



CLASS B – FLAMMABLE AND COMBUSTIBLE MATERIAL

35.(1) The products, materials and substances referred to in sections 36 to 41 shall be included in Class B - Flammable and Combustible Material listed in Schedule II to the Act.

(2) Divisions 1 to 6 are established as divisions of Class B - Flammable and Combustible Material listed in Schedule II to the Act.

INTERPRETATION / DISCUSSION of SECTION 35

WHMIS Class B - Flammable and Combustible Material, is comprised of six Divisions:

- Division 1: Flammable Gases;
- Division 2: Flammable Liquids;
- Division 3: Combustible Liquids;
- Division 4: Flammable Solids;
- Division 5: Flammable Aerosols; and
- Division 6: Reactive Flammable Materials.

In contrast to the *Transportation of Dangerous Goods Regulations*, within WHMIS, flammable and combustible materials have been grouped together under a single Class regardless of whether they are in the solid, liquid or gaseous state.

“Flash point” versus “ignition temperature”: In the case of Divisions 2 and 3 of Class B, the *CPR* specify flash point as opposed to ignition temperature. Flash point is a term which is defined in section 32 of the *CPR*. Ignition temperature is generally understood to mean the lowest temperature at which sustained combustion of a substance can be maintained. “Sustained combustion” is not a criterion for the flash point ranges specified for Divisions 2 and 3.

Explosible Dusts: It is anticipated that Class B will be expanded to include a seventh Division to address the hazards posed by explosible dusts.



Regulation, section, title/subject:

CPR Section 36 - Division 1 [of CLASS B] : Flammable Gases

Manual updated:

Division 1: Flammable Gases

36. Any product, material or substance falls into Division 1 of Class B - Flammable and Combustible Material if it is a compressed gas included in Class A - Compressed Gas that, at normal atmospheric pressure forms a flammable mixture with air

(a) when in a concentration of 13 per cent or less by volume; or

(b) over a concentration range of at least 12 per cent by volume.

INTERPRETATION / DISCUSSION of SECTION 36

To ignite a flammable gas, three basic conditions have to be met:

- ▶ the concentration of the gas would have to be within the range of concentration that the gas is capable of ignition, i.e. between the lower and upper flammable limits of the gas;
- ▶ an oxidizing gas (e.g. air) must be present; and
- ▶ a source of ignition has to be available.

The first of these three conditions is specifically addressed by the *CPR* criteria. The lower flammable limit is the minimum concentration (per cent by volume) of a gas in air below which a flame is not propagated when an ignition source is present; (i.e., the mixture is "too lean" to burn). Similarly, the upper flammable limit is the maximum concentration above which the mixture is "too rich" to burn.

Flammable limits are sometimes also referred to as the "explosive limits". The greater the range over which a gas forms a flammable mixture, the greater the likelihood is that such conditions may occur inadvertently. Similarly, gases which can ignite at relatively low concentrations (13% or less) in air would be particularly hazardous because of the likelihood that a potential flammable mixture can occur such as in the event of a leak. For example, hydrogen, with flammability limits of 4-75%, meets both criteria and 1,3 - butadiene, with flammability limits of 2-12%, meets the first criterion; as a result, both of these substances are included in Division 1 of Class B. Ammonia, with flammability limits of 15-25%, meets neither criteria and, therefore, is not included in Division 1 of Class B.

 Health Canada Santé Canada	Reference Manual for the WHMIS Requirements of the Hazardous Products Act and Controlled Products Regulations	Page: 37-1	Amended by: Effective:
Regulation, section, title/subject: CPR Section 37 - Division 2 [of CLASS B]: Flammable Liquids			Manual updated: 2002/09/16

Division 2: Flammable Liquids

37. Any product, material or substance falls into Division 2 of Class B - Flammable and Combustible Material if it is a liquid that has a flash point of less than 37.8°C (100°F), when tested in accordance with the applicable method specified in Schedule IV for that type of liquid.

INTERPRETATION / DISCUSSION of SECTION 37

The term "flash point" is defined in section 32 of the *CPR*. A liquid which has a flash point below 37.8°C, (which is approximately the average body temperature), is considered to be a "flammable" liquid under WHMIS.

Liquid vs solid: The kinematic viscosity of a liquid influences the choice of test most appropriate for measuring its flash point. The question as to at what viscosity a substance should no longer be treated as a liquid is addressed in ASTM D4359 which "covers the determination of whether a viscous material is a liquid or a solid for regulatory purposes." ASTM D4359 is considered to be the acceptable test for distinguishing between liquids and solids for the purpose of deciding upon the appropriate test method for flammability; {ref.: PIS No. 30}. ASTM standards use units of centistokes or stokes. In Canada, the unit used for kinematic viscosity is millimetre squared per second (mm²/sec.). One centistoke equals 1 mm²/sec.

Open cup versus closed cup: All of the methods specified in Schedule IV are "closed-cup" techniques in which the vapour is enclosed in the space above the liquid being tested. Open-cup techniques, where the vapour can dissipate, tend to yield flash points with values higher than those obtained with closed-cup methods. For example, the Merck index, thirteenth edition, indicates a flash point of -1°C for open cup and -4 °C for closed cup for n-heptane. Therefore, special attention must be paid when classifying a product against the criteria in this section where the flash point has been determined from an open cup method and the value is only marginally higher than 37.8°C. (See section I of the guidelines on the use of professional judgement in Appendix A of this manual for general guidance when classifying a product in the absence of results from a specified method for non-toxicological criteria that define the limits for a measurable property.)



Health Canada Santé Canada

Reference Manual for the WHMIS
Requirements of the
*Hazardous Products Act and
Controlled Products Regulations*

Page:

38-1

Amended by:

Effective:

Regulation, section, title/subject:

CPR Section 38 - Division 3 [of CLASS B]: Combustible Liquids

Manual updated:

2002/09/16

Division 3: Combustible Liquids

38. Any product, material or substance falls into Division 3 of Class B - Flammable and Combustible Material if it is a liquid that has a flash point of 37.8°C (100°F) or more but less than 93.3°C (200°F), when tested in accordance with the applicable method specified in Schedule IV for that type of liquid.

INTERPRETATION / DISCUSSION of SECTION 38

A liquid which has a flash point between 37.8 °C and 93.3 °C is considered to be a "combustible" liquid under WHMIS and is included in Division 3 of Class B.

Liquid vs solid: Please refer to the discussion of section 37 regarding the test method which "covers the determination of whether a viscous material is a liquid or a solid for regulatory purposes".

Open cup versus closed cup: Please refer to the discussion of section 37 regarding the assessment of results of open cup methods.

 Health Canada Santé Canada	Reference Manual for the WHMIS Requirements of the Hazardous Products Act and Controlled Products Regulations	Page: 39-1	Amended by: Effective:
Regulation, section, title/subject: CPR Section 39 - Division 4 [of CLASS B]: Flammable Solids		Manual updated: 2000/10/31	

Division 4: Flammable Solids

39. Any product, material or substance falls into Division 4 of Class B - Flammable and Combustible Material if it is a solid that

- (a) causes fire through friction or through retained heat from manufacturing or processing;**
- (b) can be ignited readily and when ignited burns so vigorously and persistently as to create a hazard;**
- (c) ignites readily and burns with a self-sustained flame at a rate of more than 0.254 centimetre (0.1 inch) per second along its major axis, when tested in accordance with the method set out in Schedule V; or**
- (d) is included in Division 1 of Class 4 of Part III of the *Transportation of Dangerous Goods Regulations*.**

INTERPRETATION / DISCUSSION of SECTION 39

A solid which meets any of the criteria in paragraphs (a) through (d) is considered to be a flammable solid under WHMIS. A solid which meets any of these criteria may present a flammability hazard under certain conditions. The first two criteria are the same as for Class 4, Division 1 of the *TDG Regulations*.

Paragraph (c):

The test described in Schedule V, "Method of Testing for Determining Flammable Solids that Ignite Readily", is essentially identical to that referenced in the OSHA Hazard Communication Standard.

Note: The opening section of Schedule V describes the length and depth dimensions of a rectangular metal boat used to pack samples of granules, powders and pastes. However, there had been no reference to a width dimension. This test method was included in the June 1984 Report of the Criteria Working Group and the method is also referenced in the U.S. OSHA Hazard Communication Standard 16CFR 1500.44. The width dimension specified in both of these documents is 2.54 cm (1 in.). The absence of a width dimension in the *CPR* was an unintentional omission. The *CPR* was amended accordingly; {ref.: PIS No. 71; SOR/97-543}.

 Health Canada Santé Canada	Reference Manual for the WHMIS Requirements of the <i>Hazardous Products Act and Controlled Products Regulations</i>	Page: 40-1	Amended by: Effective:
Regulation, section, title/subject: CPR Section 40 - Division 5 [of CLASS B]: Flammable Aerosols			Manual updated: 1996/03/31

Division 5: Flammable Aerosols

40. Any product, material or substance falls into Division 5 of Class B - Flammable and Combustible Material if it is packaged in an aerosol container and, when tested in accordance with the method set out in Schedule VI, yields a flame projection at full valve opening or a flashback at any degree of valve opening.

INTERPRETATION / DISCUSSION of SECTION 40

This criterion includes a test procedure to determine whether a product contained in an aerosol container is flammable and thereby presents a potential hazard. The terms “aerosol container”, “flame projection” and “flashback” are defined in section 32 of the *CPR*.

The product may ignite because of the flammability of the aerosol itself or the propellant. The test for a flammable aerosol is intended to determine whether there is a flame projection or a flashback. A flame projection is any visible ignition of the aerosol stream at full valve opening. Flashback refers to that part of the flame projection that extends back to the aerosol container at any degree of valve opening. Although the test described in Schedule VI refers to an elaborate apparatus to determine the extent of flame projection, all that is required by the *CPR* criteria for inclusion in Division 5 of Class B is **any** length of flame projection or flashback.

The test procedure described in Schedule VI is the same as is used to determine the flammability of aerosol containers sold to consumers under Part I of the *Hazardous Products Act*, the *Food and Drugs Act* and the *Pest Control Products Act*.



Regulation, section, title/subject:

CPR Section 41 - Division 6 [of CLASS B]: Reactive Flammable Materials

Manual updated:
1996/03/31

Division 6: Reactive Flammable Materials

41. Any product, material or substance falls into Division 6 of Class B - Flammable and Combustible Material if

- (a) it is spontaneously combustible and liable to spontaneous heating under normal conditions of use or liable to heat in contact with air to the point where it begins to burn; or
- (b) it emits a flammable gas or becomes spontaneously combustible on contact with water or water vapour.

INTERPRETATION / DISCUSSION of SECTION 41

Two distinct groups of hazardous products are addressed by the criteria for Division 6:

- ▶ those which react with air (oxygen) and burn; and
- ▶ those which react with water or water vapour to produce a flammable gas or become spontaneously combustible.

At present, paragraph 41(b) refers only to emissions of gas in contact with water or water vapour. However, for example, cyanide salt with water produces hydrogen cyanide, a liquid with a boiling point of 25.7°C and a flash point (closed cup) of minus 17.8°C. The controlled product released, in this case, is a vapour and not a gas. To explicitly address situations such as this, paragraph 41(b) will be amended to include "flammable vapours"; {ref.: PIS No. 67}.



Regulation, section, title/subject:

CPR Section 42 - CLASS C -- OXIDIZING MATERIAL

Manual updated:

CLASS C – OXIDIZING MATERIAL

42. Any product, material or substance shall be included in Class C - Oxidizing Material listed in Schedule II to the Act if

- (a) it causes or contributes to the combustion of another material by yielding oxygen or any other oxidizing substance, whether or not the product, material or substance is itself combustible; or**
- (b) it is an organic peroxide that contains the bivalent 0-0 structure.**

INTERPRETATION / DISCUSSION of SECTION 42

These criteria include a wide group of controlled products that either provide oxygen under conditions which are potentially hazardous or that contain the oxygen-oxygen chemical structure which is particularly chemically reactive.

Paragraph 42(a):

Elements and other chemicals may be regarded as "oxidizing" or "reducing" agents based on their reduction potential (E^0 values) relative to the potential of the Standard Hydrogen Electrode. A chemical agent can bring about oxidation by two principal mechanisms. The chemical agent may (i) provide oxygen or another oxidizing agent to the substance undergoing oxidation or (ii) the chemical agent may receive electrons which are transferred by the substance undergoing oxidation. The WHMIS criteria address the first mechanism only. Therefore, for example, although fluorine and chlorine gas are generally regarded as strong oxidizing agents in terms of electron-transfer (with reduction potentials of 2.87 and 1.35, respectively), as neither yield oxygen nor any other oxidizing substance, they are not included in WHMIS Class C.

Paragraph 42(b):

An "organic peroxide" may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.