Thought starter on the review of Annex III

I. Introduction and purpose

1. Canada volunteered to prepare this thought starter in support of the work of the Expert Working Group (EWG) on the review of Annexes. It should not be considered the position of the Government of Canada on the review process.

2. This paper is intended to provide general technical concepts on the review of Annex III and guide the EWG in the identification of hazard characteristics and classification rules that are the most relevant for the Convention to achieve its objectives.

3. This paper consists of two sections. Detailed rationale on chosen topics of interest is first provided to support the revised version of Annex III contained in the second section.

II. Detailed rationale on chosen topics of interest

a) GHS vs UN Model Regulations on the Transport of Dangerous Goods

4. The Basel Convention currently relies heavily on the *UN Model Regulations on the Transport of Dangerous Goods* for the determination of hazard characteristics. These Model Regulations provide guidance on proper packaging requirements, on the precedence of hazardous characteristics, and on tools for classification of hazardous waste (including tests).

5. The *UN Model Regulations on the Transport of Dangerous Goods* is meant to protect human health and the environment during transport of hazardous goods, and as such is directly relevant for a Convention on transboundary movement of hazardous waste, especially for physical hazards. National Regulations or international agreements on the movement of hazardous goods, for example ADR, are often structured in a manner that is very similar to the *UN Model Regulations on the Transport of Dangerous Goods.*

6. However, health and environmental hazards that derive from the disposal of hazardous wastes are not covered by the Model Regulations. For this reason, the Basel Convention may consider adopting a novel approach, and add hazard characteristics not covered by the Model Regulations. The Convention could find inspiration in the GHS, and adapt

the definitions to support its objective of environmentally sound management of hazardous wastes.

7. The revised Annex III in section two of this document attempts to find balance between characteristics designed mostly for the protection of workers and the environment during the transport of hazardous substances (*UN Model Regulations on the Transport of Dangerous Goods*), and characteristics designed mostly for the classification of pure chemicals and mixtures (GHS), for example in the chemicals industry. The most relevant characteristics and classification rules to achieve the objectives of the Convention are also presented.

b) Precedence of hazardous characteristics

8. The selection of a primary hazardous characteristic, when waste meets the criteria for inclusion in more than one, affects the packaging requirements. To ensure an appropriate level of protection for the workers and the environment during transport, the primary hazardous characteristic should, in general, be the one with the most stringent requirements. To achieve greater legal clarity and better protection of the environment and human health, the Basel Convention may want to consider adding classification rules on the basis of the guidance in the *UN Model Regulations on the Transport of Dangerous Goods* (2019).

c) Acute toxicity

9. Acute toxicity in the *UN Model Regulations on the Transport of Dangerous Goods* is meant to cover hazardous substances during transport. No substance with a LD_{50} value of over 300 mg/kg bodyweight (oral) is deemed acute toxic, since these substances do not pose a major threat during transport. Therefore, only waste containing substances of Category 1, 2 or 3 of acute toxicity could be understood to be currently covered by the Convention (these categories correspond to Class 6.1 of the *UN Model Regulations on the Transport of Dangerous Goods*).

10. The Basel Convention may want to consider clarifying that wastes containing substances of Categories 1-5 of acute toxicity, according to GHS, are included in its scope. This would allow not only protection of workers during transport, but also better protection of the environment by ensuring that the obligations on ESM, and of PIC, apply to wastes containing acute toxic substances of Categories 1-5. We suggest the addition of a new hazard characteristic for Categories 4 and 5 (refer to

H14) to ensure that alignment with the UN Model Regulations (and packaging requirements) can be kept for Categories 1-3 (H6.1).

d) New hazard characteristics

11. With the notable exception of H23 and H24, new hazard characteristics are health or environmental hazards whose definitions and classification principles are based on GHS (2019). Including GHS sub-categories (Category 2A, 2B, …) at this point would likely render the work of the EWG too complex (i.e. defining *de minimis* or threshold values for each sub-category) and is an approach that would require careful consideration by the EWG.

12. Persistent organic pollutants and endocrine disruptors are not included as specific health or environmental hazards in GHS or the *UN Model Regulations on the Transport of Dangerous Goods*. These substances can lead to serious adverse effects on human health or the environment. Adding them to the scope of the Convention in Annex III, as opposed to listing substances individually in Annex I as proposed by members of the EWG, would allow the Convention to adjust more easily to new knowledge on these hazardous substances. It would not be necessary to amend Annex I to control waste containing substances newly identified as persistent organic pollutants, or endocrine disruptors, as long as these substances are found in at least one waste stream or are considered to be at least one of the constituents in Annex I (for example Y5 or Y45).

13. Hazard Codes H11 and H12 could be deleted if the Basel Convention feels that the new Hazard Codes cover the whole spectrum of ecotoxic and toxic (delayed or chronic) substances. It could also be kept as a catch-all for these substances.

e) De minimis concentration values

14. Knowledge on substances, especially substances posing a health or environmental hazard, is constantly evolving and data is sometimes lacking to determine a hazardous threshold in waste using a risk-based approach. When such data is available, a risk-based approach is usually preferable.

15. In cases when such data does not exist or is insufficient for a risk-based approach, *de minimis* concentration values in waste could be attributed to hazard categories in the GHS, instead of substance-specific thresholds. The most hazardous substances (Category 1) should be

attributed a relatively low *de minimis* concentration value, and the least hazardous substances should be attributed a relatively higher value.

16. A consultant could be hired to determine such values, on the basis of health and environmental concerns related to the disposal of wastes containing substances posing a health or environmental hazard. When possible, a risk-based approach could also be considered for some targeted substances in waste. Substance-specific information could be added to Annex I.

ANNEX III (modification proposals are identified in red)

LIST OF HAZARDOUS CHARACTERISTICS

UN Class[1]	Code	Characteristics
1	**H1**	Explosive
		An explosive substance ~~or waste~~ is a solid or liquid substance ~~or waste~~ (or mixture of substances ~~or wastes~~) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases.
2	H2.1	Flammable Gases
		Flammable Gases, which consists of gases that, at 20°C and an absolute pressure of 101.3 kPa, **(i)** are ignitable when in a mixture of 13 per cent or less by volume with air, or **(ii)** have a flammability range with air of at least 12 percentage points determined in accordance with tests or calculations in ISO 10156, or a comparable evidence recognized by a national competent authority.
2	H2.2	Non-flammable, non-toxic gases

[1] Corresponds to the hazard classification system included in the United Nations Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1/Rev.21/, United Nations, New York, 2019).

		Gases which : **(i)** are asphyxiant- gases which dilute or replace the oxygen normally in the atmosphere, or **(ii)** are oxidizing- gases which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does, as determined by a method specified in ISO 10156, or a comparable evidence recognized by a national competent authority.
2	H2.3	Toxic gases
		Gases which: **(i)** are known to be so toxic or corrosive to humans or other as to pose a hazard to health according to CGA P-20, ISO Standard 10298, or a comparable evidence recognized by a national competent authority, or **(ii)** are presumed to be toxic or corrosive to humans because they have an LC_{50} value equal to or less than 5000 ml/m^3.
3	**H3**	Flammable liquids

		Includes flammable liquids and liquid desensitized explosives. The word "flammable" has the same meaning as "inflammable". *Flammable liquids* are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc., but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 60°C, closed-cup test, or not more than 65.6°C, open-cup test. (Since the results of open-cup tests and of closed-cup tests are not strictly comparable and even individual results by the same test are often variable, regulations varying from the above figures to make allowance for such differences would be within the spirit of this definition.) Liquids with a flash point of more than 35 °C which do not sustain combustion need not be considered as flammable liquids. *Liquid desensitized explosives* are explosive substances which are dissolved or suspended in water or other liquid substances, to form an homogeneous liquid mixture to suppress their explosive properties.
4.1	**H4.1**	Flammable solids
		Solids, ~~or waste solids, other than those classed as explosives,~~ which, under conditions encountered in transport, are readily combustible, or may cause or contribute to fire through friction, self-reactive substances and polymerizing substances which are liable to undergo a strongly exothermic reaction; or solid

		desensitized explosives which may explode if not diluted sufficiently. *Flammable Solids* are readily combustible solids and solids which may cause fire through friction. Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, and if the flame spreads rapidly. *Self-reactive substances* are thermally unstable substances liable to undergo a strongly exothermic decomposition even without participation of oxygen. *Polymerizing substances* are substances which, without stabilization, are liable to undergo a strongly exothermic reaction resulting in the formation of larger molecules or resulting in the formation of polymers under conditions normally encountered in transport. *Solid desensitized explosives* are explosive substances which are wetted with waste or alcohols or are diluted with other substances, to form a homogeneous solid mixture to suppress their explosive properties.

4.2	**H4.2**	Substances ~~or wastes~~ liable to spontaneous combustion
		Includes pyrophoric substances and self-heating substances. *Pyrophoric substances* are ~~Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire.~~ substances, including mixtures

		and solutions, which even in small quantities ignite within five minutes of coming in contact with air. *Self-heating substances* are substances, other than pyrophoric substances, which in contact with air without energy supply are liable to self-heating. These substances will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).
4.3	**H4.3**	Substances ~~or wastes~~ which in contact with water emit flammable gases
		Substances ~~or wastes~~ which emit a flammable gas at a rate greater than 1 L/kg of substance per hour or spontaneously ignite at any step in the procedure described in section 2.4.4.2 of Chapter 2.4 of the *United Nations Recommendations on the Transport of Dangerous* Goods, or a comparable evidence recognized by a national competent authority.~~by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities~~.
5.1	**H5.1**	Oxidizing
		Substances ~~or wastes~~ which, while in themselves not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material.
5.2	**H5.2**	Organic Peroxides
		Organic substances ~~or wastes~~ which contain the bivalent-O-O structure and may be considered derivatives of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. Organic peroxides are thermally unstable substances which may undergo exothermic self-accelerating decomposition.
6.1	**H6.1**	~~Poisonous~~ Toxic substances (substances of relatively high acute toxicity)

		Substances ~~or wastes~~ liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact. Includes only substances allocated to Category 1, 2 or 3 of Chapter 3.1 of the Globally Harmonized System of Classification and Labelling of Chemicals (note the related hazardous characteristic H14) [2] *De minimis* concentration values in wastes containing toxic substances of: Category 1: XX mg/kg Category 2 XX mg/kg Category 3 XX mg/kg
6.2	**H6.2**	Infectious substances
		Substances known or reasonably expected to contain pathogens. Pathogens are defined as ~~or wastes containing viable~~ microorganisms ~~or their toxins~~ and other agents such as prions, ~~which are known or suspected to~~ which can cause disease in animals or humans.
8	**H8**	Corrosives
		Substances ~~or wastes~~ which, by chemical action, will cause ~~severe~~ irreversible damage to the skin, or, ~~when in contact with living tissue, or~~ in the case of leakage, will materially damage, or even destroy, other goods or the means of transport~~; they may also cause other hazards~~.
9	**H10**	Liberation of toxic gases in contact with air or water
		Substances ~~or wastes~~ which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
9	**H11**	Toxic (Delayed or chronic)

[2] Corresponds to the hazard classification system included in the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) (ST/SG/AC.10/30/Rev.8/, United Nations, New York, 2019).

		Substances ~~or wastes~~ which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, not including substances covered by other codes in this Annex ~~including carcinogenicity~~.
9	**H12**	Ecotoxic
		Substances ~~or wastes~~ which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems, not including substances covered by other codes in this Annex.
9	**H13**	Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.
9	**H14**	Toxic substances (substances of relatively low acute toxicity)
		Includes only substances allocated to Category 4 or 5 of Chapter 3.1 of the Globally Harmonized System of Classification and Labelling of Chemicals. (note the related hazardous characteristic H6.1) *De minimis* concentration values in wastes containing toxic substances of: Category 4: XX mg/kg Category 5 XX mg/kg
9	**H15**	Serious eye damage/eye irritation
		Serious eye damage refers to the production of tissue damage in the eye, or physical decay of vision, which is not fully reversible, occurring after exposure of the eye to a substance or mixture. *Eye irritation* refers to the production of changes in the eye, which are fully reversible, occurring

		after the exposure of the eye to a substance or mixture. *De minimis* concentration values in wastes containing substances of: Category 1 (Serious eye damage): XX mg/kg Category 2 (Eye irritation): XX mg/kg
9	**H16**	Respiratory/skin sensitization
		Respiratory sensitization refers to hypersensitivity of the airways occurring after inhalation of a substance or a mixture. *Skin sensitization* refers to an allergic response occurring after skin contact with a substance or a mixture. *De minimis* concentration values in wastes containing sensitizing substances of: Category 1 (Respiratory sensitization): XX mg/kg Category 2 (Skin sensitization): XX mg/kg
9	**H17**	Germ cell mutagenicity
		Germ cell mutagenicity refers to heritable gene mutations, including heritable structural and numerical chromosome aberrations in germ cells occurring after exposure to a substance or mixture. *De minimis* concentration values in wastes containing mutagenic substances of: Category 1: XX mg/kg Category 2: XX mg/kg

9	**H18**	Carcinogenicity
		Carcinogenicity refers to the induction of cancer or an increase in the incidence of cancer occurring after exposure to a substance or mixture. Substances and mixtures which have induced benign and malignant tumours in well performed experimental studies on animals are considered also to be presumed or suspected human carcinogens unless there is strong evidence that the mechanism of tumour formation is not relevant for humans. *De minimis* concentration values in wastes containing carcinogenic substances of: Category 1: XX mg/kg Category 2: XX mg/kg
9	**H19**	Reproductive toxicity refers to adverse effects on sexual function and fertility in adults, as well as developmental toxicity in the offspring, occurring after exposure to a substance or mixture, but not including induction of genetically based inheritable effects. *De minimis* concentration values in wastes containing reproductive toxicants of: Category 1: XX mg/kg Category 2: XX mg/kg
9	**H20**	Specific target organ toxicity
		Specific target organ toxicity- single exposure refers to specific toxic effects on target organs occurring after a single exposure to a substance or mixture. *Specific target organ toxicity- repeated exposure* refers to specific toxic effects on target organs

		occurring after repeated exposure to a substance or mixture. *De minimis* concentration values in wastes containing specific target organ toxicants-single exposure of: Category 1: XX mg/kg Category 2: XX mg/kg Category 3: XX mg/kg *De minimis* concentration values in wastes containing specific target organ toxicants-repeated exposure of: Category 1: XX mg/kg Category 2: XX mg/kg Category 3: XX mg/kg
9	**H21**	Aspiration hazard
		Aspiration hazard refers to severe acute effects such as chemical pneumonia, pulmonary injury or death occurring after aspiration of a substance or mixture. *De minimis* concentration values in wastes containing an aspiration hazard substance of: Category 1: XX mg/kg Category 2: XX mg/kg
9	**H22**	Hazardous to the aquatic environment (acute or chronic toxicity)
		An environmentally hazardous substance to the aquatic environment is a substance that satisfies the criteria for categories Acute 1, Acute 2, Acute 3, Chronic 1, Chronic 2 or Chronic 3 according to Chapter 4.1 of the Globally Harmonized System of Classification and Labelling of Chemicals. *Acute aquatic toxicity* means the intrinsic property of a substance to be injurious to an

		organism in a short-term aquatic exposure to that substance. *Chronic aquatic toxicity* means the intrinsic property of a substance to cause adverse effects to aquatic organisms during aquatic exposures which are determined in relation to the life-cycle of the organism. *De minimis* concentration values in wastes containing substances toxic to aquatic environment (acute) of: Category 1: XX mg/kg Category 2: XX mg/kg Category 3: XX mg/kg *De minimis* concentration values in wastes containing substances toxic to aquatic environment (chronic) of: Category 1: XX mg/kg Category 2: XX mg/kg Category 3: XX mg/kg
9	**H23**	Persistent organic pollutant
		A persistent organic pollutant is a substance or mixture that is persistent, that bio-accumulates and that is likely, as a result of its long-range environmental transport, to lead to significant adverse human health and/or environmental effects.
9	**H24**	Endocrine disruptor
		An endocrine disruptor is an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health

		effects in an intact organism, or its progeny, or (sub) populations.

Tests and classification principles

The potential hazards posed by certain types of wastes are not yet fully documented; tests to define quantitatively these hazards do not exist. Further research is necessary in order to develop means to characterise potential hazards posed to man and/or the environment by these wastes. Standardized tests have been derived with respect to pure substances and materials. The *UN Manual of Tests and Criteria* contain criteria, test methods and procedures that can be applied to materials listed in Annex I, in order to decide if these materials exhibit any of the characteristics listed in this Annex, in conjunction with classification principles outlined in the *United Nations Recommendations on the Transport of Dangerous Goods* (2019), when appropriate. For hazardous characteristics H14-H22, the classification principles included in the Globally Harmonized System of Classification of Chemicals (2019) should be used instead. Many countries have developed national tests which can also be applied. ~~to materials listed in Annex I, in order to decide if these materials exhibit any of the characteristics listed in this Annex.~~

Precedence of Hazardous Characteristics

When hazardous wastes meet the criteria for inclusion in more than one hazardous characteristic but meet the criteria for inclusion in one of the following hazardous characteristic, that one class is the primary hazardous characteristic:

a) H1, Explosives, except for the substances with the following attributed UN numbers, for which H1 is a subsidiary class: UN3101; UN3102; UN3111; UN3112; UN3221; UN3222; UN3231; UN3232;

b) H2, Gases, and within this characteristic, H2.3, Toxic Gases, takes precedence over H2.1, Flammable Gases, and H2.1, Flammable Gases, takes precedence over H2.2, Non-flammable and Non-toxic Gases;

c) H3, Liquid desensitized explosives;

d) H4.1, Solid desensitized explosives that are included in Packing Group I of the United Nations Transport of Dangerous Goods Model Regulations, or self-reactive substances;

e) H4.2, Pyrophoric solids or liquids included in Packing Group I of the United Nations Transport of Dangerous Goods Model Regulations, or substances liable to spontaneous combustion;

f) H5.2, Organic Peroxides;

g) H6.1, Toxic Substances that are included in Packing Group I of the United Nations Transport of Dangerous Goods Model Regulations, due to inhalation toxicity;

h) H6.2, Infectious Substances.

If a hazardous waste meets the criteria for inclusion in more than one of the hazardous characteristics identified above, or if a hazardous waste has multiple hazards none of which are listed above, the most stringent packing group of the U*nited Nations Transport of Dangerous Goods Model Regulations*, denoted to the respective hazardous characteristics of the waste, takes precedence over other packing groups and the corresponding hazardous characteristic is the primary hazardous characteristic.