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#### CLASS D – POISONOUS AND INFECTIOUS MATERIAL

**43.(1) The products, materials and substances referred to in sections 46 to 64 shall be included in Class D - Poisonous and Infectious Material listed in Schedule II to the Act.**

**(2) Divisions 1 to 3 are established as divisions of Class D - Poisonous and Infectious Material listed in Schedule II to the Act.**

**(3) Subdivisions A and B are established as subdivisions of Divisions 1 and 2 of Class D - Poisonous and Infectious Material listed in Schedule II to the Act.**

**(4) A gas included in Division 4 of Class 2 in Part III of the *Transportation of Dangerous Goods Regulations* does not fall into Division 1 or Division 2 of Class D - Poisonous and Infectious Material.**

#### INTERPRETATION / DISCUSSION of SECTION 43

Class D - Poisonous and Infectious Materials includes the greatest number of criteria of any of the classes. The criteria have been grouped into three divisions, each of which describe a different type of hazard and require a different symbol as shown in Schedule II of the *CPR*.

**Redundancy of multiple classifications within WHMIS Class D:** There are instances where it would be redundant to include a material within more than one sub-classification within WHMIS Class D. Specifically:

the difference between inclusion in Class D1A and Class D1B relates to the dose needed to cause immediate and serious toxic effects. Different lethal values may be observed if the chemical is tested by different routes of exposure. However, if the acute toxicity is determined for more than one route, the most severe hazard level should be used for classification.

The situation described in the preceding paragraph is similar to that addressed in relation to corrosion vis-à-vis irritation (please refer to Section 60 of the *CPR*); i.e., materials which fall within the criteria for skin corrosivity will always meet the *CPR* criteria for skin irritation. Classification of such materials into both Class E and D2B involves redundancy for D2B information and possible confusion on the part of the users. Since corrosion is an irreversible process, it is more hazardous than irritation, which is typically reversible and therefore of less concern with respect to hazard communication.

This will also apply to chronic toxicity and mutagenicity endpoints. If a chemical falls within the criteria specified in Section 52 of the *CPR* (Class D2A) and thereby considered “very toxic”, no additional information would be provided by also including the substance as meeting the criteria specified in Section 59 of the *CPR* (Class D2B).



A germ cell mutagen also has the potential to induce somatic cells mutations that may be associated with the subsequent development of cancer or other diseases. Therefore, it would be redundant to classify a chemical in both subclasses i.e. meeting criteria for CPR Section 57 (Class D2A - heritable genetic effects) and CPR Section 62 (Class D2B - somatic cell mutagenicity). The distinction between the two subclasses relies very often on the amount of evidence (i.e test results) available.

Therefore, as a general rule:

- ▶ If a product falls into D1A, then it would be redundant to also include it in D1B;
- ▶ If a product falls into D2A in relation to a given endpoint, it would be redundant to also include it in D2B. This would be the case for the criteria set out in sections 52/59 and 57/62. However, if a product falls into D2A and D2B based on results to assess different endpoints (for example, carcinogenicity versus skin irritation), then the product would fall into the two subclasses.

#### **Subsection 43(2):**

Division 1 of Class D is entitled "Materials Causing Immediate and Serious Toxic Effects" (section 46-51). It includes criteria which describe products that are a danger because of the immediacy of any effect following exposure and because the products can cause death.

Division 2 is entitled "Materials Causing Other Toxic Effects" (sections 52-63). It includes criteria for products which usually do not pose a serious immediate toxic effect upon a single exposure. This includes products that produce immediate but non-lethal effects such as skin sensitization as well as products that can cause serious effects such as cancer or reproductive defects over longer-term exposure.

Division 3 is entitled "Biohazardous Infectious Material" and includes a single criterion; (see section 64 of the *CPR*).

#### **Subsection 43(3):**

Divisions 1 and 2 have been further divided into subdivisions A and B to distinguish products by the severity of hazard they pose. Subdivision A is entitled "Very Toxic Material" and subdivision B is entitled "Toxic Material". In Division 1, the distinction between subdivision A and B products is the quantity of the product that is required to produce a fatal effect.

In Division 2, the distinction between subdivision A and B products is, in some cases, the quantity of product required to produce a toxic effect. Subdivision B also includes products that produce immediate but less serious reversible effects.

**TDGR Packing Groups** - TDGR packing groups correlate to the primary TDG classification of a substance. Although this has no implication for the criteria set out in CPR 39(d) and 65(d), it does with regard to *CPR* 47 and 50. The distinction between D1A (*CPR* 47) and D1B (*CPR* 50) is based on the packing group of the 6.1 TDG classification. If the 6.1 classification is the subsidiary classification, it

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can be concluded that the substance falls within D1. However, the scientific literature must be searched to find the LD<sub>50</sub>/LC<sub>50</sub> values that enable the determination of whether a substance falls within the criteria for D1A versus D1B. If available LD<sub>50</sub>/LC<sub>50</sub> data do not enable an assessment against the criteria set out in CPR 46 & 49, then the substance would be included in D1B.

#### **Subsection 43(4):**

During the development of WHMIS, stakeholders had agreed that "a gas which falls in TDG Class 2, Division 4 shall not also be classified as a Very Toxic Material or a Toxic Material in WHMIS" as such materials would already be classified as a WHMIS corrosive material, (ref.: p. 67 of WHMIS Steering Committee report). As a result, Class D of the WHMIS criteria specifically excludes those gases in Division 4 of Class 2 in the *Transportation of Dangerous Goods Regulations (TDGR)*. These gases can have a lethal effect because of the extreme corrosive effect on the tissue of the respiratory tract. Such products will be included under Class A - Compressed Gas and, by virtue of paragraph 65(d) of the CPR, these substances are also included in WHMIS Class E, Corrosive Material.

A subsequent amendment to the TDGR<sup>1</sup>, however, moved nine of the twelve substances originally included in Division 4 to other Divisions in TDG Class 2. Only (i) ammonia, anhydrous, liquefied or anhydrous ammonia or ammonia solutions, relative density (specific gravity) less than 0.880 at 15°C in water, with more than 50% ammonia, UN 1005 and (ii) ammonia solutions, relative density (specific gravity) less than 0.880 at 15°C in water, with more than 35% but not more than 50% ammonia, UN 2073 retained their 2.4 classifications. The exemption from inclusion in WHMIS Class D, therefore, continues to apply to liquefied ammonia only as this is the only gas remaining in Division 4 of TDG Class 2 after the amendment to the TDGR came into effect on October 1, 1994.

The gases which were moved out of Division 4 of TDG Class 2 are boron trichloride, chlorine, hydrogen bromide (anhydrous), hydrogen chloride (anhydrous), hydrogen chloride (refrigerated liquid), hydrogen fluoride (anhydrous), hydrogen iodide (anhydrous), nitrosyl chloride and trifluoroacetyl chloride. The twelfth substance, aerosols containing any quantity of a corrosive gas, became prohibited under the TDG amendment. At the May 1995 meeting of the WHMIS Current Issues Committee, participants agreed that, in order to respect the original consensus agreement, when the CPR are amended, the applicable subsection, 43(4) and paragraph 65(d), will be revised to refer to the substances by name which were included in Division 4 of TDG Class 2 as of October 31, 1988, i.e., when the CPR came into effect. Therefore, the labels of the applicable products must continue to display the Class E symbol but need not depict the skull and cross bones nor "toxic T" symbols whether or not the substance falls within the Class D criteria. The exemption from depicting the Class D symbols on the labels of these products does not exempt suppliers from disclosing any of the MSDS hazard information relevant to these products.

<sup>1</sup> SOR/93-525, Canada Gazette Part II, December 15, 1993, p. 4056.



### Formulae for Equivalent LC<sub>50</sub>

44. For the purpose of establishing that a product, material or substance falls into Division 1 of Class D - Poisonous and Infectious Material, an LC<sub>50</sub> that is obtained in an animal assay at an exposure duration of other than four hours may be converted to an LC<sub>50</sub> equivalent to an exposure duration of four hours by using the following formulae:

(a) for a gas or vapour,

$$\text{LC}_{50} \text{ at Y hours} \times \frac{(\text{Y hours})^{1/2}}{2} = \text{LC}_{50} \text{ at 4 hours; and}$$

(b) for dust, mist or fume,

$$\text{LC}_{50} \text{ at Y hours} \times \frac{(\text{Y hours})}{4} = \text{LC}_{50} \text{ at 4 hours.}$$

**Note:** Y = actual number of hours of exposure duration.

### INTERPRETATION / DISCUSSION of SECTION 44

Four hour exposure periods are specified in paragraphs 46(c), (d) and (e) and in 49(c) and (d) of the *Controlled Products Regulations*. Since LC<sub>50</sub> determinations may be conducted over various periods of time measured in minutes to several hours, there is a need to be able to extrapolate such data for four hour exposure periods. These formulae assume a simple linear relationship between times of exposure and concentrations in the animal chamber for dust, mist and fume and a "square root" function for gas and vapour.



### Toxicological Evaluation of Mixtures: LD<sub>50</sub> and LC<sub>50</sub> Data

45.(1) Subject to subsection (3), where the LD<sub>50</sub> or LC<sub>50</sub> of every ingredient of a mixture present at a concentration of one per cent or more is known, the LD<sub>50</sub> or LC<sub>50</sub> of the mixture shall be determined, taking into account all ingredients present at a concentration of one per cent or more, by using the following formulae:

(a) for a solid or a liquid,

$$\frac{1}{\text{LD}_{50} \text{ of mixture}} = \frac{\text{proportion of ingredient A}}{\text{LD}_{50} \text{ of ingredient A}} + \frac{\text{proportion of ingredient B}}{\text{LD}_{50} \text{ of ingredient B}} + \dots + \frac{\text{proportion of last ingredient}}{\text{LD}_{50} \text{ of last mixture ingredient}}$$

(b) for a gas, vapour, dust, mist or fume,

$$\frac{1}{\text{LC}_{50} \text{ of mixture}} = \frac{\text{proportion of ingredient A}}{\text{LC}_{50} \text{ of ingredient A}} + \frac{\text{proportion of ingredient B}}{\text{LC}_{50} \text{ of ingredient B}} + \dots + \frac{\text{proportion of last ingredient}}{\text{LC}_{50} \text{ of last mixture ingredient}}$$

Note: proportion = the weight of the ingredient divided by the weight of the mixture.

(2) Subject to subsection (3), where the LD<sub>50</sub> or LC<sub>50</sub> of one or more ingredients of a mixture is not known, the LD<sub>50</sub> or LC<sub>50</sub> of the mixture is equal to the LD<sub>50</sub> or LC<sub>50</sub> of the most acutely lethal ingredient that is present in the mixture at a concentration of one per cent or more and for which LD<sub>50</sub> or LC<sub>50</sub> data is available.

(3) The LD<sub>50</sub> or LC<sub>50</sub> of a mixture may be determined by testing the mixture.

### INTERPRETATION / DISCUSSION of SECTION 45

Many of the products that will be classified according to the "acute lethality" criteria will be untested mixtures. The formulae included in this section facilitate the calculation of an approximate LD<sub>50</sub> or LC<sub>50</sub>



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**CPR Section 45 - Toxicological Evaluation of Mixtures: LD<sub>50</sub> and LC<sub>50</sub> Data**

Manual updated:

1996/03/31

value providing the relevant data exists for all those constituents present in the mixture at a concentration equal to or greater than 1%.

If the LD<sub>50</sub> (or LC<sub>50</sub>) of a mixture is unknown but the LD<sub>50</sub> (or LC<sub>50</sub>) of all the ingredients present at a concentration equal to or greater than 1% are known, then the mixture is considered to be a tested mixture with an LD<sub>50</sub> (or LC<sub>50</sub>) derived from the formula in subsection 45(1). Such a mixture is thus not subject to the untested mixture criteria in sections 48 and 51 of the *CPR*; {ref.: PIS No.29}. By virtue of subsection 12(10), the MSDS may disclose the LD<sub>50</sub> (or LC<sub>50</sub>) derived from the formula in place of the LD<sub>50</sub> (or LC<sub>50</sub>) of the ingredients for such a mixture.



Regulation, section, title/subject:

**CPR Section 46 - Acute Lethality [Class D; Division 1, Subdivision A]**

Manual updated:  
**2000/10/31**

## *Division 1: Materials Causing Immediate and Serious Toxic Effects*

### *Subdivision A: Very Toxic Material*

#### **Pure Substances and Tested Mixtures**

#### **Acute Lethality**

**46. A pure substance or tested mixture falls into Subdivision A of Division 1 of Class D - Poisonous and Infectious Material if, in an animal assay for acute lethality, it has an**

**(a) LD<sub>50</sub> not exceeding 50 milligrams per kilogram of body weight of the animal when tested in accordance with OECD Test Guideline No. 401, "Acute Oral Toxicity", dated May 12, 1981;**

**(b) LD<sub>50</sub> not exceeding 200 milligrams per kilogram of body weight of the animal when tested in accordance with OECD Test Guideline No. 402, "Acute Dermal Toxicity", dated May 12, 1981;**

**(c) LC<sub>50</sub> not exceeding 2,500 parts per million by volume of gas when tested for four hours in accordance with OECD Test Guideline No. 403, "Acute Inhalation Toxicity", dated May 12, 1981;**

**(d) LC<sub>50</sub> not exceeding 1,500 parts per million by volume of vapour when tested for four hours in accordance with OECD Test Guideline No. 403, "Acute Inhalation Toxicity", dated May 12, 1981, and a saturated vapour concentration at normal atmospheric pressure greater than two times the value of that LC<sub>50</sub>; or**

**(e) LC<sub>50</sub> not exceeding 0.5 milligrams per litre or 500 milligrams per cubic metre of dust, mist or fume when tested for four hours in accordance with OECD Test Guideline No. 403, "Acute Inhalation Toxicity", dated May 12, 1981.**

### **INTERPRETATION / DISCUSSION of SECTION 46**

There are two LD<sub>50</sub> criteria dealing with oral and dermal exposure and three LC<sub>50</sub> criteria dealing separately with gases, vapours and, collectively, dust, mist and fumes. In each case, OECD Test Guidelines are referenced.



Regulation, section, title/subject:

**CPR Section 46 - Acute Lethality [Class D; Division 1, Subdivision A]**

Manual updated:  
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### Paragraph (a):

The referenced OECD guideline defines "acute oral toxicity" as the adverse effects occurring within a short time of oral administration of a single dose of a substance or multiple doses given within 24 hours. The term LD<sub>50</sub> (median lethal dose) is defined in section 2 of the *CPR*. The principle of the specified method is that the test substance is administered orally by gavage in graduated doses to several groups of experimental animals, one dose being used per group. Observations of the effects are made. Animals which die during the test are necropsied. At the conclusion of the test, the surviving animals are sacrificed and necropsied as necessary. OECD 401 is directed primarily to studies in rodents.

**Fixed Dose Method:** The WHMIS Information Bulletin "Acute Oral Toxicity - OECD Fixed Dose Method"<sup>1</sup>, provides information regarding the use of data from the OECD Test Guideline 420 Fixed Dose Method (FDM) which measures acute oral toxicity in animals. A major factor in the development of this newer method was the desire to minimize the use of laboratory animals for testing chemical products.

The new OECD Test Guideline 420 departs from the referenced method (Test Guideline 401) in two principal ways:

- ▶ the FDM considers non-lethal endpoints; and
- ▶ the FDM does not develop a quantitative relationship between dose and lethality.

Guideline 420 relies upon clear signs of toxicity ("evident toxicity"), a nonlethal endpoint as well as lethality, as the basis for acute oral toxicity assessment.

At the time of printing of this manual, no equivalent fixed dose methods had been developed for the dermal and inhalation routes of exposure.

### Paragraph (b):

The referenced OECD guideline defines "acute dermal toxicity" as the adverse effects occurring within a short time of dermal application of a single dose of a test substance. The test substance is applied to the skin in graduated doses to several groups of experimental animals, one dose being used per group.

### Paragraph (c):

The referenced OECD guideline defines "acute inhalation toxicity" as the total of adverse effects caused by a substance following a single uninterrupted exposure by inhalation over a short period of time (24 hours or less) to a substance capable of being inhaled. Several groups of experimental animals are exposed for a defined period to the test substance in graduated concentrations, one concentration being used per group. Where a vehicle is used to help generate an appropriate concentration of the

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1. The bulletin is accessible from the classification related section of the "Publications" page of the Health Canada WHMIS website; [www.hc-sc.gc.ca/whmis](http://www.hc-sc.gc.ca/whmis).



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Amended by:

Effective:

Regulation, section, title/subject:

***CPR Section 46 - Acute Lethality [Class D; Division 1, Subdivision A]***

Manual updated:

**2000/10/31**

substance in the atmosphere, a vehicle control group is normally used.

**Paragraph (d):**

The criteria set out in paragraphs 46(d) and 49(c) include specified values of the ratio between the "saturated vapour concentration" (maximum concentration of the vapour in air) and the LC<sub>50</sub> (lethal concentration in air). This ratio indicates the potential inhalation hazard of volatile substances which may be spilled in a confined space. A consequence of the formula is that highly volatile liquids such as ethyl formate or 1,1,2-trichloro-1,2,2-trifluoroethane are classified as "A Very Toxic Material" because of their high saturation vapour concentrations even though their high LC<sub>50</sub>s would normally suggest a relatively low toxicity.

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**Poisonous Substances as Defined by the Transportation of Dangerous Goods Regulations**

**47. A pure substance or tested mixture falls into Subdivision A of Division 1 of Class D - Poisonous and Infectious Material if it is included in Division 3 of Class 2 or in Packing Group I or II of Division 1 of Class 6 in Part III of the *Transportation of Dangerous Goods Regulations*.**

**DISCUSSION of SECTION 47**

This section links the criteria described in section 46 of the *CPR* to the equivalent TDG classes and divisions, i.e., TDG Class 2.3 (poisonous gases) and TDG Class 6.1 Packing Groups I and II for all other physical states (e.g., solids, liquids, vapours and aerosols).

The TDG Regulations specify TDG packing groups for primary but not subsidiary TDG classifications. Therefore, where a substance has a subsidiary TDG classification of 6.1, it cannot be determined if the substance falls into WHMIS D1A versus D1B without assessing the substance against the LD<sub>50</sub>/LC<sub>50</sub> criteria specified in sections 46 and 49 of the *CPR*.

The distinction between D1A (*CPR* 47) and D1B (*CPR* 50) is based on the packing group of the 6.1 TDG classification. If the 6.1 classification is the subsidiary classification, it can be concluded that the substance falls within D1. However, the scientific literature must be searched to find the LD<sub>50</sub>/LC<sub>50</sub> values that enable the determination of whether a substance falls within the criteria for D1A versus D1B. If available LD<sub>50</sub>/LC<sub>50</sub> data do not enable an assessment against the criteria set out in sections 46 and 49 of the *CPR* then the substance would be included in D1B.



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Amended by:

Effective:

Regulation, section, title/subject:

**CPR Section 48 - Untested Mixtures [Class D; Division 1, Subdivision A]**

Manual updated:

1996/03/31

## Untested Mixtures

**48. An untested mixture falls into Subdivision A of Division 1 of Class D - Poisonous and Infectious Material if it contains a product, material or substance that meets any of the criteria applicable to a pure substance or tested mixture referred to in section 46 or 47 and is present at a concentration of one per cent or more.**

### INTERPRETATION / DISCUSSION of SECTION 48

Where a mixture has not been tested as a whole to determine its health hazards, for the purposes of classification under the *CPR*, the mixture is assumed to present the same hazards as the components comprising a specified percentage of the mixture. The percentage specified (0.1 versus 1.0%) depends upon the hazard under consideration. This particular criterion specifies a 1% concentration cut-off for ingredients that meet any of the criteria in sections 46 or 47.

A cut-off of 1.0% is also specified in the United States OSHA Hazard Communication Standard.



Regulation, section, title/subject:

**CPR Section 49 - Acute Lethality [Class D; Division 1, Subdivision B]**

Manual updated:  
**2000/10/31**

### *Subdivision B: Toxic Material*

#### **Pure Substances and Tested Mixtures**

#### **Acute Lethality**

**49. A pure substance or tested mixture falls into Subdivision B of Division 1 of Class D - Poisonous and Infectious Material if, in an animal assay for acute lethality, it has an**

**(a) LD<sub>50</sub> of more than 50 but not exceeding 500 milligrams per kilogram of body weight of the animal, when tested in accordance with OECD Test Guideline No. 401, "Acute Oral Toxicity", dated May 12, 1981;**

**(b) LD<sub>50</sub> of more than 200 but not exceeding 1,000 milligrams per kilogram of body weight of the animal, when tested in accordance with OECD Test Guideline No. 402, "Acute Dermal Toxicity", dated May 12, 1981;**

**(c) LC<sub>50</sub> of more than 1,500 but not exceeding 2,500 parts per million by volume of vapour, when tested for four hours in accordance with OECD Test Guideline No. 403, "Acute Inhalation Toxicity", dated May 12, 1981, and a saturated vapour concentration at normal atmospheric pressure of more than 0.4 times the LC<sub>50</sub>; or**

**(d) LC<sub>50</sub> of more than 0.5 but not exceeding 2.5 milligrams per litre or grams per cubic metre of dust, mist or fume, when tested for four hours in accordance with OECD Test Guideline No. 403, "Acute Inhalation Toxicity", dated May 12, 1981.**

### **INTERPRETATION / DISCUSSION of SECTION 49**

The criteria in this section are closely related to the criteria in section 46. These criteria represent that group of controlled products that are less hazardous in terms of their ability to cause death in a short time. Information relating to the referenced OECD guidelines is provided in the discussion under section 46.

#### **Paragraph 49(a):**

Refer to the interpretation / discussion of paragraph 46(a) for information regarding the use of data from OECD Test Guideline 420 Fixed Dose Method (FDM).

#### **Paragraph 49(c):**



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Amended by:

Effective:

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***CPR Section 49 - Acute Lethality [Class D; Division 1, Subdivision B]***

Manual updated:

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Refer to the interpretation section corresponding to paragraph 46(d) for information regarding the correlation between "saturated vapour concentration" and the LC<sub>50</sub>.