DGSA Training Course Manual

Topics Covered

1. General Philosophy
2. Classification Criteria
3. Identification: Selection of UN No. & PSN - DGL
4. Containment systems: Construction & Testing
5. Selection & Use of Containment systems
6. Labeling and Marking
7. Documentation
8. Loading unloading
9. Vehicle Crews & equipment
10. Vehicle requirements
11. Exceptions (ADR): activities, loads, LQ, EQ
12. Duties of Participants
13. Other provisions: Training Requirements, Security provisions, Tunnel restrictions, DGSA function, accident reports
14. National Legislation: CAs, Enforcement & penalties, national exemptions

1. General Philosophy

The general philosophy behind the regulations is that dangerous goods can be transported safely provided they are:

Classified correctly
Contained in specified containment systems
Clearly identified during transport by means of labels & marks on the goods and for the most part accompanied by transport documentation
Carried in suitable vehicles that are appropriately equipment when necessary
And that all staff involved have relevant training

Legal Basis of ADR

Agreement for international transport under UN ECE (United Nations Economic Commission for Europe) from 1957 (9 signatories, 47 parties)
Irish formal accession October 2006

EU Directive makes it applicable to national transport within member states (currently Dir 2008/68/EC)

Irish SI 349 of 2011 as amended by SI 238 of 2013, SI 31 & 288 of 2015, SI 5, 282 & 555 of 2017, SI 197 of 2018, SI 277 of 2019 & SI 197 of 2023 gives legal effect to ADR 2023 and the EU directive.

"Shall" is used to indicate mandatory requirements

ADR Contents

Part 1: General Provisions (scope, definitions, obligations, security, etc)
Part 2: Classification (procedures and criteria)
Part 3: Dangerous Goods List (DGL), special provisions, Excepted & Limited quantities
Part 4: Packaging & Tank Provisions (selection/use via packaging/tank instructions)
Part 5: Consignment Procedures (Labelling/placarding, marking, and documentation)
Part 6: Construction & Testing of containments (packages, pressure receptacles, IBC, Tanks, etc.)
Part 7: Provisions for carriage, loading unloading
Part 8: Vehicle crews and equipment
Part 9: Construction / approval of vehicles
Each part consists of a number of chapters. Chapters are split into sections and subsections
Each section/ subsection is numbered for easy reference e.g. 1.1.2.1

2. Classification

Classification criteria are provided in Part 2
They take into consideration a range of physical, chemical, toxicological and other properties e.g.

Physical state – solid, liquid or gas
Flash point liquids, burning rates
Chemical properties such as presence of peroxide group, radioactive elements, corrosivity, etc.
Animal and environmental toxicity data
Concentration of ingredients in mixtures

N.B. A material with multiple hazards can only be assigned to one Hazard Class using rules/tables for precedence of hazards. The other hazards are termed subsidiary hazards

Class 1 – Explosives

Substances and articles

Solid or liquid substances (not gas)
Chemical reaction occurs at such speed producing hot gases / pressure that may cause damage to surroundings
Typically a rapid oxidation reaction (combustion) of organic material using a chemical source of oxygen such as NO2 contained in or mixed with the organic compound e.g. trinitrotoluene (TNT), nitroglycerine

Explosive Characteristics

Sensitivity / Ease of initiation
Sensitive (detonators) ↔ insensitive (blasting agents)
Phlegmatizer = additive for safer handling e.g. nitroglycerine adsorbed onto kaolin clay to create dynamite

Relative **Speed** of propagation of reaction
Fast ↔ Slow
Detonation = reaction spreads faster than sound so you get a sonic bang – industrial explosives, high explosives
Deflagration = reaction spreads slower than sound -so just intense burning e.g. propellants, flares, fuses

Class 1 - Divisions

Six Divisions
1.1 Substances and articles having a mass explosion hazard
E.g. TNT
1.2 Substances and articles having a projection hazard but not a mass explosion hazard
E.g. Rockets with bursting charge UN 0295
1.3 Substances and articles having a fire hazard and either minor blast or projection hazard
E.g. Flares, surface UN 0092
1.4 Substances and articles with only slight risk of explosion in event of ignition during carriage and contained largely within package
E.g. Cartridges small arms UN 0012
1.5 Very insensitive substances with a mass explosion hazard
E.g. Explosives blasting type E UN 0332
1.6 Extremely insensitive articles which do not have a mass explosion hazard.
E.g. Articles, explosive, extremely insensitive, UN 0486

Class 1 – compatibility groups

13 compatibility groups – alphabetic codes have significance for mixed loading
Examples: "A" primary explosive, "G" for pyrotechnic substances and articles, "S" for safety denotes a substance or article so designed / packaged that effects of detonation contained within package
Classification code consists of class, division and compatibility e.g. 1.1A, 1.4G, 1.4S
Questions mainly around definitions, divisions, compatibility groups, classification codes

Classification criteria

Classification based on results of a series of tests contained in Manual of Test Criteria, Part I and then assigned to appropriate UN entry using a glossary of terms for guidance
Use of generic NOS entry requires written approval of Competent Authority of country of origin

Fireworks may be assigned to division 1.1, 1.2, 1.3 or 1.4 by reference to a default table instead of Test Series 6 data, subject to CA written approval (SP 645)

Class 2 - Gases

Covers all gases
"Gas" means a substance which:
(a) at 50 °C has a vapour pressure greater than 300 kPa (3 bar); or
(b) is completely gaseous at 20 °C under standard pressure of 101.3 kPa (1.013Bar)
Note: Standard pressure and temperature (STP) is taken as 20 °C and 101.3 kPa

Gases - subdivisions
Gases under ADR are subdivided based on how they are carried (8 sub-divisions):

1. Compressed gas (Nitrogen, oxygen)
2. Liquefied gas (Butane Propane, Chlorine)
3. Refrigerated liquefied gas (liquid nitrogen – 196 C, oxygen -183 C)
4. Dissolved gas (acetylene dissolved)
5. Aerosols & receptacles, small containing gas
   An aerosol has an integral release device whereas a gas cartridge is intended to attach to a separate device e.g. blowtorch
6. Other articles containing gas under pressure
7. Non pressurized gas (samples)
8. Chemicals under pressure
9. Adsorbed Gas

Note: IMDG (sea) & ICAO (Air) regulations divide gases into three primary divisions based on hazard properties
2.1 Flammable
2.2 Non-flammable / Non-toxic
2.3 Toxic

Gases –Classification code
Gases under ADR are also subdivided into groups based on hazardous properties, denoted by alphabetic codes
A Asphyxiant (displaces air/oxygen)
O Oxidizing (increases burning rate)
F Flammable (ignitable ≤ 13% in air or flammability range ≥ 12%)
T Toxic (LC_{50} ≤ 5,000 ml/m3 (ppm)
C Corrosive
The classification code combines the subdivision number and hazard letter(s) e.g. 1O Oxygen, compressed, 2F Butane, 2TOC Chlorine

Class 3

Flammable Liquids
Definition:
substances and articles containing substances of this Class which:
- are **liquids** according to subparagraph (a) of the definition for "liquid" in 1.2.1 (i.e. melting point ≤ 20 °C) ;
- have at 50 °C a vapour pressure of not more than 300 kPa (3 bar) and are not completely gaseous at 20 °C and at standard pressure of 101.3 kPa; and

Have a flash-point of not more than 60 °C

Flashpoint (FP) is the lowest temperature of a liquid at which its vapours form a flammable mixture with air i.e. the minimum temperature for the liquid to burn –measured using closed cup (cc) method
Vapour is the term for the gas phase of a liquid
Diesel FP 68 °C is included by derogation
Class 3 also includes liquid desensitized explosives and liquid or molten substances carried above their flashpoint.
Substances FP >35 °C may be excluded if they do not sustain combustion, unless carried at or above their FP. e.g. mixtures of a flammable liquid and water

Class 3 – packing groups
Packing groups (PG) are used to indicate the degree of danger: I high, II moderate, III low

Note: Packing groups are not used for all classes e.g. no PG for Class 1 or 2

Criteria for assigning PG based on flash point and initial boiling point

I	--	BP ≤ 35 °C
II	FP < 23 °C	BP > 35 °C
III	FP ≥ 23 °C to ≤ 60°C	BP > 35 °C

Class 3 – viscosity influence

The viscosity of mixtures or preparations e.g. paints can influence the assignment of packing group and applicability of ADR

If in a solvent separation test less than a 3% layer of solvent forms, the product does not contain > 20 % nitrocellulose if carried in receptacles ≤ 450 L and the viscosity is within defined parameters, then

- PG III instead of PG II may be assigned depending on actual FP - See ADR 2.2.3.1.4
- If the FP ≥ 23 °C they may be transported exempt from ADR provided they are non-toxic, non-corrosive and non-environmentally hazardous or EHS in receptacles ≤ 5 L - See ADR 2.2.3.1.5

i.e. PG II may change to PG III and PG III may change to exempt if viscous paints or adhesives, etc.

Class 4.1 - Flammable solids, self-reactive substances, polymerizing substances and desensitized explosives

A subdivision of Class 4 although no simple common descriptor for class 4

Covers

Solid flammable substances and articles
Solid desensitized explosives
Solid and liquid self-reactive substances
Solid and liquid polymerizing substances

Flammable Solids

Flammable solids are defined as readily combustible solids and solids which may cause fire through friction

Note: combustible means something can burn (oxidation reaction with oxygen/air) whereas the term flammable is used to indicate something that burns readily

Readily combustible solids can be in the form of powders, granules or pastes and includes metal powders

Flammable Solids Criteria

Specific test methods in Manual of Test Criteria for measuring burning times/rates

Burning time **< 45 sec over 100 mm** or

Burning rate **> 2.2 mm/sec**

PG III if **wetted zone** stops flame for at least 4 min,

PG II if not stopped by wetted zone

Metals & Metal alloys flame spreads over the whole length in ≤ 10 minutes

PG II ≤ 5 minutes, otherwise PG III

Classification due to friction is by analogy with existing substances or special provisions

Self-Reactive Substances

Defined as thermally unstable substances liable to undergo a strongly exothermic decomposition without oxygen (air).

i.e. unstable when heated, giving off more heat, which increases the decomposition rate & could result in release of toxic gases or vapours, or ignition, or explosion if confined. E.g. aliphatic azo, organic azides, diazonium

Chemical reactions in general speed up with increase in temperature – Q10 rule 2-fold increase for every 10 °C

May require limitation on package size (to allow heat dissipation), or temperature control, or desensitization with a diluent for safe transport

SADT = Self Accelerating Decomposition Temperature – the lowest temperature at which self accelerating decomposition may occur in the packaging as used during transport Manual of test criteria describes how to determine a SADT

Must not exceed that temperature to avoid a run-away reaction

Criteria: Heat of decomposition **≥ 300 J/g**

SADT of 50 kg package **≤ 75 °C**

Setting of control and emergency temperatures based on SADT temperature covered in Part 7

Classification into seven types A – G based on the degree of danger (of the package) using test methods and principles from Manual of Test Criteria
Type A is not accepted for carriage, G is not subject to provisions for class 4.1 reactive substances
Table 2.2.41.2 enables the identification of suitable packing methods, control & emergency temperatures if applicable, and UN numbers for known self reactive substances
Classification of new substances must be approved by the CA of the country of origin

Polymerizing Substances
Polymerizing substances are substances which in the absence of stabilizers are likely to undergo strongly exothermic polymerisation reactions
Classification Criteria
SAPT Self Accelerating Polymerization Temperature (as offered for carriage) ≤ 75°C
Heat of reaction > 300 J/g & Do not satisfy other classification criteria of Classes 1 – 8
Temperature control required if:
SAPT ≤ 50°C packages SAPT ≤ 45°C tanks
PG III only

Class 4.2 - Substances liable to spontaneous combustion

As distinct from self-reactive substances, Class 4.2 substances require oxygen / air to spontaneously react to produce heat/combustion
Can be solids or liquids
Two broad categories
Pyrophoric substances ignite within 5 minutes
Self heating substances will only ignite after a long time when in large amounts
Note the classification codes which indicate sub-risks, physical form, and other properties

Class 4.2 Classification Criteria
Tests according to Manual of Test Criteria
Pyrophoric solids – ignition after 1m drop or within 5 minutes
Pyrophoric liquids –after 5 min, ignition on inert carrier or ignite or carbonize filter paper
Pyrophoric are always PG I
Self heating substances – 10 cm cube at 140 °C ignites or increases temperature above 200 °C within 24 hours (60 °C rise in temperature within 24 hours)
PG II if a 2.5 cm cube shows the same effect, otherwise PG III
Note exemptions based on package size and temp rise

Class 4.3 - Substances which, in contact with water, emit flammable gases

Classification based on results of tests from Manual of Test Criteria
Class 4.3 if emitted **gas ignites** spontaneously or flammable gas is emitted at a **rate > 1L/kg/hr**
PG I if gas ignites spontaneously or rate ≥ 10 L/kg/min
PG II if ≥ 20 L/kg/hr
PG III > 1 to < 20 L/kg/hr
Note the classification codes which indicate physical form and sub-risks, if applicable
Also note that some organometallic compounds can be either Class 4.2 or 4.3 and require a decision tree in 2.3.5 to determine the appropriate class

Class 5.1 - Oxidizing substances

Promote burning of combustible materials by providing a source of oxygen
Solids, liquids and articles
Classification by comparison of test substance – cellulose mixtures with reference oxidizing material-cellulose mixtures
Solids compared to potassium bromate or calcium peroxide mixtures
O1 Test PG I burning time 4:1 or 1:1 < 3:2 bromate / cellulose
PG II burning time 4:1 or 1:1 < 2:3 bromate / cellulose
PG III burning time 4:1 or 1:1 < 3:7 bromate /cellulose
O3Test PG I burning time 4:1 or 1:1 ≤ 3:1 peroxide / cellulose
PG II burning time 4:1 or 1:1 ≤ 1:1 peroxide / cellulose

PG III burning time 4:1 or 1:1 ≤ 1:2 peroxide /cellulose

Oxidizing liquids may ignite when mixed with cellulose or cause a pressure rise of 2070 kPa in a time ≤ that of reference mixtures

PG I a 1:1 mixture with cellulose ignites or the mean pressure rise time is ≤ that of 1:1 50% perchloric acid cellulose mixture

PG II the mean pressure rise time of the 1:1 mixture is ≤ that of 1:1 40% sodium chlorate cellulose mixture

PG III the mean pressure rise time of the 1:1 mixture is ≤ that of 1:1 65% nitric acid cellulose mixture

Class 5.2 - Organic peroxides

Contain R-O-O-R

The O-O is an oxidizing group, but compared to class 5.1 oxidizers, organic peroxides present greater hazard because the also contain combustible organic components

Can be solids or liquids

Many similarities to self reactive substances

can undergo exothermic decomposition with evolution of harmful or flammable gases, may ignite, or explode if confined

Safe transport by use of appropriate package sizes, control and emergency temperatures related to SADT or diluents/stabilizers

Divided into seven types A – G which relates to maximum package size. A – prohibited, G – exempt

2.2.52.4 allows identification of existing known peroxides with associated UN number, packing method control, emergency temperatures if required, and use of suitable diluents

Part 7 relates control and emergency temperatures to SADT

Classification of <u>new organic peroxides require CA approval</u>

Review of potentially reactive substances

Material	Potential Hazard	Control measures
Class 4.1 Self reactive substance	Inherently unstable producing heat	Package size, temperature control, diluents
Class 4.1 Polymerizing substance	Polymerization reaction producing heat	Stabilizers, temperature control
Class 4.2 Spontaneously combustible substances	Combustion or heating if exposed to air	Exclude air / oxygen
Class 4.3 Water reactive substances	Release flammable gas in contact with water	Keep dry
Class 5.1 Oxidizing substances	Ignites or increases burning rate of combustible materials	Keep away from combustible material
Class 5.2 Organic peroxides	Inherently unstable producing heat via oxidation	Package size, temperature control, diluents / stabilizers

Class 6.1 - Toxic substances

Substances (solids & liquids) which are known by experience or from experiments in animals to cause damage to health or death in humans within a short time, if relatively small quantities are ingested, adsorbed through skin or inhaled as a vapour, dust or mist

Usually based on animal experiments (rats & rabbits) where various quantities of substances are administered via the various routes of entry to establish the lowest level, which causes death of 50% of the test animals within 14 days

Expressed as an **LD_{50}** in mg of substance per kg of bodyweight for oral and dermal routes and as an **LC_{50}** in mg/L or ml/m^3 concentration in air for inhalation

Class 6.1 Classification Criteria

The lower the LD/LC_{50} the more toxic the material

Assigned to PG I, II or III as follows

PG	LD $_{50}$ oral mg/kg	LD_{50} Skin mg/kg	LC_{50} dusts or mists mg/l
I	≤ 5	≤ 50	≤ 0.2
II	>5 to ≤ 50	> 50 to ≤ 200	> 0.2 to ≤ 2

III	>50 to **≤ 300**	>200 to **≤ 1000**	> 2 to **≤ 4**

Classification for inhalation toxicity of vapours of liquids also takes into account the chance of sufficient vapour being formed as limited by the saturated vapour concentration (V) at 20 °C

PG	**Criteria**
I	V ≥ 10 LC_{50} & LC_{50} ≤ 1,000 ml/m^3
II	V ≥ LC_{50} & LC_{50} ≤ 3,000 ml/m^3
III	V ≥ 1/5 LC_{50} & LC_{50} ≤ 5,000 ml/m^3

A graph is provided to make classification easier

There are complicated formulae for classifying mixtures of volatile liquids – two difficult for examination questions

Threshold test methods are also provided for mixtures

Class 6.1 Classification of oral and dermal toxicity of mixtures

If toxic (active) substance mixed with non-toxic substances then

LD_{50} mixture =LD_{50} substance x 100 / % concentration

Take a 50% solution of a substance with an LD_{50} oral 40 mg/kg dissolved in water

The pure substance is PG II (LD_{50} 40 mg/kg)

The LD_{50} of the mixture = 40 x 100 / 50 = 80 mg/kg

i.e. you have to consume twice the amount of the mixture to consume the same amount of toxic substance – less toxic

The mixture is PG III (LD_{50} 80 mg/kg)

Mixtures with multiple toxic components may also be calculated Ca/LD_{50}a + Cb/LD_{50}b.. = 100/LD_{50}mix

Class 6.2 - Infectious substances 

Infectious substances (materials) are substances which are known or reasonably expected to contain pathogens.

Pathogens = micro-organisms or other agents that cause disease in humans or animals

Divided into Category A or B depending on level of risk that takes into account the form in which it is carried

Category A high risk – exposure (if released from package) could cause permanent disability, life threatening or fatal disease i.e. high risk of infection with severe consequences

Other wise Category B and termed Biological Substance i.e. less risk of infection and/or less severe consequences

Indicative list of Category A – some Category A only in concentrated culture form, otherwise category B

Exemptions

Materials that do not contain infectious substances or materials unlikely to cause disease

Non-pathogenic organisms

Materials where pathogens have been neutralized / inactivated

Substances with naturally encountered pathogen levels with no significant risk e.g. water and food samples

Dried blood spots, faecal occult blood screening tests, blood/blood products for transfusion, tissues/organs for transplant

Exempt specimens based on professional judgement as unlikely to contain pathogens

Used medical equipment – just packaging and marking requirements

Class 7 - Radioactive Material  

The basic elemental structure of material is the **atom**

Atoms consist of a dense positively charged **nucleus** consisting of **protons** and **neutrons** surrounded by negatively charged **electrons**

A single element may have different atomic weights due to variation in the number of neutrons

E.g. Hydrogen one proton, Deuterium one proton and one neutron, Tritium one proton and two neutrons

These are termed **isotopes** of an element i.e. same chemical characteristics but different atomic mass

Some of the isotopes are unstable and decay emitting radiation from their nuclei – **radionuclides**

Radiation can be emitted in the form of

α particles – positively charged (2p2n); easily stopped but destructive if ingested

β particles – negatively charged electrons

γ rays – high energy electomagnetic; most penetrative

Neutrons – no charge; atomic mass 1 similar to proton

Different nucleotides have different rates of decay / emission (half life)

The concentration of radioactive nuclides can vary depending on whether they occur in the natural state or have been purified or enriched

Specific activity expresses the activity per unit mass in Becquerels per g (Bq/g)

Table 2.2.7.2.2.1 lists all the radioactive isotopes by atomic mass, the number after the element symbol (the atomic number shown in brackets after the full element name corresponds to the number of protons in the nucleus)

e.g. Carbon-12 is the most abundant non-radioactive isotope, whereas Carbon-14 is radioactive and is the basis of carbon dating.

It provides activity concentration Bq/g and activity per consignment limits above which a material is classified as radioactive e.g. C-14 > 10,000 Bq/g and > 10 million Bq/shipment

Shipments below these levels are **Exempt Materials / Shipments**

All radioactive materials can be dangerous to health or the environment

Fissile isotopes (Uranium-233 & -235, Plutonium-239 &-241) – risk of a chain reaction leading to Explosion! So present a physical hazard as well

Thus safe handling involves measures to prevent release, limiting exposure times and shielding against radiation

Class 8 - Corrosive Substances

Solids or liquids which destroy healthy skin or corrode metal

Acids – low pH Bases - high pH

Classification into PG based on exposure time taken to destroy intact skin or rate of metal corrosion

In vitro model test methods available

PG	**Criteria**
I	≤ 3 min exposure, observation 60 minutes
II	>3 to ≤ 60 min exposure, observation 14 days
III	>60 min to ≤ **4 hr** exposure, observation 14 days or steel /aluminium corrosion rate > **6.25 mm/year**

Classification of Mixtures for skin corrosion

Derived from classification of ingredients and concentration thresholds

Relevant ingredients are corrosive ingredients ≥ 1 %

Class 8, PG I ingredients: Mixture ≥ 5 % = Class 8, PG I Mixture 1 – 5 % = Class 8 PG II

Class 8, PG II ingredients: Mixture ≥ 5% = Class 8, PG II

Class 8, PG III + PG II ingredients Mixture ≥ 5% = Class 8, PG III

Specific concentration limits provided for some named substances in special provisions – take precedence

N.B. Mixtures below the relevant concentration threshold may still be in Class 8 because of metal corrosion effects.

Class 9 - Miscellaneous dangerous substances and articles

Li battery variant

A mixed bag of miscellaneous substances and articles

- Lithium batteries – short circuit fire risk
- Life saving appliances –airbags, seatbelt pre-tensioners, life rafts
- Asbestos – dust inhalation cancer risk
- Elevated temperature substances – burns (bitumen)
- Substances & articles producing dioxins in fire – PCBs, PCTs in old electrical equipment
- Substances evolving flammable vapour - polymeric beads
- Chemical kits
- Capacitors – energy storage > 0.3W
- Named substances
- Named substances
- Generically modified (micro) organisms
- Environmentally Hazardous Substances (aquatic environment)

EHS Classification criteria

All substances must now be evaluated against criteria for environmentally hazardous substances (EHS)

If no other class applies then assigned to Class 9
If it meets criteria for other class then that class assigned with quantity-dependent requirement for EHS marking and documentation e.g. Class 3 fuels
Classification based on data for

- Acute aquatic toxicity (fish, crustacea, algae)
- Chronic aquatic toxicity
- Bioaccumulation tendency
- Degradation behaviour

OECD Test methods exist but data may be missing

Acute Criteria
Note: more likely to have acute toxicity data available for substances as experiments are relatively quick and inexpensive

96 hr LC_{50} (Fish)	**≤ 1 mg/L**
48 hr EC_{50} (crustacea - usually dapnia)	
72 or 96 hr ErC_{50} (algae)	

Designated Acute Category 1 under GHS classification system and is an EHS for transport purposes

Chronic Criteria
EHS Classification on basis of Chronic Toxicity is more complicated
Methods depend on availability of degradation and chronic toxicity data
Different criteria depending on whether substance is rapidly degradable or not
Rapidly degradable ~ > 70% degradation in 28 days or BOD5/COD ≥ 0.5
NOEC = No Observed Effect Concentration
A non-lethal observed effect could be for or example an effect on fish reproduction or development of dorsal fins
Not Readily Degradable

- Chronic 1 = NOEC or $EC_x \leq 0.1$ mg/L
- Chronic 2 = NOEC or $EC_x \leq 1$ mg/L

Readily Degradable

- Chronic 1 = NOEC or $EC_x \leq 0.01$ mg/L
- Chronic 2 = NOEC or $EC_x \leq 0.1$ mg/L

Both Chronic 1 and Chronic 2 are EHS for transport purposes
EHS Classification Chronic Criteria in absence of full data
If insufficient chronic data available can use acute data combined with degradation data and bioaccumulation factor or indicative Log Kow
i.e. if a substance is deemed to be not readily degradable and has bioaccumulation potential a chronic classification can be based on acute data as follows

- LC_{50} / EC_{50} / ErC ≤ 1 mg/L – Chronic 1
- LC_{50} / EC_{50} / ErC_{50} >1 to ≤ 10 mg/L – Chronic 2

All EHS for transport
EHS Classification of Mixtures
If sufficient data available for mixture can apply the same criteria as for substances
If data on similar mixtures or some ingredients are available can apply suitable Bridging principles
Classification of mixtures based on info on ingredients (classification and concentration) by the **summation method** is probably the most common practical method of classification of mixtures
Table 2.2.9.1.10.4.6.2.2

- Sum Acute 1 x M Factor ≥ 25% → Acute 1

Table 2.2.9.1.10.4.6.3.3

- Sum Chronic 1 x M Factor ≥ 25% → Chronic 1
- Sum (Chronic 1 x M x10) + Chronic 2 x M ≥ 25% → Chronic 2

M Factors (table 2.2.9.1.10.4.6.4) take account of order of magnitude difference of LX_{50} / NOEC values from thresholds
EHS Classification Example

- Mixture contains
- 10% A LC_{50} 0.5 mg/L &
- 10% B LC_{50} 0.05 mg/L

Apply Summation Formula = 10 + (10 x 10) = 110 > 25 Acute 1

Could also use the formula in 2.2.9.1.10.4.5.2 to calculate the LC_{50} of the toxic portion of the mixture, which is then applied to the summation table

$20/LC_{50}$ mix = (10/0.5) + (10/0.05) = 20 +200 = 220

LC_{50} mix = 20/220 = 0.09 mg/L

Apply Summation Formula = 20 x 10 = 200 > 25 Acute 1

Simplified EHS Classification from Supply Regulations

Finally if you do not have usable data you can rely on supply classification according to CLP - If you see  on labelling or MSDS and CLP categories Acute Aquatic 1, Chronic Aquatic 1 or 2 then it is EHS for transport. If not presume not EHS.

Summary of Classification Key Points

Classification determined based on test criteria

Criterion /test data (for self-classification)	**Indicative of Class**
Flashpoint	**Class 3**
Burning time or burning rate	**Class 4.1 flammable solids**
SAPT ≤ 75°C, heat > 300J/g	Class 4.1 polymerizing substance
Spontaneous combustion or temperature rise	Class 4.2
Rates of gas evolution	Class 4.3
Burning times compared to potassium bromate, perchloric acid, sodium chlorate or nitric acid cellulose mixtures	**Class 5.1**
LD/LC_{50} rats, rabbits	**Class 6.1 ***
Time for skin destruction /metal corrosion	**Class 8 ***
LC/EC/ErC_{50} fish, crustacea, algae	Environmentally hazardous substance *
* Rules provided for calculating classification of mixtures from concentration of relevant ingredients	

Classification determined based on reference information

Class	**Class Identification**
1	Glossary of explanations of UN entries, table for fireworks, CA approval of new assignments to NOS entries
2	Definition of a gas, then flammability range or LC_{50} toxicity data and form transported
4.1 self reactive	Table of known self-reactive substances. CA approval of new substances
5.2	Table of known organic peroxides. CA approval of new substances
6.2	Indicative table of known Category A infectious substances
7	Table of all radioactive isotopes and relevant activity thresholds

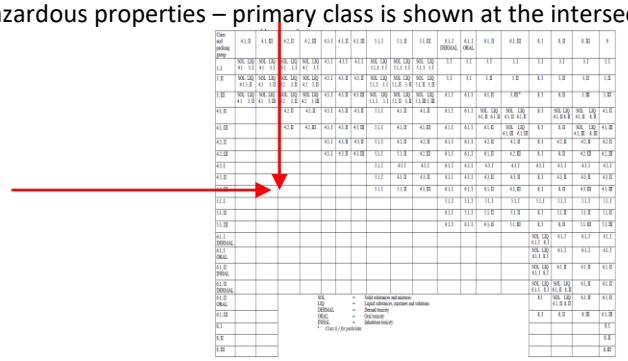
3. Identification

Identification of Class for goods with multiple hazards

ADR 2.1.3.5.3 contains a list of classes that always take precedence in the following order

Class 7 other than excepted packages
Class 1
Class 2
Liquid desensitized explosives of Class 3
Self-reactive substances and solid desensitized explosives of Class 4.1
Pyrophoric substances of Class 4.2
Class 5.2
Class 6.1 with inhalation toxicity PG I
Class 6.2

Otherwise the **Table of Precedence 2.1.3.10** enables the primary hazard class to be established for mixtures with multiple hazardous properties – primary class is shown at the intersection of relevant columns and rows



Identification of UN number & Proper Shipping Name

Table A of 3.2.1 contains the **Dangerous Goods List (DGL)** which show the 4-digit **UN number** and **Proper Shipping Name (PSN)** along with Class, subsidiary risk if applicable, and much more information

- There are approx 3,000 numbers
- The first 1,000 numbers are reserved for Class 1 (now up to 0509)
- In use UN numbers are always preceded by the letters "UN"
- Some UN numbers have multiple rows due to different packing groups or other properties

Table B in 3.2.2 contains an **alphabetical listing** of proper shipping names, which enables you to find the corresponding UN number

Proper Shipping Names - 2.1

There are four categories of PSN in order of preference – see 2.1.1.2

- **Specific entries** for many substances e.g.UN1230 METHANOL
- **Group Entries** e.g. UN1133 ADHESIVES
- **Chemical Family** entries e.g. UN1987 ALCOHOLS N.O.S.
- **Hazard group** entries e.g. UN1993 FLAMMABLE LIQUID N.O.S

The latter 3 groups are "collective entries"

Proper Shipping Names - 3.1

A PSN entry May include alternatives names E.g. Petrol, Gasoline or Motor Spirit – you must only use one
It may include explanatory text in lower case text - not part of PSN
N.O.S. stands for not otherwise specified. Many generic/N.O.S proper shipping names will have to be supplemented by the technical name(s) in brackets, <u>but only if SP274 (or SP318) applies</u>

- UN 2814 INFECTIOUS SUBSTANCE, AFFECTING HUMANS (Ebola virus) – SP318 applies
- UN 3291 CLINICAL WASTE UNSPECIFIED, N.O.S. - does not require a technical name

Selecting a PSN -2.1.2

Check the alphabetical listing to see if there is a specific entry for the substance
A specific PSN should also be used for a substance with technical impurities or additives that do not affect the classification – 2.1.2.3
A specific PSN may be used for a solution or mixture of the substance and non dangerous substances, unless:

- The solution or mixture is mentioned by name
- The PSN is clearly for the pure substance
- The class, classification code, packing group or form is different
- It requires different emergency response measures

The PSN may be supplemented by 'mixture', 'solution', 'molten', or 'stabilized' as appropriate – see chapter

Subject to CA approval additional hazards can be added to named substances based on test data

Examples of PSN Choices for Named Substances
Sodium Hydroxide

- UN 1823 SODIUM HYDROXIDE, SOLID
- UN 1824 SODIUM HYDROXIDE SOLUTION - PG II or III

Sulphuric Acid

UN 1830 SULPHURIC ACID (> 51%) – PG II
UN 2796 SULPHURIC ACID (≤ 51%) - PG II
But for a more dilute solution of PG III you would have to use the collective entry
UN 3264 CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (Sulphuric Acid) – as PG III is not covered by UN 2796

If the solutions/mixtures of named substances are so dilute as to present no hazardous properties, then not classified/subject to ADR - 2.1.2.6

Selecting the appropriate collective entry PSN

Except where present as technical impurities or additives not affecting the classification, preparations containing two or more named substances will require the use of a collective PSN e.g. a mixture of ethanol and propanol

Collective entries are also required for preparations with hazardous properties that contain no named substances from DGL

Tend to be the basis of standard exam questions!

Select from the collective entries listed at the end of each classification chapter, using the most specific entry possible (higher up the list) that reflects the physical state, chemical make up, intended use, etc.

This info can be deduced from classification codes of substances in the mixture or info provided in the exam question

Watch out for paint thinners, adhesives, pesticides, etc. where collective entries based on use are required

Include technical names (≤ 2) when SP274 or SP318 apply

Note that for pesticides use ISO common names –WHO listing

Using correct ADR references

Examiners comments on numerous exam reports

"I am a stickler that the correct route to this conclusion is demonstrated by candidates and correct set of references are shown which justify the action taken to include technical names in brackets. The process should work like this:

Determine the most suitable collective entry from Chapter 2.2 →Go to the Dangerous Goods List, Chapter 3.2 to see if Special Provision 274 applies → Look up the meaning of Special Provision in Chapter 3.3 → Go to the relevant paragraph of Chapter 3.1 which is given in SP 274."

4. Containment Systems (Part 6)

The regulations define standards of construction and testing/certification of different types of containment systems

Packages (Chapter 6.1) depending on type, may contain a maximum of 400kg or 450L of goods

Intermediate Bulk Containers / IBCs (Chapter 6.5) and **Large Packagings** (Chapter 6.6) can go up to 3,000L / $3m^3$ and are designed for mechanical handling.

A **Package** under ADR covers goods carried in packages, pressure receptacles, IBCs and large packagings. Above that carriage in **Bulk** or in **Tanks**

Packaging refers to the containment system whereas **Package** refers to the assembled dangerous goods and containment system as prepared for transport

Under IMDG Tanks are regarded as packaged goods, whereas bulk refers to transport in complete holds or tank of vessels

Packaging Certification

In general, containment systems used for dangerous goods must be tested under controlled schemes to ensure that they conform to the construction and performance requirements for the particular type of packaging

UN packaging certification is the most common system and has the advantage that it is recognised globally by all modes of transport

There are other schemes for approval of gas cylinders under the Transportable Pressure Equipment Directive; road tankers under ADR/RID approval; specialist radioactive packaging, etc.

Type-approval tests are done on samples of packaging to show that it conforms to design-type construction and performance requirements

Initial and periodic inspection of individual units may also be required for some types of packaging e.g. gas cylinders, routine leak-proof testing of packagings for liquids

Testing may be performed by the appointed Competent Authority (NSAI in Ireland), by independent test houses accredited by the CA or even by accredited in-house test labs of the packaging manufacturer

Users should always keep copies of test certificates on file, together with instructions for use

UN Certified Packaging

The UN certification mark Ⓤ must now used on all containment systems that have been certified under UN testing schemes

The mark is usually followed by an alpha-numeric code which provides important information on the type of packaging and its use e.g.

Ⓤ**4G/Y145/S/08/IRL/1234** or Ⓤ**1A1/X1.4/150/08/IRL/1235**

There is always a question on the meaning of a code

The answer can be found in 6.1 (Packages), 6.2 (pressure receptacles), 6.3 (Class 6.2), 6.5 (IBCs), 6.6 (Large Packagings)

Packaging Codes

Type Code	**Material Code**
1 Drums	A Steel
3 Jerricans	B Aluminium
4 Boxes	C Natural Wood
5 Bags	D Plywood
6 Composite	F Reconstituted Wood
0 Light gauge metal	G Fibreboard
11, 21, 31 Rigid IBC	H Plastics
13 Flexible IBC	L Textile
50 Rigid Large Packaging	M Paper multiwall
51 Flexible Large Packaging	N Metal other than steel/alu
	P Glass porcelain stoneware

PG suitability

X = I, II, <u>or</u> III

Y = II <u>or</u> III

Z = III only

<u>Drums</u>

Maximum Capacity 450L or 400kg

1 Tight head - opening < 7 cm

2 Open head/removable head

<u>Jerricans</u>

Maximum Capacity 60 L or 120 kg

<u>Boxes</u>

Maximum capacity 400 kg

Commonly used as part of combination package containing inner receptacles – a number of permutations of inner receptacles often tested – the inner receptacles are not tested on their own but as part of the combination

Manufacturers report specifies how to use and close correctly

A '**V**' box can be used with untested inners – see 6.1.5.1.7 for test requirements and <u>conditions of use</u>

Combination vs Composite Packaging

Combination Packaging

Uses two different packaging materials in combination, but the inner receptacles are intended to be separated from the outer packaging for filling or discharge

Composite Packaging

The packaging consists of two distinct materials that are not intended to be separated for filling or discharge

<u>IBCs</u>

Rigid

Composite

Flexible

<u>Large Packagings</u>

Intended for articles or inner packagings – an essential difference from IBCs

Maximum capacity 3 m^3

E.g. Some 770 L wheelie bins for clinical waste are certified as large packagings whereas other are certified as IBCs

– an advantage of large packaging certification in this instance is that periodic inspection is not required

Packaging Markings

The number after the PG code is the maximum allowable gross weight of the package in kg for solids/inner packagings or the allowable liquid density (need not be shown if <1.2)

The 'S' indicates packaging suitable for solids or inner packagings

May also be used for RID/ADR packagings for viscous liquids

The alternate marking for packagings intended for liquids is the hydraulic pressure test in kPa

The date of manufacture by year and in the case of plastic drums and jerricans and IBCs and large packaging the month must also be indicated

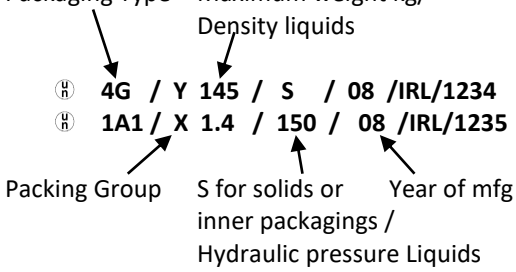
This is an important limitation as plastic drums, jerricans and IBCs have a maximum useful life of 5 years, unless a CA authorises a longer period – see ADR 4.1.1.15

When used for clinical waste this limitation does not apply as 4.1.1.15 is excluded

The country code is that of the state granting the certification, not necessarily that of the manufacturer

In some cases the code after the state may enable you to verify the certification e.g. www.vca.gov.uk database

Practical Checks using the Packaging Code



Type-approval Tests

Testing of packages as prepared for carriage & conditioned

Drop Tests on hard surface various orientations - Standard heights related to PG suitability

PG I	1.8 m
PG II	1.2 m
PG III	0.8 m
Class 6.2	9.0 m

Leakproof Tests for packagings for liquids

Check for escape of pressurised air (0.2 – 0.3 Bar) under water – like searching for a puncture in a tube

Hydraulic Pressure tests for liquid containments

Hydraulic pressure related to vapour pressure of filling liquid, but typically 100 - 250 kPa (1 – 2.5 bar)

Stacking Tests 3 m stack equivalent

24 hours minimum

28 days for load bearing plastics

Top or Bottom Lift Tests – IBCs, Large Packagings 1.25 – 6 times maximum permissible mass

Topple & Righting Tests - Flexible IBCs

Tear Tests – Flexible IBCs – check resistance to tearing after puncture with a knife

Vibration Tests - 1 hr for IBCs for liquids – no leakage

Puncture test – for Class 6.2 - impact of a steel rod with no leakage from primary receptacle

Other Tests

Leakproof testing of each production unit of receptacles for liquid using methods suitable for production lines (ADR 4.1.1.12)

Periodic Inspection of IBCs

every 2.5 years

External condition

Functioning of service equipment

Leakproof test for liquids (or solids discharged under pressure)

Every 5 years - internal condition

Maintain records & stamp IBC with inspection date

Containment systems for gases

Chapter 6.2 deals with the construction & testing of pressure receptacles, aerosols, gas cartridges and fuel cell cartridges i.e. packaged gases

Covers both UN and non-UN receptacles

Many non-UN receptacles conform to EU Directives (TPED or Aerosols) or EN standards – π-marked UN receptacles → ISO standards

6.2.1 General requirements pressure receptacles

6.2.2 UN pressure receptacles

6.2.3, 6.2.4 & 6.2.5 Non-UN pressure receptacles

6.2.6 Aerosols, Gas cartridges, fuel cell cartridges

Aerosols, gas cartridges & fuel cell cartridges (ADR 6.2.6)


Non-refillable
Maximum capacity 1000 ml (ADR)
Test pressure 10 – 20 bar
Leakage/bursting should not occur until ≥ 1.2 test pressure
Leakproof test of each filled container in hot water bath test simulating pressure at 55°C, or equivalent method
Manufactures and fillers must have a quality system
EU aerosols directive specifies additional requirements for labelling such as use of '℮' compliance mark, while an EN standard can be used for gas cartridges

Pressure Receptacles

Pressure receptacles is a collective term that includes

- Cylinders & bundles of cylinders
- Pressure drums,
- Tubes,
- Closed cryogenic receptacles,
- Metal hydride storage systems
- Salvage pressure receptacles

Pressure requirements for receptacles

Conventional Pressure Receptacles can be broadly grouped into low and high pressure receptacles
Liquefied gases more likely to be carried in low pressure receptacles whereas high pressure systems are used for compressed gases

Cylinders

Maximum capacity 150 L

<u>Low pressure cylinders</u>

(welded seams) 60 Bar
e.g. Used for household bottled gases

Butane

Propane

<u>High pressure cylinders</u>

(seamless) 200/300 Bar
e.g. Used for compressed gases


Cylinders


Cylinder Bundle

Closed cryogenic receptacles

Maximum capacity 1000 L
Insulated to maintain low temperature
Low pressure with pressure relief to slowly release pressure as gas builds up plus emergency release to prevent bursting should insulation be damaged

Metal Hydride Storage

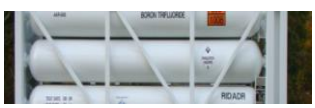
Hydrogen carriage as reversible metal hydride to increase storage capacity compared to as a compressed gas
Maximum capacity 150 L
≤ 250 Bar

Large pressure receptacles - gas equivalent of IBCs

Pressure Drums

Welded (low pressure)
150 – 1000 L

Tubes



Seamless (high pressure)
150 – 3,000 L

Construction and inspection standards

Governed by a range of technical standards for construction and inspection (ISO standards listed in 6.2.2, EN in 6.2.4)

Inspection procedures required for

- Type approval (conformance of design to type)
- Supervision of manufacture (manufacturing QA)
- Initial inspection & test (Product QC)
- Periodic inspection

Accreditation Requirements

Inspection bodies for non-UN pressure receptacles must be accredited to **EN ISO/IEC 17020** - General Criteria for the operation of various types of bodies performing inspection

The accreditation system may also be applied to UN pressure receptacle inspections

The detailed requirements for inspection bodies and the procedures for operating inspection systems are set out in Chapter 1.8.6 and 1.8.7

Irish National Accreditation Board (INAB) is the Irish CA

To date it has issued accreditations to BOC and Aviva

Types of Inspection Body

Type A inspection body (= Notified Body under EU TPED) required for Type Approval (design approval)

Type A or an In-house inspection body under the surveillance of a Type A body required for supervision of manufacture & initial inspection & test

Type B inspection body is sufficient for periodic inspection of their own cylinders

BOC are accredited by INAB as a type B inspection body

Carriage in Tanks

General construction requirements

- Resistance to forces – twice gross mass in direction of travel and downwards, gross mass at right angles to travel and upwards
- Construction & Approval: - UN or ADR systems
- Specifies engineering design principles, material properties, protection of service equipment, etc.
- Use of EN standards for ADR tanks

General Tank Variations

- Bottom or top filling
- Valve closures 2 or 3 closures
- Pressure specifications ↔ thickness of shell
- Tank linings
- Pressure relief devices

Chapter 6.7 UN Portable Tanks & MEGCs

Multimodal (acceptable for road, rail, inland waterway & all sea journeys worldwide)

Usually with outer frame to enable them to be handled and stacked as containers in accordance with Convention on Safe Containers (CSC) standards

Chapter 6.7 details requirements for construction and test in four separate sections

Tank Container 

Multiple Element Gas Container (MEGC) 

UN Construction & Inspection Requirements

Chapter 6.7.2 Tanks for Class 1 & 3 – 9. i.e. except gas

Chapter 6.7.3 Tanks for non-refrigerated liquefied gases

- Tank codeT50 identifies specific gases and MAWP

Chapter 6.7.4 Refrigerated liquefied gas T75

Chapter 6.7.5 MEGC for compressed gas

N.B. Identify relevant section for referencing inspection intervals, tank plate markings, etc.

Chapter 6.8 - ADR Tanks & Other Containments

Containments fixed or unloaded only when empty	Containments loaded/unloaded full from the vehicle
Fixed Tanks	**Tank containers** – non-UN (e.g. transferred between

Typical ADR Road Tanker **Demountable tanks** (lift on or off a vehicle only when empty) **Battery vehicles**  Cylinders, tubes, or pressure drums for gases permanently fixed to the vehicle	road and rail, but can only go on board a ship on a vehicle) **Tank Swap bodies** – can be loaded/unloaded from vehicle using vehicle equipment (similar to a skip), can not be stacked **Non-UN Multiple Element Gas Containers** (MEGCs) 
Specific requirements – left hand column Inspections every 3 & 6 years. Battery vehicle; 5 years	Specific requirements in right hand column Inspections every 2.5 & 5 years. MEGC; 5 years

Minimum Shell Thickness ADR Mild Steel Tanks

Standard (ADR 6.8.2.1.18): 5 mm if ≤ 1.8 m diameter 6 mm > 1.8 m

Reduced (ADR 6.8.2.1.19) if impact & rollover protected via stiffening rings or surge plates

3 mm if ≤ 1.8 m diameter 4 mm > 1.8 m

Formulae provided to adjust for other metals

Reduced values may not be applied to Vacuum operated tanks of Chapter 6.10

Pressure dependent calculations in 6.8.2.1.17 can require a higher minimum thickness

ADR Tank Special Provisions in Chapter 6.8

TC - Construction

TE – Equipment

TA – Approval

TT - Testing

TM - Marking

Inspections & Plate Markings

Each tank must bear a plate displaying specified info on the tank e.g. Tank code, pressures, capacities, approval markings

Gas tanks fitted with safety valves must now also be marked with SV plates SV

All reusable containment systems are subject to intermediate & periodic inspections – 3 & 6 years fixed tanks or tanks only handled when empty, 2.5 & 5 years for tanks handled when full (portable tanks)

A Full tank inspection (periodic 5/6 year) must include a hydraulic pressure test for liquids

ADR Gas tank inspection bodies must be accredited the same as for pressure receptacles – see TT9

Inspection dates must be stamped on plates (accompanied by P = periodic or L = intermediate on ADR tanks)

S denotes a tank divided into sections ≤ 7,500 L to minimise surges

Tank record – a full history file of all approval, repair and inspection certificates over the lifetime of the tank that must be maintained by the owner

Chapter 6.9 - UN Portable Fibre Reinforced Plastic tanks & Chapter 6.13 Fixed Fibre Reinforced Plastic tanks

- 3-layer construction using fibreglass and resins
- Particular requirements as regard tensile strength and stretch / deformation resistance
- Reference to Chapter 6.7 and 6.8 for periodic inspections, marking and some construction requirements
- May only be used for
  - Class 3, 5.1, 6.1, 6.2, 8 or 9
  - Substances permitted in metallic tanks - tank code shown in column 10 (UN) or 12 (ADR)of DGL
  - Vapour pressure 50°C ≤ 1.1 bar
  - Calculation pressure requirement in tank code ≤ 4 Bar

Chapter 6.10 - Vacuum operated waste tanks

Based on 6.8 with some additional requirements

Calculation pressure 1.3 times fill/discharge pressure with minimum of 4 bar

Withstand vacuum of 1 bar

May include ends that open and internal piston to facilitate cleaning

Only for

class 3, 4.1, 5.1, 6.2, 8 or 9

substances permitted in L4BH or lower hierarchy tank with bottom openings

Chapter 6.11 - Bulk containers

For carriage of solids in bulk

BK1 = sheeted bulk container with an open top covered by non rigid material (canvas)

BK2 = closed bulk container consisting of rigid sides roof and floor – roof or end/sides may open

Examples: tarmac lorries, skips

Can have hopper bases

Sift proof openings

BK3 = Flexible Bulk Containers

Capacity ≤ 15 m3 14 Ton

Drop Test = 0.8m PG III only

Shelf life 2 years from DOM

Applicable to 13 UN numbers including UN 3077

Carried in CTUs with 2/3 rigid side

By Sea in cargo hold, not in CTU

Chapter 6.12 - Mobile Explosive Manufacturing Units (MEMUs)

Used to transport Class 5.1 (ammonium nitrite) and Class 3 (kerosene) in separate tanks and mix on site to form explosive material

Also includes pumps and compartment for detonators, etc.

Tanks shall conform to Chapter 6.8 with some exceptions depending on size

Solid compartments to BK2 requirements

Containment Systems Key Points

Be able to explain packaging codes

Watch out for the “special” code letters (6.1.2.4 & 6.3.3.2)

V = combination packaging for use with untested inners

U = class 6.2 packaging for untested primary receptacles

T = Salvage packaging

W = equivalent packaging manufactured to a different spec

Be familiar with performance tests, particularly drop heights

Be familiar with periodic test requirements (frequency & tests) as applicable to IBCs, tanks and reusable gas cylinders

Be familiar with tank plate markings

Watch out for the ‘special’ code letters for ADR tanks

S = surge plates/compartments ≤ 7,500 L

P = periodic inspections that require a hydraulic pressure test

L = intermediate inspections that only require a leakproof test

Be familiar with markings on pressure receptacles/gas cylinders UN and non-UN

Be familiar with the use of the standards for construction and testing of containment systems – EN or ISO

Be familiar with the accreditation requirements for manufacture and inspection of pressure receptacles and gas tanks under EU schemes (TPED)

Reference from the relevant section for the containment in question

5. Selection & Use of Containment systems

Identification of requirements for a consignment
The dangerous goods list in Chapter 3.2 is the starting point
First check the Special Provisions in Column 6, then go to Chapter 3.3 to see their meaning – start of Volume II
SP numbers < 500 are common with other modes, > 500 ADR only
SPs can provide clarifications, extra conditions or exemptions e.g. see UN 3480 – 3481 – 3090 - 3091, UN 1293 - 1851 – 3248 – 3249 , 3077 - 3082
Identification of Suitable Containment Systems
DGN List shows
- **Packaging Instruction** in Column 8
  P, IBC, LP or R codes as applicable
- **Portable Tank & Bulk Container Instructions** in Column 10 – T, BK or (M)
- **ADR Tank instructions** Column 12
- **Bulk transport** may also be allowed according to a VC code in Column 17

The use of containment systems is also governed by respective special provisions
- PP, MP, TP, TU/TC/TE/TA/TT/TM, AP codes
- The column headers show where to find the actual instruction or special provision

Part 4 contains detail on use of containments
4.1 Packages, IBCs,LPs
4.2 UN Portable Tanks & MEGCs
4.3 ADR tanks etc.
4.4 Fibre reinforced tanks
4.5 Waste tanks
4.7 MEMUs

General Packaging Requirements 4.1.1 - 4.1.3
4.1.1.1 Good quality, properly closed, no residues
4.1.1.2 No dangerous reactions with packaging – Assimilation table in 4.1.1.19.6 for plastics
4.1.1.3 specifies **UN testing** requirement
4.1.1.4 Ullage and maximum degree of filling – you must allow sufficient room for expansion of the liquid (55°C)
4.1.1.5 Combination packages – inner packaging for liquids upright
4.1.1.6 Goods shall not be packed together if they react dangerously with each other – defines 4 types of dangerous reaction
4.1.1.7 No loss of liquid of wetted substances
4.1.1.8 Venting of liquids that release gas
4.1.1.9 Packages shall retain original performance capability – no defects
4.1.1.10 Pressure resistance for liquids – particularly low BP liquids
4.1.1.11 Requirements apply to un-cleaned
4.1.1.12 Leak testing of individual packagings
4.1.1.13 solids becoming liquid
4.1.1.14 sift proof for solids
4.1.1.15 Plastic Drums, Jerricans, IBCs < 5 years
Packing Instructions specify specific requirements such as type, material and maximum capacity
P001 applies to most liquids
P002 applies to most solids
P003 applies to many articles - UN approved packaging not required
P200 applies to most gases
Specific PI for some groups of goods e.g.
P520 Organic peroxides & Self Reactive Substances of Class 4.1
P620 Infectious substances Category A
P621 Clinical waste
P650 Biological substances Category B
P801 Batteries - Acid and alkali
PP special packaging provisions, if applicable, are shown in column 9a and will be found at the end of the relevant packing instruction

They can specify additional requirements or options
MP Mixed packaging provisions are shown in Column 9b and their meaning found in 4.10
Mixed packaging means inner packages of different dangerous goods in the same outer dangerous goods package
There is always an exam question involving mixed packaging
Class specific requirements come after the PIs
4.1.5 Class 1 - 4.1.6 Class 2
4.1.7 Self reactive & organic peroxides - 4.1.8 Class 6.2
4.1.9 Class 7
Packaging Instruction P200 provides information on pressure requirements for individual gases

General minimum test pressure 10 Bar
Compressed gases: working pressure shall not exceed 2/3 test pressure, unless a more restrictive limit specified
Liquefied and dissolved gasses: minimum test pressure specified for each gas

Examples of pressure requirements

Gas	Form	Test Pressure (Bar)
Butane	Liquefied	10
Propane	Liquefied	23
Chlorine	Liquefied	22
Carbon dioxide	Liquefied	190 - 250
Acetylene	Dissolved	60
Oxygen	Compressed	300
Adsorbed gases	Adsorbed	21

Time intervals for periodic inspection are specified in P200 – typically 5 or 10 years depending on gas & material

Extensions up to 15 years may be granted for some gases subject to conditions e.g. butane and propane

Note: Class specific provisions come after the PIs

Tank selection & pressures
UN Tanks

Tank codes in Chapter 4.2 define pressure, shell & openings
T1- T22 solids & liquids – generally increasing pressure rating and hierarchy - consult table for specific substitution options - 4.2.5.2.5
T 23 for temperature controlled 4.1 self reactive substances and Class 5.2 organic peroxides
Tank codeT50 identifies specific gases and MAWP for liquefied gases
T75 Refrigerated liquefied gas

To check if an alternative can be used, start with the tank specified in Table A and then consult the table in 4.2.5.2.5 to see if tank that you have can be used as an alternative

ADR Tank codes
Use four character code – see Chapter 4.3
1st character = tank type

L= liquids,
S = solids,
P = liquefied gases
R = refrigerated gases
C = compressed gas

2nd character = calculation pressure G → 21 Bar (chemical tanks) /→ 300 Bar (gas tanks)

Calculation Pressure = a theoretical design pressure based on the tensile strength of material & engineering calculations

3rd character = openings & location A, B, C or D
4th character = safety valves/devices V, F, N or H
Tables for tank hierarchies in 4.3.2.3.1.2 for gas tanks and 4.3.4.1.2 for other tanks

To check if an alternative chemical tank can be used, start with the tank that you have and find it in Table 4.3.4.1.2 and then see if the tank specified in Table A is listed among the alternatives codes that can be used with this tank.
Note: Special rule for vacuum waste tanks – "A" can be used where "B" specified 4.5.1.1.

For gas tanks find the tank specified in Table A in Table 4.3.3.1.2, see if the tank that you have is listed among the alternative, while also ensuring that the minimum test pressure for the tank that you have is equal to or greater than the minimum test pressure required for the gas to be carried.
Minimum test pressure specs for individual gases are given in 4.3.3.2.5

For compressed gases the test pressure must be > 1.5 times working pressure

Working pressure = pressure encountered during normal use
Test pressure = pressure tank subjected to during a hydraulic stress test
Calculation pressure = theoretical pressure that a tank is designed to withstand – relates to shell thickness
Calculation pressure > test pressure > working pressure

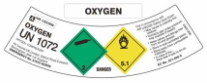
Tank Codes comparison		
Dangerous Goods	**UN Portable Tanks** (usually containers)	**ADR Road Tanks** (usually fixed)
Classes 3 - 9	T1 – T22 T23 for Class 4.1 and 5.2 temp control	S – solids L – liquids (IMO Type 4)
Liquefied gas	T50	P (IMO Type 6)
Refrigerated gas	T75	R (IMO Type 8)
Compressed gas	None – MEGCs only option	C Can be tank or battery/MEGC
IMDG Acceptability	All sea journeys	Short sea crossings carried on a vehicle (ferries)
Tank Openings Comparison		
Bottom Filling/discharge	2-closure	A 2-closure
Bottom Filling/discharge	3-Closure	B 3-closure
Top Filling/discharge	-	C Cleaning opening allowed below liquid
Top Filling/discharge	No bottom openings	D No bottom openings
Non pressurised	-	V Breather device with spill protection
Non pressurised	-	F Breather device with flame arrester
Pressurised	Spring loaded valve	N Spring loaded valve
Pressurised	Spring loaded valve + bursting disc	H Spring loaded valve + bursting disc

Use of packaging key points
Ensure adequate head space is allowed with liquids (typically 90 - 98% of capacity, depending on initial boiling point of liquid and filling temperature)
N.B. 20/80% rule for tanks with compartments > 7,500L without surge plates 4.2.1.9.6 & 4.3.2.2.4
Ensure there is a good earth connection when filling flammable materials to prevent static discharge which could cause a vapour explosion
Make sure package is closed according to manufacturer's instructions and that there are no residues of the goods remaining on the outside of the containment
Best practice is to obtain a copy of test approval certificates and manufacturer's instructions and keep on file

6. Labelling & Marking of Packages Chapter 5.2

Hazard label diamond(s)
100 x 100 mm

Banana labels allowed on class 2 cylinders



Marks (everything else is termed a mark!)
- UN Number Note dimensions!
- Proper Shipping Name (Class 1, 2, 7)
- Orientation marks liquids > 120 ml, x 2
- Environmental hazard mark > 5L/Kg
- Consignor/consignee, gross mass Class 7
- Salvage

Positioning

Labels and marking should be kept together on the same surface (note minimum UN mark dimensions – 12 or 6 mm)

For IBCs and Large Packaging greater than 450L they must be displayed on two opposite sides

Capable of withstanding open weather exposure (3 months in sea water under IMDG)

Unit Loads

Each individual package in a unit load must be marked and labelled – face outwards!

Overpacks must be marked and labelled if package labels are obscured and the word "**OVERPACK**" mark must be added in English, French or German, plus language of country of origin if different

Placarding & Marking of Containers & Vehicles

Placards:
- Same design as labels except for Class 7 and Class 9 Li battery label - minimum of 250 x 250 mm
- Containers (freight containers), MEGCs, Tank-Containers, Portable Tanks - all 4 sides
- No placarding of vehicles carrying above, unless container/tank placards not visible, then back and sides
- Bulk, Tank-vehicles, battery-vehicles, MEMUs, Demountable tanks – back and sides
- Other applicable markings such as Elevated temperature EHS/Marine Pollutant,
- Fumigation or asphyxiation risk warning s on access doors

Orange plates
- Blank plates front & rear as a minimum
- Plates with HIN and UN number on tank sides
- Oil tanks and tanks with single substance HIN and UN number front and back instead of sides

7. **Transport Document /DGN**

Consignor & **Consigne**e address
Identity of the Goods in the following order
UN Number, Proper Shipping Name, Hazard Class(es), Packing group
Number & Description of packaging/ containment system (type & material)
Total quantity DG by volume or weight
A **tunnel code** if the goods may go through a regulated tunnel e.g. The Dublin Port Tunnel
The identity of the goods should be supplemented as follows:
'**WASTE**' in front of PSN for wastes (and "waste in accordance with 2.1.3.5.5", if PSN based on main hazard)
"QUANTITY ESTIMATED IN ACCORDANCE WITH 5.4.1.1.3.2" if quantity estimated based on packaging size etc.
The statement '**ENVIRONMENTALLY HAZARDOUS**' or '**MARINE POLLUTANT**' for IMDG, if an EHS
"SALVAGE PACKAGE", where such is used
Empty un-cleaned packaging "**EMPTY PACKAGING**" plus class(es) or for different packages "**EMPTY PACKAGINGS WITH RESIDUES OF"** plus classes
Empty un- cleaned tanks: goods description preceded by "**EMPTY TANK CONTAINER, LAST LOAD**"
If tank is returned to consignor just replace total quantity by "**EMPTY UNCLEANED RETURN**"
Additional marking required for damaged tanks or tanks and IBC past inspection periods
"CARRIAGE IN ACCORDANCE WITH 1.1.4.2.1" if not fully in compliance with ADR, but with IMDG or ICAO
"HOT" for Elevated temperature substances which are not evident from PSN
Class 1: net mass per item & total net mass, plus other inscriptions depending on circumstances
Class 4.1self reactive & 5.2: **Control temperatures** and **emergency temperatures,** if applicable
Class 6.1: name and telephone No. of consignee responsible person
Language: English, French or German and language of consignor if different
Format: none specified, just legible, EDI possible
Document Retention: 3 months by consignor & carrier

Class 7 - Radioactive Material

Classification, assignment of relevant UN numbers and proper shipping names and the type of packaging that may be used is dependant upon
The level of activity (for the particular isotope)
The form of the material
fissile properties
As these properties determine the severity of risks to man and the consequences of an accident in terms of contamination of the environment

Class 7 - Relevant Properties

Special Form (2.2.7.2.3.3) indispersible solid or sealed capsule – will not contaminate if released from packaging - A_1 limits apply
Low Dispersable Radioactive Material (2.2.7.2.3.4) solid or sealed capsule with limited dispersability
Fissile isotopes (Uranium-233 & -235, Plutonium-239 &-241) – atoms split releasing energy and neutrons causing more fissions in a chain reaction with risk of uncontrolled explosion
Fissile excepted (2.2.7.2.3.5) relaxes some of the requirements for fissile material, if quantities are limited
UN Number / Package type Identification - Table 2.2.7.2.1.1
Table 2.2.7.2.2.1 lists all the radioactive isotopes by element name (with the atomic number shown in brackets after the full element name = the number of protons in the nucleus), and then by atomic mass, the number after the element symbol (e.g. Carbon-12 is the most abundant non-radioactive isotope, whereas C^{14} is a radioactive isotope that enables carbon dating)
Exempt Limits: activity concentration Bq/g & activity per consignment values above which a material is classified as radioactive e.g. C^{14} > 10,000 Bq/g and 10 million Bq/shipment
A_1(special form) and **A_2** activity values for use in determining UN number and packaging for non-exempt Class 7

Excepted Packages – exemptions from most of the requirements of Parts 5 to 7 except as detailed in 1.7.1.5
Total Activity is limited - The relationship between total activity limits for instruments, articles and materials and A_1 or A_2 values are shown in Table 2.2.7.2.4.1.2
Select relevant UN No - 2908, 2909, 2910 2911 or 3507 - See Table 2.2.7.2.1.1
Mark with UN number, consignor or consignee, permissible gross mass if >50 kg (5.1.5.4).
No labels

Transport document just show UN No., Consignor & Consignee
E.g. Ionizing smoke detectors contain Americium 241 special form
N.B. Do not confuse exempt consignments & excepted packages

Low Specific Activity (LSA) Material – Specific activity is limited
Three types - LSA I, II & III (low to high risk)
Particular materials or materials with a specific activity limit derived from the exempt shipment specific activity limit or the A_2/g – see 2.2.7.2.3.1
LSA I ≤ 30 times exempt shipment specific activity limit
LSA II ≤ 10^{-4} A_2/g solids gases, ≤ 10^{-5} A_2/g liquids
LSA III material must be solid with ≤ 2 x 10^{-3} A_2/g with negligible dispersal in water
Assign to UN Nos 2912, 3321, 3322, 3324, 3325 depending on type and fissile properties
Surface Contaminated Object (SCO-I or II) 2.2.7.2.3.2
non-radioactive solid object with surface contamination
Activity limits per cm^2 depending on radiation type and whether it can come off during routine transport (non-fixed)
UN 2913 or 3326
Industrial Packaging - General strong packaging capable of withstanding normal handling
IP-2 drop and stacking tests in 6.4
IP-3 tested as per Type A for solids in 6.4
LSA & SCO can be unpackaged or packaged in Type IP-1, IP-2 or IP-3 packages according to table 4.1.9.2.4,
Variation depending on whether under exclusive use or not

Type A Package
Total activity limited by A_1 and A_2 values
UN 2915, 3327, 3332, 3333 depending on special form ↔ non-special form and
fissile ↔ non-fissile / fissile-exempt
Specialist packaging for commercial radioactive shipments – may include shielding
Packages capable of withstanding normal handling as demonstrated by spray, drop & penetration tests in 6.4
Competent authority approval not required
Type B & C Packages
Required where activity levels exceed limits for Type A packages – nuclear industry
Designs capable of withstanding severe transport accidents requiring CA approval
Type B(U) approval of county of origin
Type B(M) multilateral approval required
Type C is the most demanding standard
Special agreement shipments
Uranium Hexafluoride

Class 7 Transport Labels
Transport Index (5.1.5.3.1): Measure mSv/hr at 1m from surface and multiply by 100 = TI (will depend on amount of radioactive material and degree of shielding)
Category I, II or III labels shall be selected based on TI and surface radiation according to Table 5.1.5.3.4
You must add isotope, activity level and TI as relevant
Apply labels on 2 sides of package
Fissile Material must also display a fissile label with the **Critical Safety Index (CSI)**
CSI is a number usually assigned to a package type as part of the approval
Vehicles carrying packages or tanks must be placarded with the radioactive placard on back and sides
Class 7 Marking
Apply marks showing
UN number and proper shipping name
Gross mass if > 50 kg
Package Markings
Type identification IP-1, IP-2, IP-3, A, B(U), B(M), C
Country of Origin & name of manufacturer for IP-3 & Type A
Identification mark of authorising CA and package serial no. for Types B & C
Embossed trefoil required for Types B & C

Transport Documentation
5.4.1.2.5
Name or symbol of each radionuclide
Description of physical & chemical form
Maximum activity (Bq)
Package Category
TI & CSI if applicable
Identification marks for CA approvals
Statement of Exclusive Use Shipment if applicable
Information on loading stowage, routing emergency procedures
Table 5.1.5.5 summarises approval and notification requirements

8. Part 7 Carriage, Loading, Unloading, Handling

Chapter 7.1 General provisions and Temperature Control requirements
Chapter 7.2 - V provisions for packages
V2 establishes requirement for Ex vehicles ↔ Class 1
Chapter 7.3 – Carriage in bulk under BK or VC codes
7.3.2.6 class 6.2 in bulk in BK containers
VA provisions provide additional requirements for carriage according to VC codes
Chapter 7.4 Tank vehicle hierarchy FL>OX>AT
7.5.2 Mixed loading prohibition charts
Essentially explosive hazards not with other classes
7.5.4 Precautions re foodstuffs and 6.1 & 6.2 - CV28
7.5.5 Limitations on quantities table for explosives on Ex, Limits for MEMUs
7.5.6 Handling & Stowage – secure, no opening of packages
7.5.8 Cleaning after unloading
7.5.9 No smoking
7.5.10 Earthing before loading unloading flammable gases liquids
CV special provisions
CV 33 limitations and distances to protect workers and materials from radioactivity based on TI plus CSI limits for fissile material

9. Vehicle crew & Equipment

Chapter 8.1 Documentation & Equipment
8.1.2 Documentation requirements
Always require Transport Document, IIW, Photographic ID
May require vehicle cert, driver ADR license, CA approvals
8.1.4 Fire Extinguishers
≤ 3.5 Ton gross mass 4 kg – 2 x 2 kg
3.5- 7.5 Ton gross mass 8 kg - 1 x 2 kg & 1 x 6 kg
>7.5 Ton gross mass 12 kg – 2 x 6 kg or 1 x 3 & 1 x 9 kg
Easily accessible, protected from weather, seal in place, inspected according to national standards (annually), label show date of next inspection
8.1.5 Equipment
Wheel chock(s), warning signs, eye wash, hivis vest, torch, gloves, goggles + mask, shovel, drain seal & container vs class
Part 8 Other vehicle crew and operation requirements
Chapter 8.2 Driver training courses and approval
Chapter 8.3
No passengers
No smoking - includes E cigarettes
Running engine during loading/unloading
Parking brake
Non metal torch
No opening of packages
Fire extinguisher training
Chapter 8.4 Supervision of vehicles
In conjunction with S1 and S14 – S24
Chapter 8.5 Special provisions

10. Part 9 Vehicle Requirements

Vehicle types

EX/II & EX/III for class 1
FL for tanks, MEGCs, battery vehicles for flammable liquids & gases
AT for tanks, MEGCs & battery vehicles for other classes

Type Approval – declaration by manufacturer or initial inspection by CA
Annual Inspections – RSA as CA oversees vehicle test centres and issues Vehicle Certificates
Requirements: Wiring, battery master switch (EX & FL), Braking antilock and endurance, Fire prevention, fuel tanks, combustion heaters, Speed limitation, Trailer coupling

11. ADR Exemptions

Exemptions in 1.1.3

Private individuals with limits of 60 /240 L for fuels
Ancillary transport supporting main activity < 450 L
Emergency response
Movement of uncleaned static tanks
Gases for propulsion, foodstuffs, sports balls
Fuels for vehicle propulsion
Nulify hazards of empty uncleaned packaging

Load Thresholds for packaged goods 1.1.3.6.3

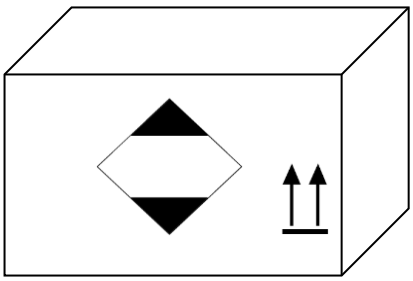
20, 333, 1000 kg/L per load as per transport category
No placards, orange plates, IIW, Hazchem driver, equipment other than a 2kg fire extinguisher or vehicle requirements

1.1.4 **US DOT Cylinders** imported or exported to non-ADR participants

Limited Quantities (Ch. 3.4)

Less risk for goods packaged in small quantities
Combination packaging or shrink-wrapped trays not requiring UN approval, but references general construction requirements in Part 6
Limits on quantities per inner package (up to 5L/kg, specific limit shown in 7a)
Package gross weight not more than 30 kg (20 kg trays)
Mark with new LQ mark from Jan 2011
(do not add the UN number)
Other marking such as orientation marks for liquids still applicable
No Documentation required under ADR – hence widely used for distribution of consumer goods – aerosols, firelighters, bleaches, etc.
Carrier must be informed in a traceable manner (text) of the gross mass of LQ because
Transport units of unladen mass > 12 Ton and carrying > 8 ton of LQ must display LQ placards front and rear of the transport unit, unless orange plates are required due to other DG

Limited Quantity Marking
Flammable Liquids Example



Surface (ADR, IMDG)

Excepted Quantities (Ch.3.5)

Even smaller quantities per inner package – max 30 g/ml (secure closures) determine from E codes Column 7b
Outer package may only contain a max of 1000 ml/g of dangerous goods – no limit on package weight.
Package must be capable of passing a 1.8 m drop test and a 3 m stacking test

Intermediate packaging containing cushioning material (and adsorbant for liquids)
No dangerous goods declaration except for IMDG
Special marking
Show primary class
Consignor Consignee
No marking required in the case of very small subset of “de minimus” quantities

Lithium Battery Exemptions
SP 188 provides for a lot of exemptions for shipping “small consumer type” Li batteries on their own or packed with or in equipment
Small means Cells ≤ 1g Li or 20 Wh; Batteries ≤ 2g Li or 100 Wh
Appropriate strong packaging, non UN-certified, capable of passing a 1.2m drop test
Protect from short circuit / inadvertent activation.
30 kg package limit, if shipping batteries only
Mark with Li battery handling mark
with UN No added.
No making of ≤ 2 batteries in equipment & ≤ 2 packages
No documentation

12. Duties of participants

Duties of Consignor 1.4.2.1
Ascertain that good are **classified** & authorised for carriage
Furnish necessary **documentation** for carrier
Use the appropriate **containment** system
Comply with requirements on **means of dispatch** (use appropriate carriers) and any forwarding restrictions
Mark and **label**
Can rely on others - if for example operating in a distribution chain

Duties of Carrier 1.4.2.2
Check that the goods are authorised for carriage
Check that information on the consignment is available and that required documentation is on board the transport unit
Check that vehicle and loads have no defects
Check that tanks, IBC etc are within inspection dates
Verify that vehicles are not overloaded
Ensure that vehicle danger labels and marking are displayed
Ensure necessary equipment is on board
Response to problem during carriage – stop ASAP

Other Participants
Consignee
Must accept the goods unless compelling reason
Loader
Only hand over goods authorised for carriage
Not load damaged packages
Comply with any special loading or handling requirements
Placard containers
Comply with mixed packaging taking into account goods already in the vehicle e.g. food & feeds

Duties of Filler
Check tank and equipment prior to filling
Check that the containment is within inspection
Check that the tank is suitable for the goods
Only fill to maximum degree of filling
Check leakproofness and closing devices
Ensure that no dangerous residue remains on outside

Ensure that orange plates and placards are displayed

Duties of Unloader
Ascertain that the correct goods are unloaded
Check that containment system is not damaged
Comply with unloading requirements
Remove dangerous residues
Ensure closure of valves and openings
Ensure prescribed cleaning/decontamination is carried out
Finally remove all placards and markings

13. Operational Requirements

Training
Carriage of goods by road above load thresholds requires the appointment of a certified DGSA and the use of certified HazChem trained drivers
- Training Certificates are issued by the Competent Authorities on passing official examinations

ADR 1.3 requires that all participants should have general awareness, safety and function specific training
- Training records (certificates of attendance) shall be maintained and made available to CA or personnel
- No official involvement in training or certification

Tunnel Restrictions
Chapter 1.9 defines the types of goods that are restricted in different category tunnels i.e. definitions of tunnel types
Category A no restrictions
Category B restriction of DG lead to very large explosion
Category C restriction of DG lead to a very large explosion, a large explosion or a large toxic release
Category D restriction of DG lead to a very large explosion, a large explosion, a large toxic release or a large fire
Category E restriction of all DG other than a few UN numbers

Tunnel codes, if applicable, are shown in Column 15 of the DGL
Where there are two tunnel codes e.g.(B/C) the first is for tanks or for explosives above the indicated threshold.
Table 8.6.4 explains what category tunnels goods with a particular tunnel code are excluded from i.e. practical info for the driver

High Consequence Dangerous Goods
Certain high consequence dangerous goods such as petrol in tanks, ammonium nitrate fertilisers and high risk infectious substances (Anthrax) have been used by terrorists
Security plans and training are required for those handling high consequence dangerous goods

14. National Legislation

Currently SI No 349 of 2011 which has been amended by SI 238 of 2013, SI 31 & SI 288 of 2015, SI 5, SI 282 & SI 555 of 2017 SI 197 of 2018, SI 277 of 2019 & SI 197 of 2023 gives legal effect to ADR 2023 and the EU directive.

Establishes competent authorities

- HSA - for all classes except Class 1 and Class 7 plus driver and ADR exams
- Department of Justice for Class 1
- Environmental Protection Agency (EPA) for Class 7 (RPII subsumed into EPA)
- RSA for ADR vehicle inspections and training/ authorisation of inspectors
- NSAI for UN packaging approvals
- INAB for accreditation of inspection bodies that need accreditation – gas tanks and cylinders and ADR tank inspections – INAB is now part of HSA
- NRA for tunnel restriction designations

Defines general duties
Establishes powers of enforcement/inspectors and penalties
Enforcement actions ranging from Directions for an Improvement Plan, issuing of a Contravention Notice, a Prohibition Notice, application to the High Court on foot of Contravention of a Prohibition Notice, Arrest without warrant if uncertain of identity/flight risk, summary conviction = class A fine, conviction on indictment up to €0.5m
Three grades of on-the-spot fines in lieu of prosecution Grade III = €100, II = €250 and I = €500 – list of categorised offences and liable participants

Exemptions
Definition of a road vehicle exempts agricultural tractors and forestry vehicles
Defence forces exempt

National Transport Exemptions
Crossing the public road between adjacent premises exempt and loading unloading on public road to warehouse
Road vehicles without anti-lock or endurance brakes registered before 1 April 2002
Tank vehicles fitted with National (old) tanks
All get a vehicle approval certificate for national transport only
National tanks = tanks constructed before 1 July 2003 (or MEMU before 1 July 2009)
ADR tanks that are not hydraulic pressure tested as required every 6 years were also treated as old tanks and thus only national transport approval certificates were issued - have to be tested to full ADR over coming years
Gas receptacles constructed before 1 July 2003
Retail deliveries of oil does not require consignor on transport document
Flexible hose reels do not have to be empty for UN 1011, 1202, 1223, 1863, 1965 or 1978
CA approval according to CV 1 not required
No transport document for pesticides of Class 3 and Class 6.1 if below load thresholds
Transport of expired distress signals to a military barracks documentation and labelling exemptions provided marked 'Time Expired Pyrotechnics'
Transport of bulk ammonium nitrate fertilizer, one transport document for repeat loads, no intermediate cleaning
Dispensing gases carried with beverages
Final distribution of inners of LQ packages

Enforcement options
Request an Improvement Plan
Issue a Contravention Notice if improvement plan is not satisfactory
Issue a Prohibition Notice where there is immediate risk
Apply to the high Court in cases of Contravention of a Prohibition Notice

For Standard offences can issue a court summons which can result in a Class A fine, but the preferred option is to issue an On-the-spot fines in lieu of prosecution

I €500
II €250
III €100

High court convictions can carry penalties up to €500,000 or 3 years jail.