to ≤ 1	> 1 to ≤ 10	> 10 to ≤ 100
Threshold Quantity Tonnes (lbs)	0.22 (500 lbs)	1.13 (2 500 lbs)	4.50 (10 000 lbs)	9.10 (20 000 lbs)

A substance is a candidate for a vapour cloud explosion if its flash point is < 23°C and its boiling point is < 35°C. A substance is considered combustible if its flash point is < 23°C or its boiling point is < 35°C. In accordance with the precautionary principle, the category with the lowest threshold will be used. For further explanation, please refer to the *Implementation Guidelines for Part 8 of the Canadian Environmental Protection Act, 1999 – Environmental Emergency Plans* (<http://www.ec.gc.ca/ee-ue/>).

Conclusion

For *trichloroethylene* # 45, the E2 hazard threshold was triggered by:

- 1) Aquatic toxicity at 1.13 tonnes;
- 2) Inhalation toxicity at 9.10 tonnes.

Therefore, *trichloroethylene* # 45 is recommended for addition to Schedule 1 of the *Environmental Emergency Regulations* under Part 3 with a threshold quantity of 1.13 tonnes.

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