Class 3 — Flammable liquids

Liquids which ignite easily and burn fiercely. Under prescribed tests, they give off a flammable vapour at 60,5°C (flash point) or less. More than 80% of dangerous goods transported is Class 3. Although there are no divisions there are three packing/danger groups based on the degree of flammability.

The packaging groups are as follows:

Packing group I which boils at 35°C or less.

Examples	*UN No*	*Uses*
Carbon disulphide	1131	Used to manufacture cellophane and carbon tetrachloride. Cold vulcanisation of rubber
Diethylether	1155	Used in liquid laundry detergents, stamp pad inks, cosmetics and toiletries.

Packing group II which has a flash point lower than 23°C.

Examples	*UN No*	*Uses*
Acetone	1090	Nail polish remover, paint solvent.
Benzene	1114	Used to make other chemicals like styrene used in plastics and phenol used in resins.
Petrol	1203	Fuel.
Tar	1999	Bitumen and asphalt for road construction.
Toluene	1294	A solvent used in rubber, paint, glues and leather tanning.

Packing group III which has a flash point from 23°C up to 60,5°C.

Examples	*UN No*	*Uses*
Camphor oil	1130	Medicinal.
Diesel	1202	Fuel.
Ethanol	1170	Used in alcoholic beverages and as a solvent in perfumes, aftershaves, cosmetics. Biofuel. Used to make methylated spirits.
Isobutanol	1212	Paint solvent, varnish remover.
Methanol	1230	Petrol additive and used to make other substances like formaldehyde. It is a poison added to ethanol to produce methylated spirits which, because it is unfit to drink, avoids the heavy tax levied on alcohol.
Methylated spirits	1986	Household cleaning solvent and a fuel for spirit burners. Made by adding methanol to ethanol.
Paraffin (Kerosene)	1223	Home heating fuel.
Pine oil	1272	Bath oil, deodorizer, disinfectant. Used in metal extraction from ores.
Turpentine	1299	Distilled from tree resins and used a raw material for the chemical industry. Its use as an industrial solvent for thinning paint has largely been replaced by the much cheaper turpentine substitute (UN No 1300) which is distilled from crude oil.

CLASS 3 HAZARDS

The main danger with flammable liquids is that of ignition of the mixture of and the vapour given off by the substance. This may occur explosively with c siderable violence, as a flash ignition of accumulated vapours over a large area locally just above the liquid surface. It is the vapour, not the liquid which bu However, the vapours of the liquid generally continue to burn after ignition, *ie* liquid is combustible. Further danger is present if the vapour is invisible and liquid floats on water. The fumes may also be toxic.

Other risks are that eye contact, skin contact, ingestion and inhalation may toxic, harmful or irritant. Sometimes, the fire risk may be considered subsidiar these other effects for the purpose of classification. Nonetheless the flamma danger should be considered an additional hazard and due precautions taken.

CLASS 3 INCIDENTS

1. Some flammable vapours are more easily ignited than others. Carbon di phide vapour, in particular, can even be ignited by an ordinary steam pipe. In instance, a bulk tanker barrel developed a small leak when discharging carl disulphide at a customer's installation. The vapour from the leak contacted a l pressure steam line and burst into flames.

2. Flash backs are another danger posed by flammable liquids as demonstrated by incident in the workshops of a large chemical haulier. A tanker, which had b carrying flammable liquid was inadvertently left in the workshop with its runoff va open. The vapours travelled across the workshop to a welding torch with a result flash back triggering off an explosion in the tank, completely destroying it.

3. In September of 1995 a petrol tanker rolled after a tyre apparently burst exploded against a garden wall on the Johannesburg-Potchefstroom Rd Westonaria. The driver was killed when he was engulfed in a fireball while runn from the tanker. Two dogs on the property were burned to death. The highway closed for several hours and the house was badly damaged. In another incident the M2 in Cleveland (near Johannesburg) during the same month, a petrol tan crashed into the side of the road and ignited. Again, the driver was killed.

4. In November 1995 a road tanker overturned on the Rivonia Rd in Sandt spilling 12 000 litres of petrol into the storm water system killing fish in Sandspruit River. Several residents were evacuated for four hours and the road closed.

5. A 500 metre stretch of the N2 at East London was affected and closed down about 24 hours in June 1996 when a truck jackknifed across the road, losing cargo of 200-litre and 25-litre drums of lubricant and antifreeze as well as boxes containing 500 litres of brake fluid.

CLASS 3 INCIDENTS (continued)

6. Two trucks were involved in an accident on the N12 at Benoni, in July 1996. One was carrying drums of hydraulic oil which leaked about 1 000 litres over 200 metres. The road was closed for 11 hours involving 34 emergency personnel and resulting in a traffic jam of several kilometres.

7. At Cape Town in July 1996, a 15 000-litre tanker left the N7, overturned and spilled petrol and paraffin, closing the road for 12 hours.

8. An incident involving two road tankers carrying a total of 52 000 litres of fuel occurred on the N2 near Khayelitsha on 10 May 1997. Eleven people were incinerated, a baby died and 30 were injured in what seasoned rescuers described as the worst accident they had seen. Two cars travelling towards Somerset West in thick morning fog collided and triggered a 60-vehicle pile-up. A petrol tanker stopped to avoid the initial accident but was hit from behind by a Landrover. A second tanker, carrying diesel, slammed into the Landrover ramming it against the first tanker. A column of flame leapt 30 m into the air as the tankers caught alight, melting tar up to 50 metres away and preventing rescuers from getting close. Both tankers exploded and were completely destroyed along with a number of other vehicles.

Packing groups

Higher risk materials require stronger, safer containers. Consequently (except for classes 1, 2, 6.2 and 7) dangerous goods have, for packing purposes, been apportioned between three groups according to the degree of danger involved in their carriage. These packing groups are symbolised as follows.

I Very severe risk.
II Serious risk.
III Relatively low risk.

The appropriate packaging group for a commodity, found in the DANGEROUS GOODS LIST❖ (COLUMN 5) is also used to determining various provisions applicable to its transportation, such as a SPECIAL PROVISIONSⓘ note or a subsidiary risk.

Subsidiary risk

Many dangerous goods have properties which relate to more than one class. Where there is a secondary danger, in addition to the primary risk which determines the allocation of class, goods are also allocated a "subsidiary risk" (see COLUMN 4 in the DANGEROUS GOODS LIST❖). Sometimes there are two subsidiary risks.

Examples	*UN No*	*Primary risk*	*Subsidiary risk/s*
Nitric oxide	1660	Class 2.3	Class 5.1 and Class 8.
Oxygen	1073	Class 2.2	Class 5.1

Compatibility

Materials of certain of the classes are liable to react with materials of another class creating a greater hazard (*eg* flammables and oxidizing agents) and must be either be kept apart during transportation or storage or must not be loaded on the same vehicle. (See LOAD COMPATIBILITYⓘ).

Difficulties in classification

Generic or not otherwise specified (NOS) — grouped substances

Since a list for every known dangerous substance would be long, complex and unwieldy to use, certain substances are grouped together under a general (generic) description and given a single UN number (See GENERIC AND N.O.S. GOODS❖). These would be substances not otherwise specified (NOS) in the list. For example, a substance not specifically listed by name but which is known to be an alcohol should be identified under the most appropriate of the "Alcohols NOS" which are listed.

There are nearly 400 NOS entries, thus covering virtually every eventuality. In order to select the correct NOS generic listing, the dangerous properties should first be determined and classified and then the description which most accurately describes the substance should be chosen. For instance, a flammable liquid of Class 3 that is known to be an aldehyde should be identified as *Aldehydes NOS (UN 1989)* rather than as *Flammable liquids NOS (UN 1993)*.

In such cases, the description appearing on the documentation and packaging should be supplemented with the actual name of the substance in brackets immediately after the generic NOS entry.

Mixtures and solutions

A mixture or solution not specifically identified in the DANGEROUS GOODS LIST❖ but contains a dangerous substance which is listed, must be identified under the appr listing for that particular substance, unless the entry for that substance applies only substance in its pure form.

Mixtures and preparations

Mixtures and preparations using different ingredients must be tested to determi hazard(s) presented and at what level to define the appropriate class/division and P GROUPⓘ. Where a particular component is the major cause of the hazard it must be in in the proper shipping name.

Waste

Waste chemicals are defined in *SANS 10228* as unusable product from chemic metal processing operations that, if improperly disposed of, contains danger polluting materials that pose a threat to humans or animals or the environment.

Waste of dangerous goods must be classified using the same criteria as for other dan goods and (except for radioactive waste) must be transported under a single entry appropriate collective entry, preceded by the word "waste" and a WASTE CLASSIFI CERTIFICATEⓘ must accompany the vehicle.

Waste not classified as dangerous but which is covered by the Basel Convention transported under CLASS 9ⓘ.

NOTE: The Basel Convention relates to the Cross-border Transport of Hazardous — designed, in theory, to prevent the dumping of hazardous waste into under-dev countries.

Empty containers

Empty containers that have not been cleaned or are not gas-free must be identi accordance with the substances they contained.

[SANS 10228 Clause 19]

Precedence of hazards

If a product, not in the DANGEROUS GOODS LIST❖, meets the criteria for more than one class, the precedence of hazard table (opposite) must be used to allocate the class

The following classes, however, always take precedence:

- CLASS 1ⓘ
- CLASS 2ⓘ
- Liquid desensitised explosives of CLASS 3ⓘ
- Self-reactive substances of division 4.1ⓘ
- Pyrophoric substances of division 4.2ⓘ
- Division 5.2ⓘ
- Toxic substances of division 6.1 with a PACKING GROUPⓘ I inhalation toxicity
- Division 6.2ⓘ
- CLASS 7ⓘ (other hazards present must be identified as SUBSIDIARY RIS

Class 9 — Miscellaneous

These are goods which present a danger during transportation but cannot be classified in any of the other classes. They include environmentally hazardous substances, substances which have anaesthetic or noxious effects, fine dusts which could endanger health by inhalation, life saving appliances, wet battery operated appliances and substances carried at elevated temperatures.

Examples	*UN No*	*Uses*
Airbag inflators	3268	A gas generator, used to inflate an air bag in a motor vehicle (a casing containing an igniter, a booster material, a gas generant and, in some cases, a pressure cylinder). Some inflators fall under UN No 0503 which is a Class 1 explosive.
Air bag module	3268	This is an air bag inflator complete with inflatable bag assembly.
Asbestos	2590	Due to its excellent resistance to heat, it was used to manufacture various products, many of which were used as building materials. Identified as a carcinogen (cause of cancer) the demolition, transport and disposal of asbestos waste must also comply with the OHS Act, Asbestos Regulations.
Battery driven vehicle	3171	Electric wheel chairs. Dangerous due to the fact that they contain acid batteries.
Carbon dioxide	1845	Dry ice, used to pack food without requiring mechanical refrigeration (not dangerous for road transport).
Lithium batteries	3090	Used for portable electronic devices, such as digital cameras, due to the best energy to weight ratios, no memory effect and slow loss of charge when not in use.
Expandable Polystyrene beads	2211	Used to manufacture packaging material, it evolves a flammable vapour (pentane).
Zinc hydrosulphite	1931	Wood pulp bleach.

Environmentally hazardous substances

Substances or mixtures dangerous to the aquatic environment not otherwise classified under classes 2 to 6 and class 8 are designated UN 3077 (for solids) and UN 3082 (for liquids) and are all assigned to packing group III.