TRANSPORT OF DANGEROUS SUBSTANCES

Carrying goods by road or rail involves the risk of traffic accidents. If the goods carried are dangerous, there is also the risk of an incident, such as spillage of the goods, leading to hazards such as fire, explosion, chemical burn or environmental damage. Most goods are not considered sufficiently dangerous to require special precautions during carriage. Some goods, however, have properties which mean they are potentially dangerous if carried.

Dangerous goods are liquid or solid substances and articles containing them that have been tested and assessed against internationally-agreed criteria (a process called classification) and found to be potentially dangerous (hazardous) when carried. Dangerous goods are assigned to the following different classes depending on their predominant hazard:

1. Explosive substances and articles
2. Gases
3. Flammable liquids
4.1. Flammable solids, self-reactive substances and solid desensitized explosives
4.2. Substances liable to spontaneous combustion
4.3. Substances which, in contact with water, emit flammable gases
5.1. Oxidizing substances
5.2. Organic peroxides
6.1. Toxic substances
6.2. Infectious substances
7. Radioactive material
8. Corrosive substances
9. Miscellaneous dangerous substances and articles

There are regulations to deal with the carriage of dangerous goods which are discussed briefly below. Their purpose is to protect everyone either directly involved (such as consignors or carriers), or who might become involved (such as members of the emergency services and public). Regulations place duties upon everyone involved in the carriage of dangerous goods to ensure that they know what they have to do to minimise the risk of incidents and guarantee an effective response.

Carriage of dangerous goods by road or rail is regulated internationally by agreements and European Directives, with biennial updates of the Directives to take account of technological advances. New safety requirements are implemented by Member States via domestic regulations which, for Great Britain, directly reference the technical agreements.

The Basic Regulatory Framework

The transport of dangerous substances is a highly complex and specialised area. Consequently it is sufficient for the purposes of this course simply to be familiar with the broad regulatory framework and the key requirements to minimise the associated risks. Transport of dangerous
substances may involve transport across national boundaries and therefore is heavily regulated by legally enforced international agreements such as:

- ADR – for European Road Transport
- IMDG – for Sea transport
- ADN – for European inland waterways
- RID – for European Rail Transport
- ICAO/IATA – for Air Transport

There are also special rules for the Channel tunnel.

The current UK regulatory system references an international agreement known as “ADR” (the letters taken as an abbreviation of the French title for the document). ADR is a very extensive and detailed tome covering all the conceptual and operational requirements for European road transport of dangerous goods. It is normally updated on a 2-year cycle. The UK has certain exemptions, extensions and modifications but the bulk of ADR is enforced “as is”.

Road Transport within the UK is now mainly controlled under the **Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009** (The “Carriage Regs”). These regulations basically reference ADR but have some slight UK-specific modifications. Their enforcement is mainly the responsibility of the HSE but some responsibility may fall on the Department for Transport, the Office of Rail Regulation or the police.

ADR

The European Agreement concerning the International Carriage of Dangerous Goods by Road is referred to by the abbreviation ADR. The current version of the Agreement contains a key article, the second, which say that apart from some excessively dangerous goods, other dangerous goods may be carried internationally in road vehicles subject to compliance with:

- The conditions laid down in Annex A for the goods in question, in particular as regards their packaging and labelling; and
- The conditions laid down in Annex B, in particular as regards the construction, equipment and operation of the vehicle carrying the goods in question.

Annexes A and B have been regularly amended and updated since the entry into force of ADR, so it is important to use a current copy.

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009

These regulations control the carriage of dangerous goods by road and rail in Great Britain and also, in so far as it relates to safety advisers, regulate the carriage of dangerous goods by inland waterway. The United Kingdom is required to apply the provisions of ADR and RID to national transport within its territory because EC Directives require ADR and RID to be applied (although the UK, like other member States of the European Community, is permitted to modify in certain ways how ADR and RID are applied within its territory.)

The key areas to briefly note in the regulations are:

**Requirements of ADR and RID** which address issues such as:

- training requirements
• compliance with safety obligations
• special requirements relating to the carriage of class 7 (radioactive) goods
• appointment of Dangerous Goods Safety Advisers
• reporting accidents or incidents
• security provisions
• requirements relating to the construction and testing of packaging, receptacles and containers
• carriage, loading, unloading and handling
• vehicle crew training equipment, operation and documentation
• construction and approval of vehicles.

Requirements in addition to ADR and RID which include:
• additional security requirement for carriage of class 1 (explosive) goods by road
• keeping of consignment information
• alternative placarding, marks and plate markings for carriage within Great Britain.

Transportable Pressure Equipment which specifies:
• design and manufacturing standards
• requirements for periodic inspection.

Key Safety Principles in Loading and Unloading of Tankers and Tank Containers

We are all familiar with the sight of tankers on our roads – typically carrying petrol. Tankers are sometimes referred to as 'fixed tanks' or road tank vehicles; the tank is permanently fixed to the vehicle chassis. Tank containers (sometimes called 'ISO tanks' or 'portable tanks'), are held in boxed-steel framework. The framework is locked to the vehicle chassis but can be unloaded from the vehicle – this is particularly suited to transfer of tanks between say road vehicle and train, or road vehicle and ship.

Drivers of tankers must be fully informed of dangers of the materials carried and the emergency action that needs to be taken. The TRansport EMergency card (TREM card) is a four-page instruction which, amongst other things, describes the nature of the hazardous load and action to be taken in an emergency. The TREM card must be kept in the vehicle cab so that it can be easily located by the emergency services in the event of an accident. The driver and the recipient of materials should have written procedures that set out the precautions that need to be taken during loading and unloading. Fire extinguishers should be carried on all vehicles. If substances are flammable or explosive, earth connections should be used during loading and unloading to prevent the possibility of a static spark, and no other sources of ignition, such as smoking materials should be allowed in the vicinity.

Where bulk storage tanks are used for different substances, there is always the possibility of cross contamination – a substance being unloaded from a tanker into the wrong bulk tank at a factory. This can be prevented by strict operating procedures and the use of couplings of a different design for each substance. It is also important to ensure that tanks to be filled have enough space so as to prevent spillage through overfilling.
Placarding and Marking of Vehicles and Packaging of Substances

As part of the regulatory system that controls transportation of dangerous goods in the UK, there is a requirement that vehicles are placarded and marked. ‘Placarding’ is simply the display of large hazard warning diamonds (which contain graphics communicating the hazardous nature of the load). ‘Marking’ is the display of orange reflectorised rectangular plates. The exact nature of these depends on the type of the vehicle and the type/amount of the load. For tanks and tankers, additional information is required to be displayed and so a modified marking system is used; for UK national transport (rather than international) it is permissible to use a variation, commonly called a “HazChem” panel. Here’s an example of such information on a tanker:

![Hazchem Panel Diagram]

The emergency action code (or “HazChem” code) gives advice to the fire authority on action to take. Both that and the United Nations (UN) number are specific to the substance (or type of substance) being carried. The box in the lower right hand corner is usually used to identify the company consigning the load. The telephone number is used to contact them in an emergency.

When dangerous goods are transported in packages (rather than in tankers), the package needs to be labelled and marked indicating the hazardous nature of the contents. Generally, this means at least a hazard warning diamond (smaller versions of the placards mentioned above) and UN number (preceded by the letters “UN” as in the example below (which also shows a handling label)):
Example of a UN Type-Approved Design

Additionally, the packaging itself must be of a UN type-approved design. This means that it has been tested and certified and marked as such. The UN specify a whole range of tests that such packaging should undergo (stacking, impact, internal pressurisation, etc.).

Every package having passed the UN approval procedure may carry the “UN” approval symbol (a “u” over an “n” within a circle); this symbol is followed by a code which indicates such things as the standard type of packaging, its performance, approving body and so on (as shown below):

Example of a UN Approval Symbol

Driver Training and the Role of Dangerous Goods Safety Adviser

As mentioned previously, the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 reinforce the ADR requirement (in Chapter 8.2) for drivers of vehicles carrying dangerous goods to attend a vocational course of instruction and sit an externally assessed examination - for the classes of goods carried (as usual there are some exemptions for small quantities). This gives them a certificate of competency, which is required to be updated at specific intervals.
The regulations also (via Chapter 1.8.3 of ADR) require the appointment of a qualified safety adviser or advisers (usually referred to as a Dangerous Goods Safety Adviser or DGSA). The DGSA must hold a vocational training certificate which covers the modes of transport used and the classes of dangerous goods transported by the employer.

The main duties of the safety adviser are:

- Monitor legal compliance requirements on the transport of dangerous goods.
- Ensure that an annual report is prepared on the activities of the employer which concern the transport of dangerous goods.
- Provide advice to the employer on the transport of dangerous goods.
- Monitor the employer's arrangements for:
  - Identification of dangerous goods.
  - Requirements for transport vehicle purchase.
  - Checking transport equipment.
  - Training employees.
  - Implementing emergency procedures.
  - Investigation and preparation of reports on serious accidents.
  - Implementation of remedial action following an accident.
  - Ensuring compliance with regulations when choosing and using sub-contractors or third parties.
  - Verification that employees involved in carriage, loading etc of dangerous goods have detailed procedures and instructions.
  - Introduction of measures to increase risk awareness in relation to dangerous goods activities.
  - Implementation of verification procedures to ensure necessary documents and emergency equipment are present on board vehicles.
  - Implementation of verification procedures to ensure compliance with requirements concerning loading/unloading.
  - Existence of a security plan.

The safety adviser must also ensure that a report is prepared on any accident affecting health and safety that occurs during the transport of dangerous goods.
Revision Question

13. How can unloading of a substance from a tanker into the wrong storage tank be prevented?

(Suggested Answer is at the end of Element C4.)