3 DANGEROUS GOODS CLASSIFICATIONS

This chapter provides the principles of dangerous goods classifications, the classes of dangerous goods, the dangerous goods restricted from transport without special treatment processes as well as economic activities related to hazardous materials and their management and control in the Emirate.

3.1 General

The dangerous goods classification is the most important step in the transport chain. In order to determine the safe transportation of dangerous goods, it is imperative to first determine the hazard classes as different dangerous goods require different measures to ensure that they are transported safely.

Commonly, the original manufacturer or supplier affords the dangerous goods classification through providing the classification information on proper labels, safety data sheets and transport documentation. In some circumstances, the consignor of dangerous goods could have a legal responsibility to classify substances or articles that may pose a danger because of the nature of the substance or article (e.g., mixing flammable paints or inks, manufacturing corrosive detergents as well as wastes like asbestos, batteries, or industrial effluent) for safe transport. In all cases, it is recommended to seek advice from a dangerous goods safety adviser when carrying out such classification.

It is worth mentioning that the legal responsibility to classify dangerous goods does not apply to logistics companies, freight forwarders, couriers, etc.

3.2 Principles of Classification

The dangerous goods classification is necessary to provide appropriate information to those involved in carriage (transport), the emergency services and responders, and end-users including those at work and consumers, and to ensure that goods are safely packaged.

The classification is determined by the type of risk involved to health, safety, property or the environment. The classification criteria for the carriage of dangerous goods by road are provided in the ADR (Volume 1, Part 2, Chapter 2), and, where required, further classification criteria are set out in the associated UN Manual of Tests and Criteria. These documents facilitate the classification of any substance, mixture, or article, including wastes. The dangerous goods has been classified into nine main hazard calssifications groups, some of which are subdivided, thus providing a total of thirteen classes, as set out in Figure 3.1, with a corresponding class or hazard label.

1. Explosive substances

2. Gases

3. Flammable liquids

4.1 Flammable solids

4.2 Substances liable to spontaneous combustion

4.3 Substances when in contact with water emit flammable gases

5.1. Oxidising substances

5.2 Organic peroxides

6.1 Toxic

6.2 Infectious

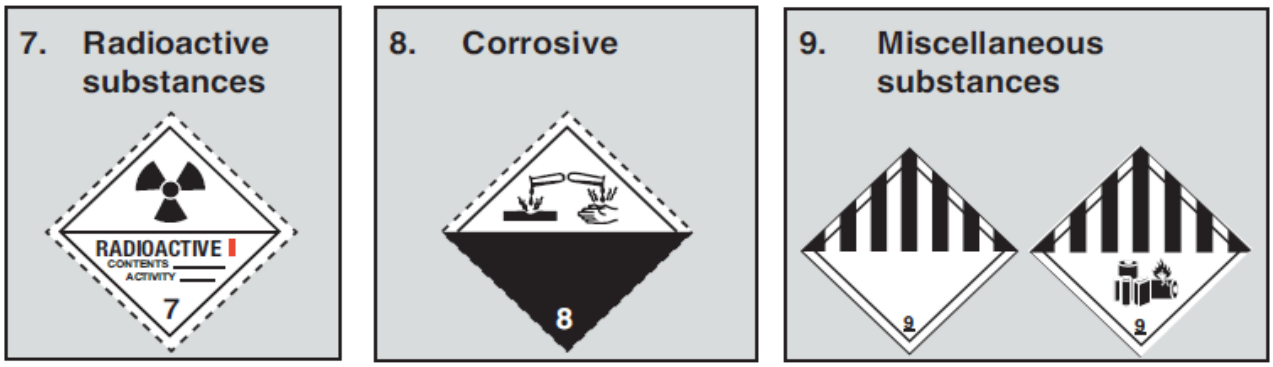

Figure 3-1: Dangerous Goods Classifications

The nine main hazard classification groups cover thousands of individual substances. Each individual substance or group of substances is given a unique number known as the "UN" number, (United Nations number). The objective of the UN definitions is to indicate which goods are dangerous and in which class, according to their specific characteristics, they should be included and not response to the degree of danger. These definitions have been devised to provide a common pattern which should prove possible to follow in the various national and international regulations.

UN numbers are four-digit numbers that identify dangerous goods, hazardous substances and articles (such as explosives, flammable liquids, toxic substances, etc.) in the framework of international transport.They are assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods. It is worth mentioning that some dangerous substances have their own UN numbers (e.g. acrylamide has UN 2074), while sometimes groups of chemicals or products with similar properties receive a common UN number (e.g. flammable liquids, not otherwise specified, have UN 1993). A chemical in its solid state may receive a different UN number than the liquid phase if their hazardous properties differ significantly and substances with different levels of purity (or concentration in solution) may also receive different UN numbers.

For example, petrol is a flammable liquid, "Class 3" and is assigned the unique UN number: UN 1203.

Substances are further categorised according to how dangerous they are by designating a "packing group" or "**PG**" as indicated in Table 3-1.

Packing Group	Description
PG I	High Danger
PG II	Medium Danger
PG III	Low Danger

Table 3-1: Dangerous Goods Packing Groups

For example, petrol is a flammable liquid and based on its properties (i.e. the flash point), petrol is allocated to PG II.

For transport, all dangerous goods must be identified correctly, and this information must be presented in a certain way (see clause 10.3). The entry on the transport document for petrol is as follows:

“UN1203, Petrol, 3, PG II” (the letters “PG” may be omitted)

For substances that have more than one dangerous property, additional hazard class (secondary hazard class) is added to the identification line in brackets after the primary hazard class”. For example,

“UN1230, Methanol, 3(6.1), PG II” i.e., a Class 3, flammable liquid with a secondary hazard, Class 6.1, toxic.

All substances must be classified prior to transportation by road or any other mode of transport. If shipping goods by air, sea, road or rail the appropriate modal classification requirements must be applied for each mode of transport and expert advice should be sought.

Note: The substances and articles are listed in tabular form namely “Dangerous Goods List - Table A” in ADR, Volume 1, Part 3, Chapter 3.2 which consists of 20 columns. Each column is dedicated to a specific subject (such as UN, class, PG, etc.) as indicated in the explanatory notes below the table. The intersection of columns and rows (cell) contains information concerning the subject treated in that column, for the substance(s) or article(s) of that row. The Table A format and explanatory notes below the table are shown in Appendix A.

3.3 Classes of Dangerous Goods

The dangerous goods nine classes are as follows:

3.3.1 Class 1 - Explosives

Explosives are materials or items which have the ability to rapidly conflagrate or detonate as a consequence of chemical reaction which produces gases at temperatures, pressures and speeds as to cause catastrophic damage through force and/or of producing otherwise hazardous amounts of heat, light, sound, gas or smoke.

The explosives substances could be divided into the followings six subdivisions as follows:

Division 1.1: Substances and articles which have a mass explosion hazard.

Division 1.2: Substances and articles which have a projection hazard but not a mass explosion hazard.

Division 1.3: Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both.

Division 1.4: Substances and articles which present no significant hazard, only a small hazard in the event of ignition or initiation during transport with any effects largely confined to the package

Division 1.5: Very insensitive substances which have a mass explosion hazard

Division 1.6: Extremely insensitive articles which do not have a mass explosion hazard

Examples of commonly transported explosives are
Ammunition/Cartridges, Fireworks/pyrotechnics, Flares, blasting caps/detonators, Fuse, Primers, Explosive charges (blasting, demolition etc), Detonating cord, Air bag inflators, Igniters, Rockets, TNT / TNT compositions, RDX / RDX compositions, PETN / PETN compositions.

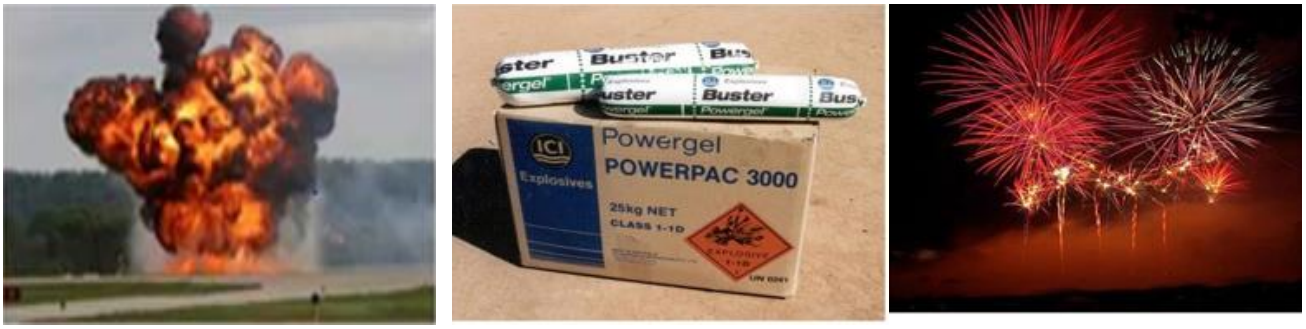

Figure 3-2: Examples of Class 1 - Explosive

Military ammunition, bombs, industrial explosives (dynamite) and fireworks.

3.3.2 Class 2 - Gases

Gases are defined by dangerous goods regulations as substances which have a vapour pressure of 300 kPa or greater at 50°c or which are completely gaseous at 20°c at standard atmospheric pressure, and items containing these substances. The class encompasses compressed gases, liquefied gases, dissolved gases, refrigerated liquefied gases, mixtures of one or more gases with one or more vapours of substances of other classes, articles charged with a gas and aerosols.

Gases are capable of posing serious hazards due to their flammability, potential as asphyxiants, ability to oxidize and/or their toxicity or corrosiveness to humans.

The gases substances could be divided into the followings three subdivisions as follows:

- **Division 2.1:** Flammable gases
- **Division 2.2:** Non-flammable, non-toxic gases
- **Division 2.3:** Toxic gases

Examples of commonly transported gases are Aerosols, Compressed air, Hydrocarbon gas-powered devices, Fire extinguishers, Gas cartridges, Fertilizer ammoniating solution, Insecticide gases, Refrigerant gases, Lighters, Acetylene / Oxyacetylene, Carbon dioxide, Helium / helium compounds, Hydrogen / hydrogen compounds, Oxygen / oxygen compounds, Nitrogen / nitrogen compounds, Natural gas, Oil gas, Petroleum gases, Butane, Propane, Ethane, Methane, Dimethyl ether, Propene / propylene, Ethylene.


Figure 3-3: Examples of Class 2 - Gases

Home use, industrial gases and Cryogenic fluids

3.3.3 Class 3 - Flammable Liquids

Flammable liquids are defined by dangerous goods regulations as liquids, mixtures of liquids or liquids containing solids in solution or suspension which give off a flammable vapour (have a flash point) at temperatures of not more than 60.5°C, liquids offered for transport at temperatures at or above their flash point or substances transported at elevated temperatures in a liquid state and which give off a flammable vapour at a temperature at or below the maximum transport temperature.

Flammable liquids are capable of posing serious hazards due to their volatility, combustibility and potential in causing or propagating severe conflagrations.

There are no subdivisions within Class 3, Flammable Liquids.

Examples of commonly transported flammable liquids are Acetone / acetone oils, Adhesives, Paints / lacquers / varnishes, Alcohols, Perfumery products, Gasoline / Petrol, Diesel fuel, Aviation fuel, Liquid bio-fuels, Coal tar / coal tar distillates, Petroleum crude oil, Petroleum distillates, Gas oil, Shale oil, Heating oil, Kerosene, Resins, Tars, Turpentine, Carbamate insecticides, Organochlorine pesticides, Organophosphorus pesticides, Copper based pesticides, Esters, Ethers, Ethanol, Benzene, Butanols, Dichloropropenes, Diethyl ether, Isobutanols, Isopropyls, Methanol, Octanes.



Figure 3-4: Examples of Class 3 - Flammable Liquids

Paints and lacquers, perfumery products and Organochlorine pesticides

3.3.4 Class 4 - Flammable Solids; Spontaneous Combustible; Dangerous when Wet' Materials

Flammable solids are materials which, under conditions encountered in transport, are readily combustible or may cause or contribute to fire through friction, self-reactive substances which are liable to undergo a strongly exothermic reaction or solid desensitized explosives. Also included are substances which are liable to spontaneous heating under normal transport conditions, or to heating up in contact with air, and are consequently liable to catch fire and substances which emit flammable gases or become spontaneously flammable when in contact with water.

Flammable solids are capable of posing serious hazards due to their volatility, combustibility and potential in causing or propagating severe conflagrations.

These substances could be divided into the followings three sub divisions as follows:

- **Division 4.1:** Flammable solids
- **Division 4.2:** Substances liable to spontaneous combustion
- **Division 4.3:** Substances which, in contact with water, emit flammable gases

Figure 3-5 Examples of Class 4 - Flammable Solids; Spontaneous Combustible; Dangerous when Wet' Materials

Flammable solids, sodium battery and Naphthalene

Examples of commonly transported flammable solids, spontaneous combustibles, and dangerous when wet' materials are Alkali metals, Metal powders, Aluminium phosphide ,Sodium batteries, Sodium cells, Firelighters, Matches, Calcium carbide, Camphor, Carbon, Activated carbon, Celluloid, Cerium, Copra, Seed cake, Oily cotton waste, Desensitized explosives, Oily fabrics, Oily fibres, Ferrocerium, Iron oxide (spent, Iron sponge/direct-reduced iron (spent) , Metaldehyde, Naphthalene, Nitrocellulose, Phosphorus, Sulphur.

3.3.5 Class 5 - Oxidiser; Organic Peroxide

Oxidisers are defined by dangerous goods regulations as substances which may cause or contribute to combustion, generally by yielding oxygen as a result of a redox chemical reaction. Organic peroxides are substances which may be considered derivatives of hydrogen peroxide

where one or both hydrogen atoms of the chemical structure have been replaced by organic radicals.

Oxidisers, although not necessarily combustible in themselves, can yield oxygen and in so doing cause or contribute to the combustion of other materials. Organic peroxides are thermally unstable and may release heat whilst undergoing exothermic autocatalytic decomposition. Additionally, organic peroxides may be liable to explosive decomposition, burn rapidly, be sensitive to impact or friction, react dangerously with other substances or cause damage to eyes.

These substances could be divided into the followings two subdivisions as follows:

Division 5.1: Oxidising substances

Division 5.2: Organic peroxides

Examples of commonly transported oxidisers and organic peroxides are Chemical oxygen generators, Ammonium nitrate fertilizers, Chlorates, Nitrates, Nitrites, Perchlorates, Permanganates, Persulphates, Aluminium nitrate, Ammonium dichromate, Ammonium nitrate, Ammonium persulphate, Calcium hypochlorite, Calcium nitrate, Calcium peroxide, Hydrogen peroxide, Magnesium peroxide, Lead nitrate, Lithium hypochlorite, Potassium chlorate, Potassium nitrate, Potassium chlorate, Potassium perchlorate, Potassium permanganate, Sodium nitrate, Sodium persulphate.

Figure 3-6: Examples of Class 5 - Oxidiser; Organic Peroxide

Chemical oxygen generators, Ammonium nitrate fertilizers and Chlorates

3.3.6 Class 6 - Toxic Substances; Infection Substances

Toxic substances are those which are liable either to cause death or serious injury or to harm human health if swallowed, inhaled or by skin contact. Infectious substances are those which are known or can be reasonably expected to contain pathogens. Dangerous goods regulations define pathogens as microorganisms, such as bacteria, viruses, rickettsia, parasites and fungi, or other agents which can cause disease in humans or animals.

Toxic and infectious substances can pose significant risks to human and animal health upon contact.

These substances could be divided into the followings two sub divisions as follows:

- **Division 6.1:** Toxic substances
- **Division 6.2:** Infectious substances

Examples of commonly transported toxic substances and infectious substances are Medical/Biomedical waste, Clinical waste, Biological cultures / samples / specimens, Medical cultures / samples / specimens, Tear gas substances, Motor fuel anti-knock mixture, Dyes, Carbamate pesticides, Alkaloids, Allyls, Acids, Arsenates, Arsenites, Cyanides, Thiols/mercaptans, Cresols, Barium compounds, Arsenics / arsenic compounds, Beryllium/ beryllium compounds, Lead compounds, Mercury compounds, Nicotine / nicotine compounds, Selenium compounds, Antimony, Ammonium metavanadate, Adiponitrile, Chloroform, Dichloromethane, Hexachlorophene, Phenol, Resorcinol.

Figure 3-7: Examples of Class 6 - Toxic Substances; Infection Substances

Clinical waste, Dyes and Mercury compounds

3.3.7 Class 7- Radioactive Materials

Dangerous goods regulations define radioactive material as any material containing radionuclides where both the activity concentration and the total activity exceeds certain pre-defined values. A radionuclide is an atom with an unstable nucleus, and which consequently is subject to radioactive decay.

Whilst undergoing radioactive decay radionuclides emit ionizing radiation, which presents potentially severe risks to human health.

There are no subdivisions within Class 7, Radioactive Material.

Examples of commonly transported radioactive materials are Radioactive ores, Medical isotopes, Yellowcake, Density gauges, Mixed fission products, Surface contaminated objects, Caesium radionuclides / isotopes, Iridium radionuclides / isotopes, Americium radionuclides / isotopes, Plutonium radionuclides / isotopes, Radium radionuclides / isotopes, Thorium radionuclides / isotopes, Uranium radionuclides / isotopes, Depleted uranium / depleted uranium products, Uranium hexafluoride, Enriched Uranium.

Figure 3-8: Examples of Class 7 - Radioactive Materials

Radioactive ores, Depleted uranium and Enriched Uranium

3.3.8 Class 8 - Corrosives

Corrosives are substances which by chemical action degrade or disintegrate other materials upon contact. Corrosives cause severe damage when in contact with living tissue or, in the case of leakage, damage or destroy surrounding materials.

There are no subdivisions within Class 8, Corrosives.

Examples of commonly transported corrosives are Acids/acid solutions, Batteries, Battery fluid, Fuel cell cartridges, Fire extinguisher charges, Formaldehyde, Flux, Alkylphenols, Amines, Polyamines, Sulphides, Polysulphides, Chlorides, Chlorosilanes, Bromine, Cyclohexylamine, Phenol / carbolic acid, Hydrofluoric acid, Hydrochloric acid, Sulfuric acid, Nitric acid, Sludge acid, Hydrogen fluoride, Iodine, Morpholine.

Figure 3-9: Examples of Class 8 - Corrosives

Acid solutions, Batteries, Battery fluid and flux

3.3.9 Class 9 – Miscellaneous Dangerous Goods

Miscellaneous dangerous goods are substances and articles which during transport present a danger or hazard not covered by other classes. This class encompasses, but is not limited to, environmentally hazardous substances, substances that are transported at elevated temperatures, miscellaneous articles and substances, genetically modified organisms and micro-organisms and (depending on the method of transport) magnetized materials and aviation regulated substances.

Miscellaneous dangerous goods present a wide array of potential hazards to human health and safety, infrastructure and/ or their means of transport.

There are no subdivisions within Class 9, Miscellaneous Dangerous Goods.

Examples of commonly transported miscellaneous dangerous goods are Dry ice / cardice / solid carbon dioxide, Expandable polymeric beads / polystyrene beads, Ammonium nitrate fertilizers, Blue asbestos / crocidolite, Lithium ion batteries, Lithium metal batteries, Battery powered equipment, Battery powered vehicles, Fuel cell engines, Internal combustion engines, Vehicles, Magnetized material, Dangerous goods in apparatus, Dangerous goods in machinery, Genetically modified organisms, Genetically modified micro-organisms, Chemical kits, First aid kits, Lifesaving appliances, Air bag modules, Seatbelt pretensioners, Plastics moulding compound, Castor bean plant products, Polychlorinated biphenyls, Polychlorinated terphenyls, Dibromo difluoromethane, Benzaldehyde.

Figure 3-10: Examples of Class 9 - Miscellaneous Dangerous Goods

Dry ice, Expandable polymeric beads and Blue asbestos

3.4 Dangerous Goods Forbidden from Transport

Dangerous goods forbidden from transport includes any substance or article that meets the definition of goods too (high) dangerous to be transported such as goods or combinations of goods for which the statement 'are not to be accepted for transport' applies in a special provision that is applied to the goods by column (6) of the Dangerous Goods List A or other goods that are so sensitive or unstable that they cannot be safely transported even if all relevant requirements are complied.

These dangerous good required special treatment processes followed by necessary precautions to prevent the possibility of a dangerous decomposition or polymerization under normal conditions of carriage and ensure that receptacles and tanks do not contain any substances liable to promote these reactions.

The transporter (carrier) must ensure that the considered dangerous goods are not forbidden from road transport and if that, the required treatment processes (if required) and the followed necessary precautions should be carefully studied and properly implemented.

The following are examples of dangerous substances and articles not accepted for carriage without proper treatment process and applying the necessary precautions:

- Explosive class 1 articles of compatibility group K shall not be accepted for carriage (1.2K, UN No. 0020 and 1.3K, UN No. 0021).
- Chemically unstable gases of Class 2 which are subject to the possibility of a dangerous decomposition or polymerization under normal conditions of carriage such as:
  - UN No. 2186 HYDROGEN CHLORIDE REFRIGERATED LIQUID.
  - UN No. 2421 NITROGEN TRIOXIDE / UN No. 2455 METHYL NITRITE.
  - Dissolved gases which cannot be classified under UN Nos. 1001, 2073 or 3318.
  - Aerosols where gases which are toxic or pyrophoric according to packing instruction are used as propellants.
  - Aerosols with contents meeting the criteria for packing group I for toxicity or corrosivity.
  - Receptacles, small, containing gases which are very toxic (LC50 lower than 200 ppm) or pyrophoric according to packing instruction.
- Substances of Class 3 which are liable to form peroxides easily (as happens with ethers or with certain heterocyclic oxygenated substances) if their peroxide content, calculated as hydrogen peroxide (H2O2), exceeds 0.3%.
- Radioactive materials unless the necessary precautions addressed in FANR regulations have been implemented.

3.5 Economic Activities related to Hazardous Materials

As discussed in clause 1.2, the hazardous materials are considered as dangerous goods when they have transport. Hazardous materials are participated in several economic activities in Abu Dhabi Emirate as illustrated in Table 3-2. Each activity is inspected and controlled by authorized governmental entity through Hazardous Materials Management Team (see clause 3.6)

P. N	Economic Activity	Authorized Entity
1	Wholesale of tar and asphalt trading	Environment Agency- Abu Dhabi
2	Wholesale of synthetic cleanser trading	
3	Gas and Petroleum Materials Storing	
4	Wholesale of synthetic gas trading	
5	Wholesale of synthetic chemical trading	
6	Wholesale of dyeing and canning material trading	
7	Wholesale of chemical material trading for building purposes	
8	Chemical Material Storage	
9	Wholesale of acid and alkalis trading	

10	Wholesale of laboratory and factory chemicals trading	
11	Wholesale of water treatment and purification chemicals trading	
12	Wholesale of oil well chemicals trading	
13	Wholesale of Petrochemical Material Trading	
14	Wholesale of Chemical Fertilizers Trading	Abu Dhabi Agriculture and Food Safety Authority
15	Retail Sale of Chemical Fertilizers	
16	Retail Sale of Natural Fertilizers and Agricultural Reclamation Material	
17	Wholesale of Natural Fertilizers and Agricultural Reclamation Material Trading	
18	Retail Sale of Agricultural and Veterinary Pesticides	
19	Wholesale of Agricultural and Veterinary Pesticides	
20	Wholesale of House Pesticides Trading	Ministry of Climate Change and Environment
21	Retail Sale of House Pesticides	None
22	Public Health Pests Control Services	Abu Dhabi Waste Management Centre (TADWEER)
23	Termite Control	
24	Chemical Wastes Collection	
25	Activities related to Hazardous Waste Handling and Transport • Transportation of Chemical Waste • Chemical Waste Treatment • Collection and Transportation of Lubricant Oil • Processing of Liquid Batteries Waste • Processing of Metal Waste for Material Recovery • Dismantling of automobiles, devices and equipment's for materials recovery • Transportation of Medical Waste • Trading of Used Batteries Waste • Transportation of Poisonous Waste • Treatment of Medical Waste • Transportation of Ships Waste Oils • processing of waste ships oil • Collection of electronic and electrical waste • Trading of Waste Electrical and Electronic Equipment • Transportation of Used Batteries • Trading of Lubricant Oil Waste • Transportation of Asbestos Waste • Reclaiming of Chemicals from Chemical Waste • Incineration of Dead Animals • Oil-Based Lubricating Oils or Greases Manufacturing	
26	Transport of Hazardous Materials	ITC -DMT and Ministry of Energy and infrastructure

27	Transport of Radioactive Materials	Federal Authority for Nuclear Regulation / Ministry of Energy and infrastructure
28	Transport of Explosive material and fireworks	Abu Dhabi Police General Command – Explosives Division

Table 3-2: Economic Activities Related to Hazardous Materials in Abu Dhabi Emirate

3.6 Management and Control of Hazardous Materials

3.6.1 Integrated Hazardous Materials Management System (IHMMS)

The management of hazardous materials is one of the most critical priorities in the Emirate of Abu Dhabi. This comes in accordance with the requirements of federal and local laws related to security, safety and the environmental protection, as well as the directions of the Abu Dhabi government to impose control on hazardous materials to protect society, and the environment from the dangers that might arise from these materials. Accordingly, IHMMS is established as a computerized electronic and integrated system used as a tool for the management and control of hazardous substances imported and produced in Abu Dhabi Emirate as shown in the link https://www.hazmat.ae/.

The system is an electronic model for the integrated and core management of hazardous materials (chemicals, radioactive, pesticides… etc.), as well as to provide the necessary information in an integrated manner for the involved decision-makers on the types, locations and quantities of hazardous materials used. The system has been launched according to Decree No. 20G 9/2008 issued by the Executive Committee of the Executive Council of the Emirate of Abu Dhabi.

This system includes an electronic database for the management of hazardous materials as well as many other functions, including:

- Management of the unified list of banned and restricted materials in the United Arab Emirates through concerned authorities.
- Monitoring of banned and restricted materials entering the Abu Dhabi Emirate.
- Provision of Safety Data Sheets for chemical materials (SDS).
- Tracking of materials and facilities that deal with hazardous materials.
- Provision of a data base of hazardous materials incidents.
- Provision of a data base of violations related to hazardous materials.
- Provision of instant reports and statistics related to hazardous materials.

The system also ensures a link between hazardous materials concerned authorities and determines their roles in order to avoid duplication in jurisdiction which eases the permitting requirements for HazMat trader. It also supports the integration of their work and cooperation in the management of hazardous materials.

At the same time, the system enhances the competencies, capacities, and mechanisms of relevant institutions in the management of hazardous materials, as well as the exchange of information and internal documentation. The system has an advantage of being flexible and can accommodate enhancement and inclusion of other ministries and governmental institutions concerned in the future.

3.6.2 Hazardous Materials Management Team (AD-HMMT)

Abu Dhabi Hazardous Materials Management Team (AD-HMMT) has been established to prepare and implement proper executive plan to manage hazardous resources in the Emirate of Abu Dhabi.

The team's main role is to identify and manage hazardous materials in the Emirate. It keeps detailed records of all dealings with such materials and coordinates with other authorities to draft relevant legislations. Other responsibilities include developing the Emirate's governance system and assessing risks related to retail outlets which handle hazardous materials .

The team's work involves the followings:

- Conducting gap analysis and reviewing the current challenges in the management of hazardous materials, as well as looking into the global best practices to prepare and approval of a governance system, list of materials of security concern, as well as management procedures based on governance systems and security were developed.
- Preparing emergency response plans to respond to accidents of hazardous materials transport vehicles, accidents in stores and facilities.
- Ensuring the implementation of the requirements for drivers of hazardous materials vehicles and tracking system for vehicles transporting these materials .
- Dissemination of the implementation of the Integrated Hazardous Materials Management System (IHMMS) at the Emirate level by the authorities.

Currently, the number of companies and factories that have been considered in the team implementation plan is about 1840 as addressed in table 3-2. The aim of the team in the concerned authorities is to follow up on the establishments' inclusion of hazardous materials within the system and ensure the start by companies and factories to fill in the Integrated Hazardous Materials Management System (IHMMS).

4 SAFETY MEASURES AND SUPPLY CHAIN RESPONSIBILITIES

This chapter provides all parties in the transport supply chain with the safety measures to be considered in the transport of HazMat, the required personal protective and vehicle safety equipment, security provisions particularly for high-risk dangerous goods and the emergency response actions including the incident reports.

4.1 General

The rule pertaining the carriage of dangerous goods by road set out the responsibilities of all parties in transport supply chain. The parties /duty holders with specific legal duties are the consignor, carrier, driver and vehicle crew, packer, filler, loader, unloader, tank container/ portable tank operator, consignee and the safety advisers (DGSA). There are generally several duty holders in a particular transport chain. For example, HazMat manufacturing facility as the "consignor" could deliver the product to another courier company or be also a carrier If they employ a driver and use a company truck.

It worth mentioning that any duty holder acts on behalf of parties, a clear contract of carriage, outlining all transfers of duties under the national regulation, should be agreed and signed by all parties involved.

4.2 General Safety Measures

All supply chain parties who are responsible for transport of HazMat are responsible for complying with the national regulations of dangerous goods transportation. They must take reasonable steps to prevent breaches of mass, dimension, loading, speed and fatigue rules. Currently, this is expanded to include vehicle standards and maintenance.

The chain of responsibility (COR) rules should improve safety and compliance, require parties to manage risk, create a level playing field and increase productivity, protect infrastructure, and protect against the demands of off-road parties that can lead to breaches of the regulations. In contrast, COR obligations can be breached in many ways such as:

- Applying business practices or demands that cause a driver to breach fatigue management requirements, or speed limits,
- Failing to weigh, measure or secure loads,
- Setting schedules with unrealistic timeframes,
- Causing delays in loading and unloading,
- Packing goods incorrectly,
- Failing to consult or engage with other parties to ensure safe practices, and
- Failing to assess driver fitness for duty.

- The participants in the carriage of dangerous goods shall take appropriate measures according to the nature and risks of the consignment to avoid damage or injury and, if necessary, to minimize their effects. They shall, in all events, comply with the requirements of national laws and regulations in their respective fields.

When there is an immediate risk that public safety may be jeopardized, the drivers shall immediately notify the emergency services and shall provide them with all available information in order to take action."

This general provision means that all participants must ensure that they take all necessary actions to reduce the risk of an accident involving dangerous goods. In general, a drivers must:

- Ensure that a person employed for the duties concerning the carriage of dangerous goods, has received the appropriate training.
- Keep records of such training.
- Comply with specified legal duties.
- Take appropriate measures to avoid damage or injury.
- Notify emergency services of an immediate risk to public safety.

The following subclauses discuss the roles and responsibilities of supply chain parties in terms of safety measures according to the international best practices and ADR business guide.

4.2.1 Consignor

The consignor is the enterprise handing over (or has control of) the dangerous goods prior to transportation such as a manufacturer, supplier, forwarding warehouse, etc.

The consignor must provide the transport documents and accompanying documents according to the national regulations. When the consignor acts on behalf of a third party, the latter must inform the consignor in writing that dangerous goods are involved and make available to him all the information and documents needed to perform the consignor's obligations.

The consignor must have a place of business in the Emirate. If no person in the Emirate satisfies this requirement, the consignee (customer) of the goods assumes the duties of the consignor.

According to national and international regulations, the consignor must in particular:

a) Ascertain that the dangerous goods are classified (see clause 3.3) and authorized for carriage in accordance with national regulations.

b) Furnish the carrier with information and data and, if necessary, the required transport documents and accompanying documents (authorizations, approvals, notifications, certificates, safety data sheet (SDS), etc). The consignor must ensure that a carrier is informed in advance of the nature of the dangerous goods to be picked up and, when a driver arrives on site, ensure that all necessary documentation is provided.

c) Use packaging, large packaging, intermediate bulk containers (IBCs) and tanks (tank-vehicles, demountable tanks, battery-vehicles, MEGCs, portable tanks and tank-containers) approved for and suited to the carriage of the substances concerned and bearing the markings prescribed by national regulations.

d) Comply with the requirements on the means of dispatch and on forwarding restrictions addressed in the national regulations (See chapter 9).

e) Ensure that even empty, uncleaned and not degassed tanks (tank-vehicles, demountable tanks, battery-vehicles, MEGCs, portable tanks and tank-containers) or empty, uncleaned vehicles and large and small bulk containers are appropriately marked and labelled and that empty uncleaned tanks are closed and are leakproof to the same degree as when they are full.

f) Comply with security provisions as appropriate (see clause 4.6).

g) Ensure that on handing dangerous goods over to a driver, he is carrying an appropriate driver training certificate and photo identification.

h) Ensure emergency procedures are in place (see clause 4.7).

i) Ensure all employees are appropriately trained and certified to work with dangerous goods (see chapter 6).

If the consignor uses the services of other parties (packer, loader, filler, etc.) such as ports, appropriate measures must be taken to ensure that the consignment meets the requirements of national regulations. The consignor may, however, in the case of (a), (b), (c) or (e), rely on the information and data made available by other participants.

4.2.2 Carrier

The carrier is the entity performing the actual carriage of dangerous goods in or on a vehicle (with or without a transport contract), for example a logistics company, courier, vehicle owner/operator (who may also be the consignor or driver, as a self-employed vehicle owner/operator).

According to national and international regulations, the carrier must ensure that:

a) Dangerous goods to be carried are authorized for carriage in accordance with national regulations (by means of confirmation from the consignor, or otherwise).

b) All information prescribed in national regulations related to the dangerous goods to be carried has been provided by the consignor before carriage (see chapter 10) and that the prescribed documentation is on board the transport unit or, if electronic data processing (EDP) or electronic data interchange (EDI) techniques are used instead of paper documentation, that data is available during transport in a manner at least equivalent to that of paper documentation.

c) Vehicles and loads have no obvious defects, leakages or cracks, missing equipment, etc. and ensure this is carried out by putting in place a monitoring/audit procedure to assess vehicles and equipment.

d) The date of the next test for tank-vehicles, battery-vehicles, demountable tanks, portable tanks, tank-containers and MEGCs has not expired (see clause 10.6). As in (c) above, build inspection checks into regular monitoring/audit function.

e) The vehicles are not overloaded.

f) The hazard labels and markings prescribed for the vehicles have been affixed (see chapter 7).

g) The equipment prescribed in the written instructions for the driver is on board the vehicle (see clause 10.5). This must also take account of fire extinguisher requirements (see clause 4.5).

h) Comply with security provisions as appropriate (see clause 4.6).

i) Ensure emergency procedures are in place (see clause 4.7).

j) The driver and crew are well trained in regard to work involving dangerous goods. Drivers must also hold an appropriate driver training certificate (see chapter 6 & clause 12.3).

Documented procedures including periodic audits will ensure the vehicle and other transport equipment are in a suitable condition for use.

The carrier may, however, in the case of (a), (b), (e) or (f), rely on information and data made available by other parties (e.g. consignor, loader, packer or filler).

If the carrier observes an infringement of the requirements of national regulations, the consignment must not be forward until the matter has been rectified.

If during the journey, an infringement which could jeopardise the safety of the operation is observed, the consignment must be halted as soon as possible, bearing in mind the requirements of traffic safety, the safe immobilisation of the consignment and public safety. The transport operation may only be resumed once the consignment complies with applicable regulations.

4.2.3 Driver and Vehicle Crew

The driver is the person who is in immediate control of the vehicle and fulfils the driving function. Crew members also have responsibilities and must have appropriate training in line with their duties and responsibilities. Note that if any crew member drives the vehicle, he must hold an appropriate driver training certificate.

According to national and international regulations, the driver and vehicle crew must in particular:

a) Ensure that their personnel carry the official training certificate (drivers) and photo ID. (all crew members).

b) Ensure that they have read and understood transport documentation provided in advance of any transport operation. If an issue does arise with the documentation the crew members must raise and rectify any matter prior to driving the vehicle.

c) Keep written emergency instructions readily available in the vehicle.

d) Ensure all vehicle safety equipment and PPE is available and report i any deficiency or missing items with the carrier.

e) Ensure the vehicle is properly plated, placard and marked. Ensure orange plates, placards and marks are kept clean. And when they are not required remove or cover plates, placards and marks.

f) Ensure that damaged or leaking packages are not loaded.

g) Ensure not to drive a vehicle that is not in compliance with national regulations and report and rectify any non-conformity issues prior to driving the vehicle.

h) Ensure that only crew members are available in the vehicle, no passengers are allowed in transport vehicles carrying dangerous goods.

i) Ensure that members of the vehicle crew are trained to use emergency response equipment (e.g.: fire extinguishers, spill kits, etc).

j) Not to open a package containing dangerous goods.

k) Ensure that only spark-proof lighting apparatus are used.

l) Ensure that smoking is prohibited during handling operations (inside and in the vicinity of vehicles).

m) Ensure that the engine is shut off during loading and unloading operations except where it must be used to drive the pumps or other appliances for loading or unloading the vehicle and the laws of the country in which the vehicle is operating permit such use.

n) Ensure that no vehicles carrying dangerous goods are parked without the parking brakes being applied. Vehicle operators to set their truck and trailer brakes and block their wheels to prevent vehicle movement. Wheel chocks should be placed under the rear wheels, which means two chocks should be used – chocking just one wheel isn't enough.

o) Ensure that in the case of a transport unit equipped with an anti-lock braking system consisting of a motor vehicle and trailer, the electrical connections always connect the towing vehicle and the trailer during carriage.

p) In cases of tank filling or emptying, ensure as may be appropriate (e.g. for flammable liquids) that there is a good electrical connection to the earth prior to the emptying or filling operation (see subclause 4.2.5).

q) Ensure no dangerous residues of the filling substance adhere to the outside of tanks filled or emptied (see subclause 4.2.5).

r) If involved in the loading operation, initially or during the transport operation, ensure dangerous goods are properly secured to the vehicle. If released to unload part of the shipment, remaining dangerous goods must properly be re-secured to the vehicle (see chapter 9).

s) Ensure that vehicle supervision provisions are adhered (see clause 9.8).

4.2.4 Packer

The packer (an individual or business) is the party who is responsible for the final packaging of dangerous goods prior to transportation.

According to national and international regulations, the packer must in particular:

a) Comply with requirements concerning packing provisions, or mixed packing provisions (these requirements vary and may require input from a DGSA, please refer also to clauses 9.3 and 9.4).

b) Comply with the requirements concerning marking and labelling of the packages when preparing packages for carriage (see chapter 7).

4.2.5 Filler

The filler is the party (individual or business) who is responsible for filling tanks or containers (for carriage in bulk) with dangerous goods prior to transportation.

According to national and international regulations, the filler must in particular:

a) Ensure, prior to the filling of tanks, that the tanks and their equipment are in a satisfactory technical condition.

b) Ensure that the date of the next test for tank-vehicles, battery-vehicles, demountable tanks, portable tanks, tank-containers and MEGCs has not expired.

c) Only fill tanks with the dangerous goods authorised for carriage in those tanks;

d) In filling the tank, comply with the requirements concerning dangerous goods in adjoining compartments.

e) During the filling of the tank, observe the maximum permissible degree of filling or the maximum permissible mass of contents per litre of capacity for the substance being filled.

f) After filling the tank, check that the closing devices are leakproof.

g) Ensure that no dangerous residue of the filling substance adheres to the outside of the tanks filled by him or her.

h) Ensure that, in preparing the dangerous goods for carriage, the orange plates and placards or labels prescribed are affixed on the tanks, on the vehicles and on the large and small containers for carriage in bulk in accordance with the requirements.

i) Ensure compliance with the relevant provisions of national regulations when filling vehicles or containers with dangerous goods in bulk (see chapter 9).

4.2.6 Loader

The loader is the entity (individual or business) who is responsible for loading dangerous goods onto a vehicle prior to transportation.

According to national and international regulations, the loader must in particular:

a) Hand over the dangerous goods to the carrier only if they are authorized for carriage in accordance with national regulations.

b) When handing over packaged dangerous goods or uncleaned empty packagings, check whether the packaging is damaged. Damaged packaging must not be handed over, especially if it is not leakproof and there are leakages or the possibility of leakages of the dangerous substance, until the damage has been repaired.

c) When loading dangerous goods into a vehicle, a large or small container, loader must comply with the special requirements concerning loading and handling of certain classes indicated in Column (18) of Table A as advise by the dangerous goods safety advisor (DGSA).

d) After loading dangerous goods into a container, comply with the requirements concerning hazard markings conforming to the regulations (see chapter 7).

e) When loading packages, comply with the prohibitions regarding mixed loading considering dangerous goods already in the vehicle or large container and requirements concerning the segregation requirements. These requirements may not be required for foodstuffs and other articles of consumption or animal feedstuffs (see chapter 5).

The loader may, however, in the case of (a), (d) or (e), rely on information and data made available to him by other participants.

4.2.7 Tank- container / Portable Tank Operator

The tank-container/portable tank operator is the entity (individual or business) who is responsible for the operation of a tank-container/portable tank.

According to national and international regulations, the tank-container / portable tank operator must in particular:

a) Ensure compliance with the requirements for construction, equipment, tests and marking.

b) Ensure that the maintenance of shells and their equipment is carried out in such a way as to ensure that, under normal operating conditions, the tank-container/ portable tank satisfies the requirements of national regulations until the next inspection.

c) Implement detailed inspection when the safety of the shell or its equipment is liable to be impaired by a repair, an alteration or an accident.

4.2.8 Unloader

The unloader is the participant (individual or business) who is responsible for the removal of dangerous goods from a vehicle, the unloading or discharge of dangerous goods from a tank, container or vehicle.

According to ADR international regulation, the unloader must in particular:

a) Ensure that the correct goods are unloaded. Unloader should refer to the relevant information in the transport document with the information on the package, container, tank, MEMU, MEGC or vehicle.

b) Before and during unloading, check whether the packagings, the tank, the vehicle or container have been damaged to an extent which would endanger the unloading operation. In case of damage, ensure that unloading is not carried out until appropriate measures have been taken.

c) Comply with all relevant requirements concerning unloading.

d) After the unloading of the tank, vehicle or container:

   I. Remove any dangerous residues which have adhered to the outside of the tank, vehicle or container during the process of unloading; and
   II. Ensure the closure of valves and inspection openings.

e) Ensure that the prescribed cleaning and decontamination of the vehicles or containers is carried out.

f) Ensure that the containers once completely unloaded, cleaned and decontaminated, no longer display danger markings conforming to national regulations (See chapter 7).

g) If the unloader makes use of the services of other participants (cleaner, decontamination facility etc) he must take appropriate measures to ensure that the requirements of national regulations have been complied with.

4.2.9 Consignee (Customer or Recipient)

The consignee is the entity (individual or business) who takes charge of the dangerous goods when delivered.

According to ADR international regulation, the consignee has the following obligations:

a) Not to defer acceptance of the goods without compelling reasons and to verify, after unloading, that the requirements of ADR placed on the consignee have been complied with;

b) In the case of a container, this verification identifies any infringement from the requirements of national regulations, the consignee must return the container to the carrier only after the infringement has been remedied. and

c) If the consignee makes use of the services of other entities (unloader, cleaner, decontamination facility, etc), appropriate measures must be taken to ensure that the requirements of (a) and (b) have been complied with.

4.3 Safety Data Sheet (SDS)

A Safety Data Sheet is a detailed informational legal document prepared by the manufacturer or importer of products, substances or chemicals that classified as are hazardous materials or dangerous goods describing their physical and chemical properties provided to customers by substances production or sales enterprises in accordance with legal requirements. The SDS are mainly used in:

- Provide information on the hazards of substance to protect users of the products including physical data (melting point, flash point, boiling point, etc.), disposal considerations, toxicity, reactivity, health effects, first aid, protective equipment, etc.
- Ensure safe operation and provide technical information for the formulation of safe management procedures for hazardous substances.
- Provide technical information helpful for emergency rescue and emergency handling of accidents.
- Guide the safe circulation and safe use of the substances.
- It is an important information source for substance registration management.
- It plays a very important role in the customs declaration, transportation, customs, air transportation, land transportation and other links of import and export.

The consignor is responsible for obtaining the SDS from the original manufacturer or supplier, ensuring their compliance with the national rules and affording it to the concerned parties in the transport supply chain (drivers, vehicle crew, workers, DGSA, emergency team, etc.). The information in the SDS should be presented using the following 16 headings in order given below:

1. Identification of the substance/mixture
2. Hazards identification
3. Composition/information on ingredients
4. First aid measures
5. Firefighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

An example of SDS is presented in Appendix H. In addition, IHMMS include SDS for huge numbers of materials.

It is worth mentioning that the **Globally Harmonized System (GHS)**, developed by a United Nations (UN), is commonly used for the classification, and labelling of chemicals according to two major standardized elements:

- Rules for classifying the hazards of chemical products (i.e., substances, materials, or mixtures)
- Hazard communication tools such as:
  - format for safety data sheets (SDSs),
  - content for label and SDSs with
    - hazard and precautionary statements
    - symbols

- signal word

GHS covers all hazardous chemicals products, such as those used for industrial chemicals consumer chemical products, pesticides, agricultural chemicals and pharmaceuticals. The target audiences for GHS include workers in many different industries (e.g., warehouses, construction, chemical manufacturing, transportation), emergency responders, and consumers.

4.4 Safety Advisers for Dangerous Goods

Businesses whose activities include the consignment, carriage or the related filling and emptying, packing, loading or unloading of dangerous goods must appoint one or more dangerous goods safety advisers (DGSAs).

The role of the safety adviser is to help control the risks inherent in such activities in regard to persons, property and the environment. DGSAs generally complete training and must be successful in passing specified exam(s) to gain the qualification, which must be renewed every two years or as requested by the competent authority (see clause 6.4 & clause 9.5).

The main duties of a DGSA are as follows:

- Advising on the safe transport of dangerous goods by road.
- Monitoring compliance with the requirements / regulations governing the carriage of dangerous goods.
- Preparing an annual report to management or a local public authority, as appropriate, on the activities involving the carriage of dangerous goods. Such annual reports must be preserved for five years and made available to the national authorities at their request.
- Investigating any accidents or infringements of regulations and preparing reports.
- Monitoring the provision of training and advice to any staff involved in the transport of dangerous goods.

There are exemptions provided for businesses with limited exposure to these activities so that they are not required to formally appoint a DGSA, for example

- Where the amounts of dangerous goods handled are so small (see clause 5.3) or are so infrequently consigned, that the appointment of a DGSA might be unreasonable.
- For operations that can avail of the exemptions permits in the national regulations known colloquially as the ‘load limit exemption’ or the ‘carrier exemption’ refer to chapter 5 in this guideline.

The assessment of whether businesses are required to legally appoint a DGSA should be carried out by the competent authority (see clause 9.5) and should be documented, and the particular circumstances should be reviewed periodically to ensure that the initial assumptions and criteria

are still valid and applicable. However, where businesses are not required to appoint a DGSA, it is highly recommended to seek advice or guidance from a qualified DGSA from time to time as required.

A formally appointed DGSA may be an employee, the head of the business or an external consultant. The DGSA must be certified and have access to all relevant aspects of the business to carry out this function.

4.5 Personal Protective and Vehicle Safety Equipment

Safety equipment are essential for personal protection whether during routine activities or during emergencies. The personal protective equipment for drivers and crew and safety equipment to be carried on vehicles for use by the crew are specified in the international regulations and this guidelines manual to ensure that, in the event of an accident or incident, the personnel transporting the dangerous goods:

- have adequate protection to prevent injuries.
- can effectively respond to either control the situation or mitigate the effects while waiting for the arrival of emergency services or the approved emergency responder.

It is the responsibility of carriers to supply safety equipment and ensure it is provided and maintained in good working order. All safety equipment must be stowed in an accessible position in the vehicle except for respiratory protective equipment, which must be carried securely and in an accessible position in the vehicle cabin. The safety data sheet for particular substances may specify additional personal protective equipment.

4.5.1 Mandatory Equipment

The following equipment is mandatory for each vehicle:

- A suitable pair of wheel chocks.
- Two self-standing warning signs;
- Eye wash (2x 500ml – not required for goods with danger label numbers 1, 1.4, 1.5, 1.6, 2.1, 2.2 and 2.3).

The following equipment is mandatory for each member of the vehicle crew:

- A warning (reflective) vest.
- Spark-proof torch.
- Protective gloves. and

- Safety glasses/goggles.

Additional equipment for certain classes:

- An emergency escape mask for each crew member in vehicles carrying goods with danger label numbers 2.3 or 6.1.
- A shovel drain seal and plastic collecting container in vehicles carrying goods with danger label numbers 3, 4.1, 4.3, 8 and 9.

In addition to the above items the driver should carry a first aid kit and any other safety items identified in the risk assessment (e.g. chemical spill kit, chemical over suit, protective overalls, safety boots, hard hat, etc.).

Table 4.1 shows more details the safety equipment required for transporting each class or division of dangerous goods (X = required item).

Class/ Division	Escape breathing apparatus	Gas tight goggles/ face shield	Eyewash kit (d)	Chem-resistant gloves	Thermal gloves	Chem-resistant coveralls	Chem-resistant boots	Torch	Flame-proof torch
2.1 (a)		X (c)			X				X
2.2		X (c)			X			X	
2.3	X (b)	X	X		X			X	
3 / 4			X	X					X
5.1 Solids			X	X				X	
5.1 Liquids		X	X	X		X	X	X	
5.2		X	X	X		X	X		X
6.1 and 8	X (b)	X	X	X		X	X	X	
6.2				X				X	
9			X	X	X (e)			X	

(a) gas detector required for un-odorized LPG

(b) short-term air supplied breathing apparatus equipment is required, unless there is no possibility of harmful vapors, gases or dusts even in an emergency

(c) if the receptacle carries more than 500 liters or contains cryogenic liquid

(d) an eyewash kit must be of at least 250ml capacity, filled and ready for use

(e) if elevated temperature substance or dry ice

Table 4-1: Safety Equipment Required for Transporting Each Class of Dangerous Goods

Respiratory protection is required when transporting a placard load of Division 2.3, 6.1 or Class 8 dangerous goods (see clause 4.6) that may give rise to harmful vapors, gases or dusts. The minimum requirement is an air supplied short-term breathing apparatus suitable for escape purposes. Where the driver also attends to the loading or the transfer of the goods then a Self-Contained Breathing Apparatus with a duration greater than 15 minutes may be required.

Note: Instructions in writing (or transport emergency card) contain emergency action information for crew members, and a list of mandatory personal and vehicle safety equipment (excluding fire extinguisher requirements). Such mandatory equipment is listed on the instructions in writing (see chapter 10 and Appendix B). See also chapter 10, which outlines what documentation should be carried on the vehicle.

4.5.2 Fire Fighting Equipment

Table 4.2 outlines the specific fire extinguisher requirements for various transport units carrying dangerous goods.

Scenario	Requirement
All transport units.	Minimum of a 2 kg dry powder (or equivalent) extinguisher – suitable for fighting a cab or engine fire.
Units with max. permissible mass of more than 7.5 tons.	One or more portable fire extinguishers with minimum total capacity of 12 kg dry powder (or equivalent) – at least one extinguisher being minimum of 6 kg capacity.
Units with max. permissible mass of more than 3.5 tons up to and including 7.5 tons.	One or more portable fire extinguishers with minimum total capacity of 8 kg dry powder (or equivalent) – at least one extinguisher being minimum of 6 kg capacity
Units with max. permissible mass of up to and including 3.5 tons.	One or more portable fire extinguishers with minimum total capacity of 4 kg dry powder (or equivalent).
Transport Units exempted under Small Load Exemption (ADR 1.1.3.6).	Minimum of a 2 kg dry powder (or equivalent) extinguisher – suitable for fighting a cab or engine fire.

Table 4-2: Fire Extinguisher Requirements for Transport Units Carrying Dangerous Goods

Extinguishers must be maintained and inspected periodically as specified by the manufacturer. Extinguishers must be stowed securely in/on the vehicle in a quick-release bracket and be readily accessible, i.e. not locked in storage compartments in the vehicle. The placement of fire extinguisher could be as follows:

- Where only one extinguisher is required for the unite, locate it on the discharge side of a tank vehicle.
- For other vehicles, locate it near the driver's door or at the front of the trailer with a placard load.
- Where two or more extinguishers are required for the unit, mount one on the near side towards the rear and one on the offside near the front.

4.6 Security Provisions

In relation to the transport of dangerous goods, security means measures or precautions to be taken to minimize theft or misuse of dangerous goods that may endanger persons, property or the environment as well as possible terrorist risks.

Security measures should be an integral part of the safety and quality management system of every company involved with the transport of dangerous goods as well as their risk assessment outcomes. All persons engaged in the carriage of dangerous goods must consider the security requirements commensurate with their responsibilities.

The dangerous goods storage areas must be properly secured and well-lit as well as inaccessible to the public. The restricting access areas could be achieved through physically controlling access to locations housing dangerous goods, requiring staff to wear photo ID passes at all times and controlling unsupervised access by contract/agency staff to particular areas.

Dangerous goods must only be offered for carriage to carriers that have been appropriately identified and permitted from relevant authority in the Emirate according to proper procedures must be put in place to verify companies and persons to whom you hand over dangerous goods.

Drivers and vehicle crew must carry with them means of identification, including their photograph, during carriage of dangerous goods. This is satisfied when carrying the new driver training certificate or separate company i.d. card or driving licence.

2. The application of the approved standard specification for LPG workers must be followed.
3. Any activities or work relating to the storage, transport or distribution of LPG cylinders is prohibited without prior approval from the Abu Dhabi Civil Defense Authority (Firefighting).
4. All LPG tanks, cylinders and their accessories used in gas trading must be according to approved international standards.
5. The circulating gas cylinders must conform to the approved gulf standard specifications.

G.3.3 LPG Transport:

G.3.3.1 Gas Cylinder Transport Vehicles

Gas cylinder transport vehicles: they are specially designed to transport a range of LPG cylinders.

➢ **General Conditions:**

1. LPG transport vehicles must be diesel-powered types.
2. It is forbidden to use any vehicle for transporting, selling and distributing of gas cylinders without meet all the requirements of safety and obtain a permit from the Abu Dhabi Civil Defense Authority (Firefighting).
3. The vehicle licensing should be periodically renewed according to the Abu Dhabi Civil Defense Authority (Firefighting) technical examination procedures.
4. The distribution of the cylinder's suppliers is prohibited from supplying gas cylinders to the stores which are not licensed for gas cylinders storage.
5. The use of closed vehicles (such as passenger cars) is prohibited from transporting two LPG cylinders with a capacity of 25 kg per cylinder.

➢ **LPG Cylinder Transport Vehicle Design Requirements:**

1. LPG transport vehicles must meet safety requirements in terms of processing and performance.
2. The surface and bottom of vehicle's box should be closed. The box should be ventilated through a solid iron mesh barrier equipped on both sides of the vehicle. The floor should be of compact wood or durable, friction-resistant and spark-resistant insulator suitable for purpose.
3. The box of the cylinder transport vehicle must be well-made and fixed with provisions on the vehicle.
4. The box should be equipped with a solid bond to prevent the movement of the cylinders, shaking and bumping into each other during the vehicle movement.

1. The elevation of the cylinder box roof should not exceed 45 cm from the head of the cylinders in order to ensure adequate ventilation and the ease of placing and removing cylinders from the box, considering that the storage above the cylinders is not allowed.
2. The metal parts in the box (on which cylinders lay on) should be covered with an insulating material to prevent the friction between them and the cylinders during the vehicle movement.
3. The vehicle must be painted in a distinctive color and is marked as "Danger - Flammable Gas Cylinders " and followed the application of HazChem international markings and labelling for hazardous materials transport vehicles.
4. The gas cylinder transport vehicle must be equipped with a small hand cart used by the staff to transport the cylinder from the vehicle to the client's location.
5. The vehicle must be provided with a shock reliever at front and rear of the vehicle. The reflective striped phosphorus tape is attached to the vehicle's back to facilitate the vehicle distinguish.
6. The vehicle must be equipped with sturdy wooden pieces that are jammed under the tyres to stop their moving while loading and downloading cylinders.
7. The vehicle must be equipped with enough front and rear light signals to at least six, two are mounted at the top of the driving cabin in addition to the side lights showing the boundaries of the tank.
8. The vehicle must be equipped with an electric circuit manual breaker within the reach of the vehicle's driver, in addition to the electric circuit automatic breaker to be activated when the load on the electrical extensions is increased.
9. The casing of the vehicle's electrical extensions must be of the thick, durable, hard type material resisting to damage factors, and the external extensions must be in metal tubes.
10. Exhaust drain unit must be installed downwards the front corner of the vehicle below the shock proof and its end is equipped with spark arrester to prevent sparks coming out.
11. The brake system must be sound and strong.
12. The engine must operate properly and its appearance must be sound and free of any fuel leakage.

- **Daily Inspection of Gas Cylinder Transport Vehicles:**

The authority, which has a license to transport and distribute gas cylinders, must inspect the following points on a daily basis regarding the safety and validity of the vehicle and before starting to use them:

1. Electrical connections in relation to electrical insulation, resistance to moisture and heat, damaged materials and the validity of the electrical current breakers in the failure cases.
2. Check the validity and cleanliness of the engine and fuel lines before each trip including inspecting the engine oil, cooling water and motion belts.
3. Verify the efficiency of the vehicle's brakes as they work properly.
4. Adjust the air pressure in the vehicle's tires.
5. Check the validity of vehicle lights including warning signal lights and mirrors.
6. Check the validity of the steering wheel.

- **Safety Precautions in the Handling, Transportation and Distribution of Gas Cylinders:**

1. The cylinders must be installed in their normal vertical state as per clause 3.2 and the total cylinder weights should not exceed 90% of the vehicle's permitted load.
2. The entire body of the cylinder must be inside the vehicle without appearing anything from it outside or behind the vehicle.
3. The vehicle's load must not exceed the limit set in the license for cylinders.
4. The vehicle must have a speed not more than 60 (km/h) with the words "speed 60 (km/h)" written on a panel mounted on the back of the vehicle.
5. Cylinders must be handled with a high degree of caution and care and it is forbidden to throw, roll or shock them even if they are empty.
6. The cylinder transport vehicle must be free of flammable materials.
7. It is forbidden to load and transport gas cylinders (empty or full) with other objects, and the use of cylinder transport vehicle for other purposes is prohibited.
8. Parking "waiting" for gas cylinder transport vehicles (packaged or full) in places have a lot of passers is prohibited except at specified periods of loading and uploading in distribution areas.
9. If the vehicles loaded by gas cylinders are disabled, it is forbidden to leave them on main roads or in residential. The company should inform the Abu Dhabi Civil Defense Authority (Firefighting), security authority and the company responsible official and take what is necessary to ensure the safety of the situation. In addition, the company should drag the vehicles to the workshops of the owner company after unloading the cylinders with the must stop the engine until the completion of the upload process.
10. The vehicle must be fully parked during loading and uploading operations in the fresh air.
11. In any case, the driver of the vehicle must be accompanied by a loading assistant in the vehicles that are loaded by more than 10 cylinders.

12. It is not permitted to transport or use any gas cylinder unless it is certified by the relevant authority, and to be completely intact and free of visible defects such as the bodies roughness, paint damage, scratches, cracks and bruises.
13. Attempts to hide scratches, scars and cracks from the body of the gas cylinder are prevented from using the putty or other substances.
14. No cylinder is permitted unless it is equipped with a metal protective collar mounted to its valve in order to prevent shocks and damage during transport and handling.
15. The gas cylinder is not allowed to be loaded and transported unless its valve is sealed and the lid is installed on it.
16. In any case, the cylinder valves must be sealed.
17. Empty cylinders must be transported in the same way as filled cylinders.
18. Vehicles not designed to load LPG cylinders are prohibited from entering the loading area.
19. Guidance panels must be placed on the doors of the vehicle on the two sides addressing the distributor name, the license number and the phone number.

- **Fire Prevention Requirements in the Handling, Transportation and Distribution of Gas Cylinders:**

1. The vehicle must be equipped with at least 2 9 kg of multi-purpose dry powder fire extinguishers, which are mounted outside the vehicle on both sides of the driving cabin (from behind), within the vehicle's dimensions.
2. Smoking is strictly prohibited while working on LPG cylinder transport vehicles and electric cigarette lighters and as same are prohibited inside the driving cabin.
3. Workers must be trained to follow the correct methods of loading, transporting and uploading gas cylinders and making them aware of their risk. The driver of the vehicle must always carry the guide to deal with the prevention of LPG accidents as well as the vehicle's license for the transportation of gas cylinders.
4. It is forbidden to leave the vehicle loaded with gas cylinders unattended.
5. In the event of a vehicle overturning or experiencing a serious accident, people should be removed from the area of the accident, preventing the prohibition of all forms of ignition sources and informing the company's official and the use of civil defense (fire) and security agencies to deal with the accident, organize traffic and breaker up the gathering around the accident.

G.3.3.1 LPG Transport Tanker

It is a design-specific vehicle and integrated with an LPG transport tank. The term tank is given to both the transported tank (solo) and the vehicle integrated into the tank.

- **General Conditions:**

1. The use of the LPG tank is permitted when all the requirements of the "safety" are met, and the necessary license is obtained from the competent authorities such as the General Directorate of Traffic and Abu Dhabi Civil Defense Authority (Firefighting) and the license is renewed periodically - after passing all the requirements of technical examination.
2. LNG supply providers are prohibited from supplying unauthorized sites with LPG storage.

- **Design Requirements:**

1. The design and manufacture of the tank must be in accordance with international standards adopted to resist the quality of the gas, the transport capacity and the operating pressure.
2. The tank discharge exit must be equipped with an automatic insulation valve to close the discharge tube closes when accidentally separated from the filling hose while the tank is filled.
3. The vehicle engine must be of the diesel-fueled and meet the safety requirements in terms of processing and performance.
4. The tank should be painted white and marked with **danger, liquefied flammable gas** - with the obligation to apply Haz-Chem international markings and symbols for hazardous materials transport vehicles.
5. The vehicle must be equipped with a shock reliever (support) that is solid in front and rear and the back is glued to reflective striped phosphorus tape - to facilitate the vehicle's discrimination.
6. The vehicle must be equipped with sturdy wooden pieces (crammed under the tyres) to stop its movement during packing and unloading.
7. The vehicle must be equipped with enough front and rear light signals to at least six, two of which are installed at the top of the driving cabin as well as side lights showing the boundaries of the tank.
8. The vehicle must be equipped with a manual electric breaker for its electric circuit, one at the rear of the tank and another at the filling and unloading connections, to enable the vehicle commander to stop the filling or unloading process in emergencies.

9. The vehicle must be equipped with a manual breaker near the vehicle's driver to enable cutting off the electrical circuit during the filling and unloading process and in emergency situations, in addition to the automatic breaker that automatically cuts the vehicle's electrical circuit when the load on the electrical extensions is increased.
10. The wrapping of the vehicle's electrical cable extensions must be of thick type, tension-resistant and damage factors, and the external extensions must be in metal pipes.
11. The Exhaust drain unit must be mounted downwards the vehicle's front corner under the shock protector and its end must be equipped with spark arrester to prevent sparks from coming out.
12. The brake system must be sound and strong.
13. The engine must operate properly, and its appearance must be sound and free of any fuel leakage.

- **Daily Inspection Requirements for LPG Tank:**

The requirements of clause 3.2.1 must be adhered to in this regard.

- **Safety Requirements in Transporting and Driving Gas Tanks on the Roads:**

1. The vehicle load should not exceed the quantity and operating pressure prescribed for the tank.
2. The vehicle must be more than 60 (km/h) with the words "speed 60 (km/h) written on a plate mounted on the back of the tank.
3. The vehicle must be clean and free of any other ignition materials.
4. Parking or waiting for a packed or empty tank in crowded places is prohibited, as well as on roads blocked on LPG tankers.
5. In the event of failure, it is forbidden to leave the full or empty tank on the main roads or in residential areas. The company should notify the Abu Dhabi Civil Defense Authority (Firefighting), the security authorities and the own company responsible official team to take what is necessary to ensure the safety of the situation, and to drag the vehicles to the workshops of the company, with the preference of emptying it before withdrawing. In all cases, the tank must be emptied before entering the maintenance workshop.

- **Safety Requirements to be Followed in Tank Filling and Unloading Processes:**

The filling and unloading of the tank must be carried out under the supervision of a technical person trained in facing and implement emergency procedures and his responsibilities shall be as follows:

1. Any leaked tank in the filling site is prohibited from filling and must be immediately withdrawn to a safe place (in accordance with the special relevant procedures) with the evacuation of the area and the recall of the owner and civil defense (Firefighting).
2. Filling is forbidden at night unless the lighting is adequate, protected and spark proof.
3. During filling and unloading, the tank must be parked in a safe place and away from the risk of collision, making sure that the manual brakes are tightened, and the wood pieces are placed under the tyres to stabilize the vehicle's movement completely.
4. The tank engine must be completely isolated and shut down, including any moving units or electrical equipment, except for gas filling and unloading equipment.
5. Workers must wear protective gloves during the filling and unloading process.
6. The LNG reservoir must be inspected to verify its suitability to receive the quality and quantity of the gas.
7. Make sure that the tank to be filled and its extensions are in a sound state, free of defects or failures and suitable in terms of design to withstand pressure and quality of the gas transported.
8. The tank must be grounded (connected to grounding cable) before and during the filling and uploading process to discharge static electricity from it, and ensure that the grounding cable is removed from the vehicle before moving.
9. Pressure meters should be monitored during tank filling and reservoir uploading to prevent the LPG rash, and the meter reading should be re-inspected after the operation has been completed.

- **Fire Prevention Requirements for LPG Tankers:**

1. The vehicle must be equipped with at least 2 of 12 kg multi-purpose dry powder fire extinguishers installed outside the vehicle on both sides of the driving cabin (from behind) within the vehicle's dimensions.
2. Smoking is strictly prohibited during transportation, filling and unloading of LPG tanks as well as the presence of electric cigarette lighters and so on is prohibited inside the driving cabin.
3. Workers should be aware of the LPG dangers and trained to follow the correct procedures for transporting, filling and unloading gas tanks. The vehicle ‘s driver must always carry a guide for dealing with emergency accidents of LPG tanks as well as the necessary license for the vehicle to transport gas.

4. It is forbidden to leave the vehicle unattended, whether packed or empty.

5. In the event of a tank overturning or having a serious accident, transport the persons from the incident place, banning all forms of ignition sources from the area and informing the officials of the company. In addition, ask for civil defense (Firefighting) and security agencies support to contain the incident, organize traffic and ending up the crowd around the incident.

6. The tank vehicle must always be maintained to sustain its validity and integrity through regularly comprehensive technical examination. The contractor or tank owner must maintain a permanent reference record of the tank's work periods, distances, maintenance and repair work to be submitted to the competent authorities upon request.

G.4 Compressed Gases

G.4.1 Detentions

- **Compressed Gases:** Gases that retain their gas status when packaged inside the cylinders. The packing process is carried out under relatively high pressure and the conditions of normal or very low temperatures.

- **Liquefied Gas:** Gases that could be liquid and gaseous conditions under the pressure of packaging and at normal temperature 25 ^{O}C. These gases can be classified according to the conditions of their packaging into two types:

  a) Gases with medium pressure and very low cooling (- 190 ^{O}C), such as oxygen, nitrogen and argon.
  b) High-pressure and lightly cooled gases (-20 ^{O}C), such as carbon dioxide and nitrous oxide.
  c)Cooling liquefied gases are called cryogenics or cold gases.

- **Medical Gases:** Gases that are used in the medical fields for surgical and an aesthesia purposes and are highly pure.

- **Toxic Gases:** Highly toxic gases that, if they come to living organisms and humans by touch, swallowing or inhalation, have the potential to damage and destroy the tissues and organs of the body or injure the functioning of the body's vital functions and may lead to death - depending on the extent of gas exposure, concentration, rate, location and area of absorption of the body.

- **Flammable Gas:** Gas**,** which, if combined in appropriate proportions with air, oxygen or other oxidants, burns under normal pressure conditions and gas ignition temperature.

G.4.2 General Requirement

1. The clause concerned the processes related to the transportation, trading, storage and handling of compressed flammable, toxic, industrial or medical gases packed in cylinders, fixed or transported tanks or used within an extension network.

2. Preliminary approval must be obtained from the Abu Dhabi Civil Defense Authority (Firefighting) and then the issuance of a necessary license (for the storage or circulation of compressed flammable, toxic, industrial or medical gases including their extension network for the followings:

   a) quantities of compressed flammable gas that do not exceed 60 m^3.
   b) quantities of non- flammable compressed gas that does not exceed 180 m^3.

   Calculating the volume of compressed gas depends on the size of the vacuum occupied by it in the natural pressure and temperature (1 air pressure, 25 ^{O}C).

3. The distinction of compressed gas cylinders must be abided in accordance with the international specification adopted by the Abu Dhabi Civil Defense Authority (Firefighting) in this regard.

4. The installation (or attempt to repair) of any extensions for the use of compressed gases is prohibited except by specialists.

5. Customers of these gases should be fully aware of suppliers and how to contact them when needed in case of emergency.

6. When dealing with these gases, protective clothing, which does not interact with the skin when fire, should be worn to protect the skin as well as visor face masks, glasses and gloves for the compressed gases handling which should be the type that is easy to take off when the gas leaks into it, as well as appropriate rubber shoes.

7. A prior contingency plan (written) must be prepared in coordination with the Abu Dhabi Civil Defense Authority (Firefighting) on dealing with compressed gas accidents.

G.4.3 Compressed Gas Transport Tanks

Compressed gas Tanker: It is a design-specific vehicle integrated with a compressed gas tank. The term tank in this item is given to both the transported tank (solo) and the vehicle integrated into the tank.

1. Compressed gases must be filled in special designed tanks licensed by the Abu Dhabi Civil Defense Authority (Firefighting).

2. The tank is forbidden to be filled with any gas until it has been completely cleaned of any other gases that may interact with it, by pushing it with inert gas.

3. The international marking and symbols system must be applied on the tanks.
4. Any tank where the leak is detected at the packing site is prohibited from filling and must be immediately withdrawn to a safe place (in accordance to special procedures) with the evacuation of the area and the recall of the owner and Abu Dhabi Civil Defense Authority (firefighting).
5. Special parking should be allocated for filling and unloading compressed gas tanks.
6. The packing and unloading process must be carried out with trained supervisors who are fully aware of the seriousness of the gases and how to deal with them in emergencies through using the relevant protective devices.
7. The tank must be grounded before the discharge process begins when the contents are flammable.
8. It is prohibited to initiate the process of filling or unloading before the complete braking of the tank has been confirmed using of manual brakes.
9. Warning plates and signs should be placed during and until the completion of the filling or unloading process to warn non-specialists not to approach. The plate should be 30×40 centimeters and written in white on a blue background and carrying phrases such as Stop, Dangerous gases.
10. The tank valves must be sealed after uploading and then place the words "gas tank" ... - empty on it with the name of the gas in the vacuum depending on the gas type before leaving the tank.
11. Excessive force is prohibited in closing tank valves when filling or unloading, especially in the event of leakage, tampering in extensions or using a hammer to open any valve that is difficult to open with the call of competent authorities such as Abu Dhabi Civil Defense Authority (firefighting), owner, supplier, etc.
12. Make sure that the tank is completely free of all its contents before subjecting it to any welding or maintenance operations.

G.4.4 Special Protective Requirements for some Compressed Gases

1. **Cryogenics (called frost or cooled gases):** They are gases that are highly cooled to a temperature that may reach to 180°C below zero, such as oxygen, nitrogen and argon.

   Oxygen vessels and cylinders should be disinfected from grease, oils and any contaminants before being filled.

   Ignition sources should be putted away from compressed oxygen gas and liquid.