The Globally Harmonized System for the Classification and Labelling of Chemicals (The GHS)

Implementation of the GHS in Canada

Transport of Dangerous Goods

Introduction

Although Dangerous Goods labelling is both hazard-based and risk-based requirements for chemicals are predominately the former. Only acute health and physical hazards are addressed.

With a few exceptions, labels for the nine Classes of Dangerous Goods are the same as those shown in the **United Nations Recommendations on the Transport of Dangerous Goods Model Regulations**. Symbols used for acute health and physical hazards are the same as those used in the GHS, where they are used.

Although there are no provisions for warning statements or signal words on labels, Class numbers must be displayed in the lower section of the square-on-point label.
In addition packages must be marked with the proper Shipping Name and corresponding UN number.

Safety Data Sheets are not currently required under TDG but, each consignment of Dangerous Goods must be accompanied by a Shipping Document. This document contains a description of the Dangerous Goods including the Shipping Name, primary and subsidiary classifications, the UN number, the Packing Group, and a 24-Hour telephone number.

Aquatic toxicity is addressed using the criteria from the International Maritime Dangerous Code (IMDG Code). Since the Sub-Committee of Experts on the Transport of Dangerous Goods have recently accepted the GHS criteria, it is expected that the TDG requirements will change.

TABLE 1 GHS hazards which are identified on Transport of Dangerous Goods (TDG) labels

GHS Physical Hazard Categories	TDG Labels	Comment
Explosive Substances/Articles (Liquid or Solid)	yes	
Flammable Gases	yes	
Flammable Aerosols	yes	
Oxidizing Gases	yes	
Gases Under Pressure	yes	
Flammable Liquids	yes	
Flammable Solids	yes	
Self-Reactive Substances	yes	
Pyrophoric Liquids	yes	
Pyrophoric Solids	yes	
Self-Heating Substances	yes	
Substances which in contact with water emit flammable gases	yes	
Oxidizing Liquids	yes	
Oxidizing Solids	yes	
Organic Peroxides	yes	
Corrosive to Metals	yes	

GHS Health and Environmental Hazards Categories	TDG Labels	Comment
Acute Toxicity - Oral	yes	
Acute Toxicity - Skin	yes	
Acute Toxicity - Inhalation	yes	
Skin Corrosion/Irritation	yes	
Serious Eye Damage/Eye Irritation	no	Not required by TDG
Respiratory Sensitization	no	Not required by TDG
Skin Sensitization	no	Not required by TDG
Mutagenicity	no	Not required by TDG
Carcinogenicity	no	Some are included as Miscellaneous items
Reproductive Toxicity	no	Not required by TDG
Target Organ Systemic Toxicity - Single Exposure	**?**	**May be considered in the future by the UN Sub-Committee**
Target Organ Toxicity - Repeat Exposure	**?**	**May be considered in the future by the UN Sub-Committee**
Aquatic Toxicity	yes	Now accepted by the UN Sub-committee

TABLE 2 Comparison of Hazard Communication: TDG and the GHS

Explosives

Class	1.1	1.2	1.3	1.4	1.5	1.6
TDG						
Division	Unstable/1.1	1.2	1.3	1.4	1.5	1.6
GHS	 **Danger** **Explosive; mass explosion hazard**	 **Danger** **Explosive; severe projection hazard**	 **Danger** **Explosive; fire, blast or projection hazard**	**1.4*** **Warning** **Fire or projection hazard**	**1.5*** **Warning** **May explode in fire**	**1.6***

* Apply to substances or mixtures subject to the UN Recommendations for the Transport of Dangerous Goods, Model Regulations

Comments: Unstable explosives are FORBIDDEN for transport

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Flammable Gases

Class	2.2	
TDG		Not required under TDG
	Category 1	Category 2
GHS	 Danger Extremely flammable gas	No symbol Warning Flammable gas

Comments: In addition to the testing criteria for 'flammable range' outlined in the GHS, for mixtures TDG allows the use of calculations specified in ISO 10156.

Flammable Aerosols

Class	2.1	2.1
TDG		
	Category 1	Category 2
GHS		
	Danger **Extremely flammable aerosol**	**Warning** **Flammable aerosol**

Comments: Since TDG is silent on the criteria for flammable aerosols, criteria in the *UN Recommendations on the Transport of Dangerous Goods, Model Regulations* should be used. In the 12th Revised Edition of the *Model Regulations*, criteria are defined in Special Provision 63:

> "*(a) Division 2.1 applies if the contents include more than 45% by mass, or more than 250 g of flammable components. Flammable components are gases which are flammable in air at normal pressure or substances or preparations in liquid form which have a flash point less than or equal to 100 °C;*"

GHS testing procedures were recently incorporated into the *UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria* so it expected that TDG will be in line with the GHS in the future.

Oxidizing Gases

Class	2.2(5.1)
TDG	
	Category 1
GHS	
	Danger **May cause or intensify fire, oxidizer**

Comments: Since TDG is silent on the criteria for oxidizing gases, criteria in the *UN Recommendations on the Transport of Dangerous Goods, Model Regulations* should be used. In the 12th Revised Edition of the *Model Regulations*, the criterion for oxidizing gases is the same as the GHS.

Gases Under Pressure

Class 2.2	Compressed Gas	Liquified Gas	Refrigerated Liquified Gas	Dissolved Gas
TDG				
	Compressed Gas	**Liquified Gas**	**Refrigerated Liquified Gas**	**Dissolved Gas**
GHS	 Warning Contains gas under pressure; may explode if heated	 Warning Contains gas under pressure; may explode if heated	 Warning Contains refrigerated gas; may cause cryogenic burns or injury	 Warning Contains gas under pressure; may explode if heated

Comments: Under TDG these symbols are not required for toxic, oxidizing or flammable gases.

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Flammable Liquids

Class 3	Packing Group I	Packing Group II	Packing Group III	
TDG				**Not required under TDG**
	Category 1	**Category 2**	**Category 3**	**Category 4**
GHS	 **Danger** **Extremely flammable liquid and vapour**	 **Danger** **Highly flammable liquid and vapour**	 **Warning** **Flammable liquid and vapour**	**No symbol** **Warning** **Combustible liquid**

Comments: The GHS has a flash point requirement for Category 1 of < 23 °C, no such requirement exists in either TDG or the *UN Recommendations on the Transport of Dangerous Goods, Model Regulations*.

Flammable Solids

Class 4.1	Packing Group II	Packing Group III
TDG		
	Category 1	**Category 2**
GHS	 **Danger** **Flammable solid**	 **Warning** **Flammable solid**

Comments: In addition to the above categories for Flammable solid, TDG regulates 'solid desensitized explosives' and 'substances that cause fire through friction'. Neither of these groups are covered by GHS criteria.

Self-Reactive Substance

Class 4.1 Packing Group II	Type A	Type B	Types C & D	Types E & F	Type G
TDG	**Forbidden for Transport**				**Not required under TDG**
	Type A	**Type B**	**Types C & D**	**Types E & F**	**Type G**
GHS	 **Danger** **Heating may cause an explosion**	 **Danger** **Heating may cause a fire or explosion**	 **Danger** **Heating may cause a fire**	 **Warning** **Heating may cause a fire**	**No label elements**

Pyrophoric Liquids

Class 4.2	Packing Group I
TDG	
	Category 1
GHS	 **Danger** **Catches fire spontaneously if exposed to air**

Pyrophoric Solids

Class 4.2	Packing Group I
TDG	
	Category 1
GHS	 **Danger** **Catches fire spontaneously if exposed to air**

Self Heating Substances

Class 4.2	Packing Group II	Packing Group III
TDG		
	Category 1	**Category 2**
GHS	 **Danger** **Self-heating; may catch fire**	 **Warning** **Self-heating in large quantities; may catch fire**

Substances, which in contact with water, emit flammable gases

Class 4.3	Packing Group I	Packing Group II	Packing Group III
TDG			
	Category 1	**Category 2**	**Category 3**
GHS	 **Danger** **In contact with water releases flammable gases which may ignite spontaneously.**	 **Danger** **In contact with water releases flammable gases**	 **Warning** **In contact with water releases flammable gases**

Oxidizing Liquids

Class 5.1	Packing Group I	Packing Group II	Packing Group III
TDG			
	Category 1	Category 2	Category 3
GHS			
	Danger **May cause fire or explosion; strong oxidizer**	**Danger** **May intensify fire; oxidizer**	**Warning** **May intensify fire; oxidizer**

Oxidizing Solids

Class 5.1	Packing Group I	Packing Group II	Packing Group III
TDG			
	Category 1	Category 2	Category 3
GHS			
	Danger **May cause fire or explosion; strong oxidizer**	**Danger** **May intensify fire; oxidizer**	**Warning** **May intensify fire; oxidizer**

Organic Peroxides

Class 5.2 Packing Group II	Type A	Type B	Types C & D	Types E & F	Type G
TDG	**Forbidden for Transport**				**Not required under TDG**
	Type A	**Type B**	**Types C & D**	**Types E & F**	**Type G**
GHS	 **Danger** **Heating may cause an explosion**	 **Danger** **Heating may cause a fire or explosion**	 **Danger** **Heating may cause a fire**	 **Warning** **Heating may cause a fire**	**No label elements**

Corrosive to Metal

Class 8	Packing Group III
TDG	
	Category 1
GHS	 **Warning** **May be corrosive to metals**

Acute Toxicity: Oral – Liquid

Class 6.1	Packing Group I	Packing Group II	Packing Group III		
TDG				Not required under TDG	Not required under TDG
mg/kg		5	50	500	

	Category 1	Category 2	Category 3	Category 4	Category 5
GHS					No symbol
	Danger Fatal if swallowed	Danger Fatal if swallowed	Danger Toxic if swallowed	Warning Harmful if swallowed	Warning May be harmful if swallowed
mg/kg		5	50	300	2000 5000

Comments: The current TDG breakpoint for Category 4 is 500 mg/kg. A change to a breakpoint of 300 mg/kg for Packing Group III would result in fewer toxic liquids being regulated.

Acute Toxicity: Oral – Solid

Class 6.1	Packing Group I	Packing Group II	Packing Group III		
TDG				Not required under TDG	Not required under TDG
mg/kg		5	50	200	

	Category 1	Category 2	Category 3	Category 4	Category 5
GHS	 Danger Fatal if swallowed	 Danger Fatal if swallowed	 Danger Toxic if swallowed	 Warning Harmful if swallowed	No symbol Warning May be harmful if swallowed
mg/kg		5	50	300	2000 5000

Comments: The current TDG breakpoint for Category 4 in 200 mg/kg. A change to a breakpoint of 300 mg/kg for Packing Group III would result in more toxic solids being regulated.

Acute Toxicity: Skin

Class 6.1	Packing Group I	Packing Group II	Packing Group III		
TDG				Not required under TDG	Not required under TDG
mg/kg	40	200	1000		

	Category 1	Category 2	Category 3	Category 4	Category 5
GHS					No symbol
	Danger Fatal in contact with skin	Danger Fatal in contact with skin	Danger Toxic in contact with skin	Warning Harmful in contact with skin	Warning May be harmful in contact with skin
mg/kg	50	200	1000	2000	5000

Comments: The current TDG breakpoint for Category 1 is 40 mg/kg. A change to a breakpoint of 50 mg/kg would increase the number of toxic substances included in Packing Group I.

Acute Toxicity: Inhalation (dust, mist)

Class 6.1	Packing Group I	Packing Group II	Packing Group III		
TDG				Not required under TDG	Not required under TDG
mg/L(1h)	0.5	2.0	10		
	Category 1	Category 2	Category 3	Category 4	Category 5
GHS	 Danger Fatal if inhaled	 Danger Fatal if inhaled	 Danger Toxic if inhaled	 Warning Harmful if inhaled	No symbol Warning May be harmful if inhaled
mg/L(4h)	0.05	0.5	1.0	5.0	

Comments: The result of replacing the current TDG breakpoints with the GHS breakpoints would be to decrease the number of toxic substances in Packing Group I while increasing the number in Packing Group II also, the number of substances in Packing Group III would be reduced. It is not expected that this would have much impact since very few substances are classified using these criteria.

Acute Toxicity: Inhalation (vapour)

Class 6.1	Packing Group I	Packing Group II	Packing Group III		
TDG				**Not required under TDG**	**Not required under TDG**

mL/m^3(1h) **1000** **3000** **5000**

	Category 1	Category 2	Category 3	Category 4	Category 5
GHS	 **Danger** **Fatal if inhaled**	 **Danger** **Fatal if inhaled**	 **Toxic if inhaled**	 **Warning** **Harmful if inhaled**	**No symbol** **Warning** **May be harmful if inhaled**

mg/L(4h) **0.5** **2.0** **10.0** **20.0**

Comments: The results of aligning the current TDG breakpoints, based on hazard alone, with those of the GHS would be dramatic. Packing Group I would cover extremely toxic substances (LC_{50} < 250 mL/m^3). Packing Group II would include the remainder of substances currently in Packing Group I. Packing Group III would be comprised of those substances currently in Packing Groups II and III. TDG breakpoints also include a 'risk factor' "V"(saturated vapour concentration). Although truly only useful in defining Packing Group I, "V" should be considered before any mass reclassification of substances.

Acute Toxicity: Inhalation (gas)

	Class 2.3		
TDG		**Not required under TDG**	**Not required under TDG**
mL/m^3(1h)	**5000**		

	Category 1	Category 2	Category 3	Category 4	Category 5
GHS	 **Danger** **Fatal if inhaled**	 **Danger** **Fatal if inhaled**	 **Danger** **Toxic if inhaled**	 **Warning** **Harmful if inhaled**	**No symbol** **Warning** **May be harmful if inhaled**
ppm(4h)	**100**	**500**		**2500**	**5000**

Comments: TDG has no breakpoints within Class 2.3 and so, all toxic gases must be treated as if they were in GHS Category 1
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Skin Corrosion/Irritation

	Category 1A	Category 1B	Category 1C	Category 2	Category 3
TDG				**Not required under TDG**	**Not required under TDG**
GHS	 **Danger** **Causes severe skin burns and eye damage**	 **Danger** **Causes severe skin burns and eye damage**	 **Danger** **Causes severe skin burns and eye damage**	 **Warning** **Causes skin irritation**	**No symbol** **Warning** **Causes mild skin irritation**

Serious Eye Damage/Irritation

	Category 1	Category 2A	Category 2B
TDG	**Not required under TDG**	**Not required under TDG**	**Not required under TDG**
GHS	 **Danger** **Causes serious eye damage**	 **Warning** **Causes serious eye irritation**	**No symbol** **Warning** **Causes eye irritation**

Respiratory Sensitization

	Category 1
TDG	**Not required under TDG**
GHS	 **Danger** **May cause allergy or asthma symptoms or breathing difficulties if inhaled**

Skin Sensitization

	Category 1
TDG	**Not required under TDG**
GHS	 **Warning** **May cause an allergic skin reaction**

Germ Cell Mutagenicity

	Category 1A	Category 1B	Category 2
TDG	**Not required under TDG**	**Not required under TDG**	**Not required under TDG**
GHS	 **Danger** **May cause genetic defects (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Danger** **May cause genetic defects (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Warning** **Suspected of causing genetic defects (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**

Carcinogenicity

	Category 1A	Category 1B	Category 2
TDG	**Not required under TDG**	**Not required under TDG**	**Not required under TDG**
GHS	 **Danger** **May cause cancer (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Danger** **May cause cancer (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Warning** **Suspected of causing cancer (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**

Toxic to Reproduction

	Category 1A	Category 1B	Category 2
TDG	**Not required under TDG**	**Not required under TDG**	**Not required under TDG**
GHS	 **Danger** **May damage fertility or the unborn child (*state specific effect if known*) (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Danger** **May damage fertility or the unborn child (*state specific effect if known*) (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Warning** **Suspected of May damaging fertility or the unborn child (*state specific effect if known*) (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**

Effects on or via Lactation

	Category 1
TDG	**Not required under TDG**
GHS	**May cause harm to breast-fed children**

Target Organ Systemic Toxicity (Single Exposure)

	Category 1	Category 2
TDG	**Not required under TDG**	**Not required under TDG**
GHS	 **Danger** **Causes damage to (*state all organs affected, or use a general statement where there is no definite evidence that other organs are not affected*) if (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Warning** **Causes damage to (*state all organs affected, or use a general statement where there is no definite evidence that other organs are not affected*) if (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**

Target Organ Systemic Toxicity (Repeated Exposure)

	Category 1	Category 2
TDG	**Not required under TDG**	**Not required under TDG**
GHS	 **Danger** **Causes damage to (*state all organs affected, or use a general statement where there is no definite evidence that other organs are not affected*) if (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**	 **Warning** **Causes damage to (*state all organs affected, or use a general statement where there is no definite evidence that other organs are not affected*) if (*state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard*)**

Aquatic Toxicity (Acute)

	Category 1	Category 2	Category 3
TDG		**Not required under TDG**	**Not required under TDG**
GHS	 **Warning** **Very toxic to aquatic life**	**No symbol** **No signal word** **Toxic to aquatic life**	**No symbol** **No signal word** **Harmful to aquatic life**

Comments: TDG now follows the requirements outlined in the *International Maritime Dangerous Goods Code* (IMDG CODE) for marine transport only. As it expected that these requirements will be harmonized with the GHS, TDG will follow suit

Aquatic Toxicity: Chronic

	Category 1	Category 2	Category 3	Category 4
TDG				
GHS	 **Warning** **Very toxic to aquatic life with long lasting effects**	 **No signal word** **Toxic to aquatic life with long lasting effects**	**No symbol** **No signal word** **Harmful to aquatic life with long lasting effects**	**No symbol** **No signal word** **May cause long lasting harmful effects to aquatic life**

Comments: TDG now follows the requirements outlined in the *International Maritime Dangerous Goods Code* (IMDG CODE) for marine transport only. As it expected that these requirements will be harmonized with the GHS, TDG will follow suit