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Dangerous Goods Logistics

Warehouse Procedures

Owner: BDM Dangerous Goods

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Dangerous Goods Logistics

Warehouse Procedures

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1. OBJECTIVE

The objective of this Procedure is to protect SMSA facilities, SMSA workers and cargo from the hazards of chemicals, to prevent or reduce the incidence of chemically induced illnesses and injuries resulting from the use of chemicals stored at the warehouse facility, and consequently to enhance the protection of the general public and the environment by providing instructions for:

- a) ensuring that all chemicals storage, including impurities, by-products and intermediates, and wastes that may be formed, are evaluated to determine their hazards;
- b) ensuring that SMSA is provided with a mechanism for obtaining from the suppliers information about the chemicals used and stored at work to enable SMSA to implement effective programs to protect workers and the Company from chemical hazards;
- c) providing workers with information about the chemicals at the workplaces and about appropriate preventive measures to enable them to participate effectively in safety programs;
- d) establishing principles for such programs to ensure that chemicals are stored safely;
- e) making special provision to protect confidential information which disclosure to a competitor would be liable to cause harm to SMSA.

This Procedure provides practical instructions and implementation.

2. APPLICATION

This Procedure applies to all SMSA warehouses in which chemicals are stored, except where specifically excluded from the application of KSA or International laws by the competent Authority. This Procedure should be considered as basic requirements for preventing or reducing the risks to health and safety, the Company and the environment when storing hazardous chemicals.

3. DEFINITIONS

“Chemical substance” means a substance composed of an element or a compound formed when elements are chemically bonded.

“Hazardous substance” can be any **substance**, whether solid, liquid or gas, that may cause harm to your health. **Hazardous substances** are classified on the basis of their potential health effects, whether acute (immediate) or chronic (long-term).

“Chemical and hazardous substances storage” means either a storage of chemical substance or a storage of hazardous substance or both.

“Storage facility” means a warehouse used to store chemicals and hazardous substances.

“Storage” means storage of chemical and hazardous substances inside and outside a storage facility but not including storage in tank, silo and portable/bulk container cryogenic liquefied gas or refrigerated liquefied gas.

“Walls” means walls of a warehouse where chemical and hazardous substances are stored that is constructed of fire-resistant materials or built as fire walls, as deemed appropriate.

“Fire-resistant materials” means construction materials that are non-combustible.

“Fire walls” means the vertical partitions built to separate the internal area of the building and prevent the spread of fire, which are constructed of fire-resistant materials that can withstand fire. The fire-resistant ratings are, depending on types of materials and thickness of walls, 30 minutes, 60 minutes, 120 minutes and 180 minutes in compliance to the international standards.

“Safety signs” means specific signs and symbols identifying activities, situations and providing information or operational procedures related to safety and/or occupational health, with which colors and symbols are coordinated and entitled to be in compliance to concerned laws.

“Packaging” means packages and International Bulk Containers (IBCs) used to contain chemical or hazardous substance for storage in the storage facility.

“Packages” means a container of chemical or hazardous substance having maximum capacity of not exceeding 450 liters and maximum net mass not higher than 400 kg.

“Intermediate Bulk Containers (IBCs)” means containers of chemical or hazardous substance having a capacity of:

- a) not more than 3.0 m³ (3,000 liters) for solids and liquids classified in Packing Group II and III;
- b) not more than 1.5 m³ for solids classified in Packing Group I when packed in flexible, rigid, fiberboard, wooden or composite IBCs having inner plastic receptacle.
- c) not more than 3.0 m³ for solids classified in Packing Group I when packed in metal IBCs.

“Salvage packages” means a special package, into which damaged, defective, leaking or non-conforming packages or chemicals or hazardous substances that have spilled or leaked, are placed for purposes of transport for recovery or disposal.

“Classification of chemical and hazardous substances for storage” means classification of chemical and hazardous substances by their physical, chemical properties or their possible hazards for purposes of safety storage.

“Preventive measures” means measures taken to prevent any dangers that may occur from chemical and hazardous substances storage, which comprises various activities such as hygiene management, operating instructions, training and spill & leak response, etc.

“Special requirements” means additional requirements for a storage facility of chemical and hazardous substances of specific properties, which are explosives, gases, flammable substances and oxidizing substances.

“ADR” means Accord européen relatif au transport international des marchandises dangereuses par route (The European Agreement Concerning the International Carriage of Dangerous Goods by Road)

“IMDG” Code or International Maritime Dangerous Goods Code means the International Guideline for the safe transportation or shipment of dangerous goods or hazardous materials by water on vessel.

“IATA Dangerous Goods” Regulations (**DGR**) means to the International Publication used to prepare, handle or accept **dangerous goods** shipments by air.

“SDS” (Safety Data Sheet) is a document that contains information on the potential health effects of exposure to chemicals, or other potentially dangerous substances, and on safe working procedures when handling and storing chemical products.

4. GENERAL STORAGE REQUIREMENTS

1. Storing should be based on the class and the level of danger posed by the substance.
2. A copy of the MSDS should be kept in the warehouse.
3. Substances should not be exposed to heat or sunlight.
4. All containers must be tightly sealed.
5. The stored quantities should be minimized.
6. Temperature inside the storage area must be controlled depending on the substance stored.
7. Each class must be kept in a separate area, to prevent fires from escalating.
8. Chemicals must be handled with care, and not dropped or thrown.
9. The containers must be made from proper materials depending on the substance stored.
10. Warning signs should be clearly printed on all containers.
11. The cylinders or containers must be stored vertically (upright)
12. Separate substances that are incompatible or may react dangerously together.
13. Containers must not allow water to interact with the substance.
14. The shelves must be rigid and divided into storage spaces that are appropriate to the substance stored.
15. Spaces should be left between the stored substances and between the substances and the walls.
16. The older items should be used first, or the items that are closer to the expiry date (FIFO).
17. Each container should have the following information clearly written on it: chemical name, international reference code, date of manufacturing, date of storage, destination, and the number of recipient.
18. The containers must be placed on bases (pallets) that are at least 10 cm high, and they should be made from the same material as the container.
19. Containers must not be placed in the aisles or in front of the exits, even if temporarily.
20. Flat ground level is required for storage.
21. Warehouse must be dry and free of humidity.
22. The containers should not be opened to refill the smaller containers inside the storage area; there should be a specific area for that.
23. Colors must be used to distinguish gas cylinders.
24. Air reactive materials must be stored underwater or any other substance depending on the nature of the material stored.

25. Oxygen cylinder must be stored away from other flammable gasses.
26. Oxidizing agents must not be stored with flammable or combustible goods.
27. Manufacturer instructions must be followed when handling the dangerous goods.

5. SPECIFIC STORAGE REQUIREMENTS:

Class 1: Explosives:

A special list of requirements is available with the Civil Defense.

2.1. Flammable Gases:

Examples: Hydrogen, Oxygen, etc.

Dangers: low flashpoint, and highly flammable.

Storage:

2. Keep away from fire sources, explosives, and oxidizing agents.
3. Keep away from substances that interact with air or humidity.
4. Must be kept in a safe place where there is no risk of the containers falling down.
5. Oxygen must be kept away from other flammable gases.
6. Canisters must be continuously monitored to prevent/avoid leakage.
7. Fire alarms and leakage sensors must be present at the facility.
8. The warehouse must have windows to provide natural lighting spread uniformly across the walls, and the windows should occupy a space no less than 10% of the total wall spaces in the warehouse. The warehouse must have vents as well with a space no less than 25% of the total wall spaces in the warehouse.
9. The height of the ceiling vent should not be less than 2.5 meters from the ground, and the lower vents should be on the ground level approximately.

2.2. Non toxic non flammable gasses:

Examples: Nitrogen, Carbon dioxide.

Storage requirements:

The cylinders must be kept vertical and the valves tightly shut.

- Cylinders containing the same type of gas should be stored together, and separate from other gas types.
- The cylinders must be stored in a safe area where the cylinder is not at risk of falling down.
- The cylinders must be continuously monitored in order to detect leaks.
- The cylinders can only be repainted through the original supplier.
- Empty cylinders must be stored in a separate dedicated area inside the warehouse.

The contents of the cylinder must match the description written on the cylinder itself.

Valves, regulators, and measurement devices must be kept functional at all times and covered with a protective cover/lid.

Class 3:

3.1. Flammable liquids: these substances have a flashpoint of less than 37.8 degrees Celsius (100 F).

Categorized based on the flashpoint:

Class A: Flashpoint less than 22.8 Celsius (73 F), with a boiling point less than 37.8 Celsius (100 F).

Class B: Flashpoint less than 22.8 Celsius (73 F), with a boiling point at or more than 37.8 Celsius (100 F).

Class C: Flashpoint at or more than 22.8 Celsius (73 F), with a boiling point less than 37.8 Celsius (100 F).

3.2. Combustible liquids: these substances have a flash point at or more than 37.8 Celsius (100 F), categorized as follows:

Class I: flash point at 37.8 Celsius (100 F) and less than 60 Celsius (140 F)

Class II: flash point at or more than 60 Celsius (140 F) and less than 93.4 Celsius (200 F)

Class III: flash point at or more than 93.4 Celsius (200 F)

Storage requirements:

Must be stored away from oxidizing agents/acids.

Must be stored away from sources of ignition, heat, flames, sparks, and open flames.

Must be stored in a cold, dry area with no humidity.

The warehouse must contain multiple ventilation ducts at the ground level approximately 3 cm from the ground level; the air change rate needs to be 4-6 changes per hour.

Class 4: Flammable solids:

Storage:

Must be kept away from sources of ignition and oxidizing agents.

Class 5: Oxidizing agents and organic peroxides:

Subcategories:

5.1. Oxidizing agents: substances that react violently with organic substances.

Storage requirements:

Must be kept in a cold, dry, non humid area.

Must be kept away from flammable/combustible material, and organic solvents.

Must be kept away from reducing agents.

Must not be stored on shelves or pallets made from wood, carton, or paper products.

Chlorine must be stored away from acids.

5.2. Organic Peroxides:

Storage requirements:

Must be stored in a cold dry area.

Must be kept in a dimly lit/dark area, and the containers must be kept tightly shut.

Must be disposed of prior to the expiration date.

Class 6: Toxic chemicals:

Storage requirements:

Must be stored in tightly shut containers, in the lower shelves/racks.

Must be kept in a separate area from the other substances.

Must be kept away from heat, humidity, and other sources of ignition.
Must not be mixed with acids and gasses.
Must be kept away from acids, and other corrosive materials.
PPE must be provided in the storage area (gloves, rubber shoes, breathing masks, first aids kits, etc.)
The handlers must be instructed not to inhale any fumes or physically touch the chemicals.

Class 7: Radioactive material:

No information provided.

Class 8: Corrosives:

Subcategories:

- 1- Liquid corrosives.
- 2- Solid corrosives.
- 3- Gaseous corrosives.

Storage requirements:

Must be kept away from caustics, oxidizing agents, and other acidic substances (mineral acids, oxidizing acids).

Must be kept away from active metals.

Oxidizing acids must be kept away from other acidic substances such as organic acids and other flammable or combustible substances.

Acids must be kept away from chemicals which can produce flammable or toxic gasses.

Must be kept away from toxic substances.

Stronger acidic substances must be stored in a separate location from reducing agents.

The containers must be stored on the lower shelves/racks.

The warehouse must be cold, dry, and non humid.

Air change rate must be 4-6 changes per hour.

Showers must be present in the storage area.

8.1. Caustics:

Must be kept away from acids, organic acids, and oxidizing acids.

Must be kept away from metals, explosives, organic peroxides, and flammable/combustible material.

The containers must be stored on the lower shelves/racks.

Class 9: Miscellaneous substances:

1. Water reactive substances:

Storage requirements:

Must be kept away from water sources, and in a location where water from fire fighting hoses will not reach them.

Must be kept in a cold, dry, and non humid area.

Must be kept away from ignition sources.

Must be kept away from acids and caustics.

Must be kept away from chemical reactions.
ABC or D fire extinguishers must be available in the storage area.
Smoke and heat detectors must be available at the storage area.

2. Pyrophorics:

Storage requirements:

Stored in a cold dry area, with the containers tightly shut.
Containers must be flushed with inert gasses or liquids depending on the type of pyrophoric stored, ex: white phosphorus should be flushed with water.
Must be stored away from sources of ignition, acids, and caustics.
Must be stored away from chemical reactions.
Must be stored away from water sources, and humidity.

3. Light sensitive chemicals:

Storage requirements:

Must be stored in a cold dry area.
Must be stored in a dark area.
The containers must be colored with yellow and red colors.

4. Cyanides:

Must be stored away from acids and oxidizers.

Preventive Measures:

- i. The sticker on the cylinder, the colors, and the information written must not be removed.
- ii. Lightning rods should be installed on the warehouse.
- iii. Smoking and lighting matches should not be allowed in the warehouse area, and clear warning signs should be present at warehouse entrance.
- iv. The warehousing area should be always clean and free from clutter.
- v. The warehouse should be always closed and only opened during dispatching and receiving.
- vi. Body searches for all workers or visitors to make sure none of them are carrying ignition sources (lighters, matches)
- vii. Unauthorized personnel are not allowed inside the warehouse.
- viii. DG awareness training to all workers.
- ix. Eating and drinking should not be allowed within the storage area.

6. RESPONSIBILITY FOR THE WAREHOUSE

Overall responsibility for the warehouse is borne by SMSA Logistics Department Head.

In particular, the Logistics Head is responsible for:

- intended operation of the storage facility,
- due and proper labeling and safe handling of the products,
- due and proper storage,
- due and proper condition, in particular of the safety installations,
- assessment of risks and the stipulation of protective measures,
- work hygiene, work safety, and protection of the environment,
- selection of qualified employees,
- training and instruction of employees,
- coordination of activities and work processes,
- a code of practice for external personnel,
- planning of measures for emergencies.

The Logistics Management must appoint a suitable DG Warehouse Safety Supervisor with the above obligations in order to fulfill the tasks mentioned, the DG Warehouse Safety Supervisor must have adequate knowledge of safe handling of hazardous substances. Training and further training is necessary in this respect.

Cooperation between companies

An appraisal of the combined or reciprocal risks is necessary if an in-house or a partner company or customer jointly occupying the premises carries out activities parallel to SMSA. Recurring situations are to be recorded in the documentation of the risk assessment; in individual cases or in the case of special activities, a coordinator should ensure that the necessary protective measures and scheduling are coordinated with each other.

7. APPROVALS

The Logistics Department is responsible for ensuring the proper operation; in particular they may not store any products with properties and in quantities that are not covered by the approval of the applicable Authorities in KSA.

8. RISK ASSESSMENT

In order to operate the warehouse where hazardous substances are being stored in packages and containers, the Logistics Department is required to carry out and document a risk assessment.

Procedures for assessment

The assessment should be carried out by the appointed Logistics Department persons who have the necessary information, instruction and training and are competent to do so. It should include:

Assessment of risks

This should include consideration of which chemicals are used and the nature of their hazards, i.e. whether they may present a risk of one or more of the following:

- acute or chronic ill health by entry into the body through inhalation, skin absorption or ingestion;
- injury or ill health from skin or eye contact;
- Injury from fire, explosion or other events resulting from physical properties or chemical reactivity;
Absorption of hazardous substances through skin contact, oral intake or inhalation.
- Storage in small quantities.
- Joint storage of combustible liquids with flashpoints over 60 °C to 100 °C with flammable liquids.
- Storage of acutely toxic or flammable gases in protected areas for pressurized gas cylinder or containers.
- Behavior of combustible fluids in extinguishing water retention installations (explosion protection measures)
- Storage of substances that require a shortening of escape/emergency route lengths.
- Behaviour in emergency situations (e.g. leakages, fires).
- Open handling (e.g. for refilling work and sampling).
- Handling with warehouse facilities, vehicles and warehouse handling equipment (e.g. automatic stretch wrapping machines, conveyors) as well as
- Frequency of emergency drills

Appraisal of control measures

An estimate of risk, and whether it can be eliminated, should be made, taking into account the engineering control measures and systems of work. In estimating health risks, account should be taken of exposure limits or other exposure criteria specified, approved or recognized by the competent authority (Civil Defense, Fire Department). Personal protective equipment should only be taken into account as a method of control where other measures have been taken but are not sufficient;

Action program

The estimated risk should be compared with criteria that have been formulated, agreed or recognized by the Competent Authority (Civil Defense and Fire Department) for safety in the use of chemicals and a program of work drawn up based on these established criteria or, where such criteria do not exist, other valid criteria.

The assessment of risks should take into account:

- (a) the quantity of the chemical present at the workplace;
- (b) the operating conditions and processes applied at the workplace;
- (c) the range of uses of chemicals for which the employer is responsible, which might include production, handling, storage, transport and disposal;

- (d) the variety of tasks that contribute to a work activity, particularly those where the engineering controls provided are not available, e.g. during certain maintenance, breakdown or cleaning tasks;
- (e) the nature of the chemical and whether the hazards and associated risks are increased by the way it is used, e.g. at high temperatures and pressures;
- (f) the consequences and likelihood of a possible failure or sequence of failures of the control measures provided.

Review of assessment

The assessment should be reviewed whenever there is reason to suspect that it is no longer valid or where there has been a significant change in the work to which the assessment relates.

The assessment may be shown to be no longer valid because of, for example:

- (a) the results of periodic thorough examinations and tests of engineering controls;
- (b) an incident which led or was liable to lead to a fire or explosion;
- (c) the results of monitoring exposure at the workplace, the results of health or medical surveillance, or a confirmed case of occupationally induced disease;
- (d) new information on health hazards, or on fire and explosion risks.

A significant change in the work may consist of:

- (a) a change in the substances used or their source;
- (b) plant modification, including engineering controls;
- (c) a change in the process or methods of work;
- (d) a change in the volume or rate of production.

Elimination

Employers should include in their assessment consideration as to whether the risks from the hazardous chemicals used can be eliminated by:

- (a) ceasing to use the chemicals;
- (b) replacing them by less hazardous chemicals or by the same substances in a less hazardous form. Care should be taken to consider all the known risks of the proposed substitutes, and action should be taken on precautionary measures before substitution;
- (c) using an alternative process.

9. SAFETY DATA SHEETS

Safety data sheets (SDS) are documents with information on the safe handling of hazardous substances or

mixtures. Safety data sheets provide the professional user of chemicals with important information on the identity of the product, possible occurring risks, safe handling and storage, as well as appropriate measures for prevention and in the event of danger. It is sensible and

required to check the details in the supplied safety data sheet for consistency and plausibility upon initial receipt of goods. This check can be carried out in stages.

SDS

General details

The manufacturer's/supplier's identification, the trade name of the product and the revision date are to be shown on the first page of the safety data sheet. In addition, the respective page number and the total number of pages are to be stated on each page. Alternatively, reference can also be made to further following pages – in which case, the last page is to be marked clearly.

Section 1: Identification of the substance/mixture and of the company/undertaking

This section contains details of product identification, on its use and distribution, and an emergency phone number.

Section 2: Hazards identification

This section contains the classification and labelling elements of a substance or a mixture. (1a) (1b)

Section 3: Composition/information on ingredients

Using these details, it is possible to recognize the hazardous properties of the relevant components of a mixture. As it is not necessary to specify the complete composition (type of components and their respective concentrations), the total of specified ingredients can deviate from 100 %. The actual hazardous properties of the mixture are stated under section 2.

Section 4: First-aid measures

This section describes which steps are to be taken immediately in the event of accidents, whether medical

assistance is necessary or advisable or whether immediate medical attendance is necessary, whether possible delayed effects have to be expected because of the exposure and what symptoms and effects can occur, but also when no first-aid should be carried out by untrained personnel.

Section 5: Fire-fighting measures

This section specifies the requirements for fighting a fire caused by the substance or mixture.

Section 6: Accidental release measures

This section contains details on personal protective measures, environmental protection measures and cleaning procedures.

Section 7: Handling and storage

The details in this section help the business operator to stipulate suitable work procedures and organizational measures.

Section 8: Exposure controls/personal protection

The details on limitation and monitoring of exposure help to keep employee exposure as low as possible whilst using the substance or mixture.

Section 9: Physical and chemical properties

This information provides details on how to take appropriate protective measures. For this reason, it is necessary to specify all known relevant physical-chemical properties of the substance or mixture.

Section 10: Stability and Reactivity

The stability of the substance or mixture, as well as possible dangerous reactions, are described in this section. Both the intended use as well as a foreseeable improper use of the product should be taken into account.

Section 11: Toxicological information

This section contains a brief but complete description of the various toxicological effects (on health) that may arise if coming into contact with the substance or the mixture.

Section 12: Ecological information

This section describes the possible effects and the behavior and remaining traces of the substance in the environment (air, water and/or soil).

Section 13: Disposal considerations

This section contains appropriate disposal procedures for the substance or mixture and for soiled packaging materials (incineration, recycling, depot etc.).

Section 14: Transport information

Details are provided of the special precautions that need to be observed with regard to transport and transport containers. Where relevant, details of rating according to the respective regulations on the various types of transport are to be provided: IMDG (sea transport), ADR (road transport), RID (rail transport), ICAO/IATA (air transport).

Section 15: Regulatory information

Information regarding relevant Community safety, health and environmental provisions for substances and mixtures which are not listed in the preceding sections of this safety data sheet, they are to be provided as far as possible in this section. Wherever possible, reference is also to be made to special national regulations and other relevant national features. Here, it can be seen whether the supplier has subjected the substance or mixture to a chemical safety assessment.

Section 16: Other information

Contains all other information that is of significance for understanding the safety data sheet. This also includes details concerning revisions of the safety data sheet (amendments can be specified and explained here), main abbreviations and important literature references and data sources.

10. REGISTER OF HAZARDOUS SUBSTANCES

The Register of Hazardous Substances is a systematic compilation of hazardous substances stored and provides information for preparing risk assessments and necessary safety measures in the warehouse. The Register of Hazardous Substances must contain the following details:

- The names of the hazardous substances (e.g. product or trade name from the Safety Data Sheet).
- Classification of the hazardous substance or information on the hazardous properties.
- The tonnage levels used and
- Affected working areas (typical working areas can include warehouse, warehouse areas and warehouse sections).

- A copy of every hazardous product entering the warehouse or intended to be stored in the warehouse. In case of fire or spill with a particular product, the SDS of the product must be consulted for procedures.

Organizational measures for safety and health protection

The employees in the warehouse make a considerable contribution to safe storage. Appropriate steps should also be taken to protect them against risks to health and safety when storing products through risk assessments taking into account overall health and safety. Only appropriate and instructed employees who carry out work in accordance with operating instructions and regulations may be granted access to work in the DG area. The employees are under obligation to notify the warehouse management immediately about any occurrences such as damaged packaging, leakages, fires and accidents.

Operating instructions and employee information

Operating instructions must be on hand when carrying out storing and related activities. The results of the risk assessment are the basis for the operating instructions. The following points should be clarified in the instructions:

- Each employee is responsible for the cleanliness and tidiness of his own workplace; each workplace should always be tidied up at the end of work.
- Gangways, aisles and means of access must be kept free of obstructions.
- Tools and auxiliary appliances which are no longer required, e.g. ladders, steps and empty pallets, must be cleared away immediately and returned to the intended storage points.
- Floor soiling, in particular caused by oil and grease, must be removed immediately.
- Waste must be collected at the intended collection points and removed from the warehouse at the end of work.

Good housekeeping is very important. Attention must be paid in this respect to not only cleaning floors but also removing dust deposits and cleaning conveyor systems. Brushing with a broom should be avoided as this throws up clouds of dust particles. Dust deposits should preferably be cleared away with industrial vacuum cleaners or industrial suction sweepers. The type of vacuum cleaner and filter quality should be chosen according to the type of substance involved.

An examination of orderliness and cleanliness is part of the regular inspection routine. Corroded, deformed or damaged containers are to be removed. Damaged or illegible labels are to be replaced. Slow moving items should be identified at the latest during a stock inventory (e.g. on an annual basis). Warehouse items that are no longer required should be disposed of in a correct manner. The behavior of employees should also be noted during inspection tours.

Rules of conduct include in particular:

- compliance with the ban on smoking,

- wearing suitable work clothing,
- no consuming of food and beverages in the storage area,
- washing hands before breaks,
- follow access and behavior rules for visitors,
- not damaging safety installations; reporting any damaged safety installations,
- not restricting the function of or access to safety installations.

Operating instructions for hazardous substances

Operating instructions can relate to individual substances (e.g. special substances or substance groups such as cyanide, hydrofluoric acid, organic peroxide, potentially explosive substances) or groups of hazardous substances with similar properties (group instructions). In particular, the following points are to be observed:

- Specification of respective hazard labeling and classification.
- Hazards that are linked to the storage of these dangerous substances.
- Technical, organization and personal protective measures, as well as code of behavior.
- References to joint storage bans.
- Behavior in the event of emergencies, e.g. instructions for occurrences of leaks or fires.
- Pay attention to any danger of fire and explosion.
- Avoid ignition sources that could lead to fires or explosions. Ignition sources can include auxiliary substances or waste (e.g. oil-soaked cleaning rags).
- First-aid measures.
- Disposal of waste products.
- Operating instructions are to be brought in line with latest findings and must be updated accordingly to the current level of risk assessment.

Instruction

Employees are to be instructed on the basis of the operating instructions prior to commencement of activities and subsequently at least once a year in the event of significant changes. Attendance to the course of instruction must be confirmed by means of signature. It is important for the course of instruction as well as for the preparation of the operating instructions – which the choice of language is such that everyone involved is able to understand the contents. Photos are also very suitable for illustrating general operating instructions.

The contents of the course of instruction should also include behavior in the event of emergencies, e.g. in the event of product leakage or fire. In addition, drills should be carried out to rehearse how employees in the warehouse should get to safety or be rescued. The frequency of these regular emergency drills is to be determined in the risk assessment.

Substance-related information (e.g. safety data sheets) concerning the substances stored in the warehouse must be kept on hand in order to inform the indoor and outdoor workforce about

possible dangers and the corresponding steps to be taken, in particular in the event of any product leakage. This information must show:

- The name of the stored hazardous substances.
- Name and address of the manufacturer, importer or distributor.
- Information about particular dangers.
- Protective measures in order to counteract such danger.
- Steps to be taken in the event of any breakage or other damage to the packaging.
- Steps to be taken and appropriate assistance if anyone comes into contact with the stored substance.
- Steps to be taken in the event of fire, in particular the resources or groups of resources that may or may not be used for fire-fighting.
- Steps to be taken in order to avoid environmental damage.

Hygiene

SMSA Logistics Department is responsible for providing employees with the necessary resources for their personal hygiene.

These include:

- Sanitary systems.
- Washing and showering facilities.
- Social rooms.
- Separate storage possibilities for everyday and work clothing if there is a danger of contamination by dangerous chemicals.

In order to avoid hazardous substances being carried along inadvertently into clean areas such as offices, conference rooms or canteens, it is important to ensure that work clothing contaminated with hazardous substances is removed before leaving the work area (e.g. do not hold stairway banisters/rails with contaminated gloves).

Personal protective equipment

Personal protective equipments as body protection must always be used if the dangers of injury and health hazards cannot be eliminated or not adequately eliminated through technical or organizational safety measures. This applies, for example, in the case of contaminated containers, when working above head-height and in the event of leakages and their rectification. Risks and dangers at the respective workplace are to be taken into account when choosing appropriate personal protective equipment because there is no universally suitable form of protective equipment. Additional protection against electrostatic charging is to be provided in explosive atmospheres, e.g. antistatic safety shoes and work clothing. The protective equipments (depending on requirements according to the results of the risk assessment: safety gloves, safety shoes, safety helmet, safety goggles, face protection mask,

protective clothing, respiratory protective devices etc.) must be suitable for leaking chemicals and work to be carried out and must be placed at the disposal of the respective employees. Employees must wear provided protective equipment as instructed; compliance is to be monitored by Supervisors. Regular maintenance (and cleaning where applicable) is required to ensure correct function. SMSA Logistics Department must ensure the appropriate cleaning of any work clothing contaminated by hazardous substances. SMSA Logistics shall dispose of and replace damaged personal protective equipment. Portable respiratory-protection equipment is also to be kept available or carried depending on the type of substances being stored and the local conditions. Personnel must be carrying respiratory protective devices when entering storage rooms where products are stored that require the wearing of such devices. Respiratory protective devices must be kept outside of the hazard areas in a manner such that the employees can access it quickly.

Non-stationary electrical equipment

Only explosion-protected electrical equipment or electrical equipment that complies with the Industrial Safety may be used in potentially explosive atmospheres. Mobile electrical equipment such as sweeping machines and vacuum cleaners, as well as lamps, scanners, handheld-equipment and tools, must be suitable for the respective warehouse sector (conformity declaration, manufacturer's operating manual). Electrical equipment must be checked for apparent faults, each time before being used.

The use of private electrical equipment by employees in the DG or DG containment area, such as mobile phones, radios or MP3 players, is not permitted insofar as their safety status cannot be ensured.

11. TRAINING

A training register must be kept for all Training containing copies of:

- Staff ID
- Certificates
- Job function

Training on the Procedures and Dangerous Goods must be scheduled for all new employees. Refresher training must be conducted once a year and recorded. Training must also be conducted as soon as new procedures or new equipment and new products are being stored.

Training must be arranged by the designated person responsible as appointed by the Logistics Management.

12. STORAGE PLAN



For storing hazardous substances, a storage plan must always be drawn up to provide employees in the warehouse with a clear indication which substances and amounts of them can be stored where so that an easy orientation is possible in the event of a fault (e.g. leakage) or a fire.

The storage plan should also contain information on storage points that may only be used under certain restrictions. These include storage points

- with height restriction, e.g. because of ventilation ducts, sprinkler pipes or nozzles,
- with reduced load capacity,
- in the immediate vicinity of effective sources of ignition; in this case, storage of flammable hazardous substances is not permitted,
- in the immediate vicinity of lighting elements; products may not be stored here that could react dangerously as a result of warming up.

Controlling joint storage is achieved appropriately through the details in the storage classes for each warehouse area or warehouse sector. The storage class is determined through the classification of a product. The rules for the separate and joint storage with products of different storage classes are based on this. The following basic rules must be observed when drawing up the storage plan:

- Hazardous substances may only be stored jointly if this does not increase the risk.
- Separate storage within one warehouse sector may be necessary in order to reduce hazards related to specific stored substances of the same storage class or substances of different storage classes.

This can be achieved by sufficient distances or by barriers (e.g. walls, cabinets made of non-combustible materials, products made of non-combustible substances) or by storing them separately in separate containment areas. Indications for the need to store substances separately may result from, for example:

- hazard statements, supplemental hazard information and precautionary statement and product-related safety information, such as:
- safety data sheets (Section 5 “Fire-fighting measures” and Section 7 “Handling and Storage”; experience has shown that information contained in Section 10 “Stability and Reactivity” is less detailed)

(e.g.: cyanides shall not be stored jointly with substances – e.g. acids – with which they may produce hydrogen cyanide).

Hazardous substances must be neither kept or stored in the immediate proximity of pharmaceuticals, food or forage, including their additives, or cosmetics, drink and tobacco. Suitable steps must be taken in order to avoid cross-contamination. This can be achieved with horizontal spacing of more than two meters.

Segregation instruction for large quantities of Dangerous Goods

DANGEROUS GOODS & COMBUSTIBLE LIQUIDS STORAGE COMPATIBILITY CHART													
Class or Subsidiary Risk		FLAMMABLE GAS 2	NON FLAMMABLE GAS 3	TOXIC GAS 2	OXIDIZING GAS 2	FLAMMABLE LIQUID 3	FLAMMABLE LIQUID 4	SPONTANEOUSLY COMBUSTIBLE 4	DANGEROUS WHEN WET 4	OXIDIZING AGENT 5.1	ORGANIC PEROXIDE 5.2	TOXIC 6	CORROSIVE 8
FLAMMABLE GASES		OK TO STORE TOGETHER	OK TO STORE TOGETHER		SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
NON TOXIC NON FLAMMABLE GASES		OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
TOXIC GAS		SEGREGATE At least 3m	OK TO STORE TOGETHER	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
OXIDIZING GAS		SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
FLAMMABLE LIQUIDS + COMBUSTIBLE LIQUIDS		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 5m	SEGREGATE At least 5m
FLAMMABLE SOLID		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES
SPONTANEOUSLY COMBUSTIBLE		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 3m
DANGEROUS WHEN WET		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	OK TO STORE TOGETHER	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
OXIDIZING AGENT		SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 5m	KEEP APART	SEGREGATE At least 5m	SEGREGATE At least 5m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 3m
ORGANIC PEROXIDE		ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	OK TO STORE TOGETHER	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 3m
TOXIC SUBSTANCES		SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	ISOLATE	OK TO STORE TOGETHER	SEGREGATE At least 5m
CORROSIVE		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES

Operations of storage and handling in small quantities

Packages should be;

- closed when not in use;
- stored on surfaces which will not deteriorate if the package is damaged resulting in a spill;

- stored in such a way to minimize the risk of falling, and;
- positioned in such a way so that leakage will not affect other DG.

Transfer

- An appropriate area should be set aside for the purposes of transfer or decanting of DG products;
- Spill containment should be provided to hold the spill of the largest package i.e. bunding;
- Vapour or dust generation during transfer should be minimized, and;
- Consideration should be given to minimizing the generation of static electricity and for sources of heat or ignition.

Segregation

- Incompatible substances should be segregated such as;
- Solids/liquids - 1.5m
- Gases – 3m Separation
- DG should be separated from people or property. Where barriers are used these should be impervious.

Ventilation

- The generation of flammable or harmful atmospheric levels should be kept to minimum using adequate ventilation.

13. CONTAINMENT FACILITIES



In order for chemicals to be recognized, retained and removed in the event of emission or spillage, a containment area is to be provided in particular for fluids; this must be made of chemical resistant material and may not be connected to the public sewers. Dangerous goods packages that have been damaged must be removed from the storage area by trained personnel and placed in the DG containment area. Any clean up of the storage area must be conducted by the trained personnel and removed to the DG containment area until it is correctly disposed. No incompatible damaged DG may be stored in the DG containment area simultaneously. The DG containment area must be thoroughly cleaned with the appropriate cleaning materials as per the instruction of the damaged product's SDS.

Work clearance

A work clearance system including special written instructions by the employer shall be applied in the event of activities that could cause hazards through interaction (e.g. welding). Work clearance shall be provided by the responsible person before the beginning of the activities.

14. ACCESS CONTROL

The purpose of access restriction is to achieve two protection objectives. On the one hand, the group of people present in the DG warehouse or DG area of the warehouse is to be limited to employees and on the other hand actions by unauthorized persons (e.g. theft or manipulation) are to be avoided.

Authorized persons shall be appointed and instructed by the Logistics Department management at regular intervals. Prohibition of access shall be clearly and permanently indicated by means of a prohibiting sign
(No access for unauthorized persons). Organizational measures are to be taken to ensure that only authorized persons have access to the warehouse (e.g. non-employees are to be addressed by personnel; gates and doors are to be locked at end of work).



(No access for unauthorized persons)

Substances and mixtures that are classified as toxic, highly toxic, carcinogenic shall be kept under seal or must be stored in such a manner that only experts and reliable persons have access to them.

15. GOODS RECEIPT

Goods Receipt has an important control function in the management of the warehouse so that only the correct (i.e. also only actually required and ordered) and permitted goods are received and placed in storage. Only authorized, trained personnel may receive and check dangerous goods upon delivery. The correct PPE must be worn at all times:

- Eye goggles
- Gloves
- Chemical protective shoes
- Protective workwear over their personal clothing

Assurance has to be provided that storage is authorized and that all necessary measures have been observed:

- Review of risk assessment and all technical, organizational and personal protective measures,
- Adherence to corresponding technical and legal requirements and restrictions (cf. warehouse approval) such as quantity restrictions,
- Restrictions to the storage of specific groups of substances (e.g. flammable liquids, explosive substances),
- Load-bearing capacity of shelving,
- Adherence to joint storage prohibitions.

Goods Receipt is divided into several sub-sections:

Goods receipt control and acceptance

- Check of delivery papers and comparison with order (Was correct material delivered? Are the delivery papers complete?).
- Identity control (e.g. analysis),
- Check labels (product identification, labeling),
- Check of quantities,
- Check of containers (cleanliness, intact, suitability of storage unit),
- Comparison of analyses certificates with specification,
- If necessary, attachment of Goods Receipt labels,
- If necessary, inclusion in own materials management system.

Each individual packaging and mixed pallet is to be checked in the case of composite packaging with differing products, as well as mixed pallets.

Physical storage

- Stacking suitability of containers, packages and pallets
- Assignment and transport to place of storage.

Documentation of storage

- Warehouse management through WMS system and hard copies on file.

16. EMERGENCY RESPONSE

First-aid

First-aid measures to be taken by the Logistics Department can be divided into

- Medical care, first-aid providers,
- Instruction of workers,
- First-aid facilities, rescue equipment and installations and other aids.

Further installations, facilities and appliances for first-aid and emergency rescue in the warehouse include:

- Eye showers, body showers (emergency safety showers),
- Respiratory protective devices (escape masks),
- Fire blankets,
- Medical equipment, first-aid rooms, antidotes.

Fire extinguishers

Structural fire protection is to be stipulated according to the type and extent of local operating conditions and the goods being stored in each case. In addition, extinguishers for fighting incipient fires are to be made available and kept in a functional condition in the warehouse. The necessary type and number of fire extinguishers depends on the type of fire risk and the size of the area. The functionality of the fire extinguishers must not be restricted by weather influences, vibrations or other external effects. Fire extinguishers to be operated by hand must be easy to reach rapidly at all times. They must be suitable for their respective intended purpose.

Note: Other suitable extinguishing agents can be found on the safety data sheet. Information about the respective extinguishing agent units can be taken from the details on the fire extinguisher.

17. PROCEDURE IN THE EVENT OF PRODUCT LEAKAGE

Mechanical loads, chemical effects (e.g. in the event of damage to the inner coating or paint layer in the case of metal containers), ageing and moisture can lead to packaging failure and, consequently, product leakage. A further cause for leakages is incorrect closure of packaging, in particular after removal of a part-quantity of the product. Rodents can also cause damage to packaging made of paper or cardboard.

Hazardous substances must be stored in such a way that any leakages can be detected and intercepted. Leakages must be rectified immediately in order to restrict the duration and extent

of exposure. Regular inspection patrols are to be carried out in order to detect leaking substances. Employees must leave the danger zone immediately in the event of any danger. Personal protective equipments are to be worn and stipulated protective measures are to be taken according to the properties of the respective substance and the volume of the leakage (observe safety data sheet). Equipment to be kept available in the warehouse for clearing up leaked hazardous substances shall include:

- Empty drums or salvage drums for leaked products
- Suitable absorption material (absorbents or binding agents)
- Neutralization agents and detergents
- Brooms and shovels
- If necessary, industrial vacuum cleaners and fluid pumps (attention must be paid to explosion protection where applicable).

Procedure upon product leakage:

- Leave danger area, shut down machinery and electrical equipment in the danger area.
- Alert employees, superiors and, if necessary, the fire brigade and seal off the danger area.
- Select appropriate measures.
- Prevent damage from spreading; prevent liquid products from flowing or spreading by turning the damage point upwards or creating liquid barriers.
- Seal damaged container or pump off contents and transfer to another container.



Cleaning away spilled storage product using explosion-protected vacuum cleaner

- Pick up spilled liquids with absorption material. Attention must be paid that oxidizing substances are not picked up together with flammable materials. A hazard-free removal of these substances is generally possible by dissolving in plenty of water or collecting with suitable bonding material, such as diatomite, sand or cement. Powders and granulates are to be collected dust-free, e.g. with an industrial vacuum cleaner.
- Clean any contaminated surroundings; fill cleaning material and contaminated packaging into sealable containers.
- Remove immediately any clothing contaminated by the product; store separately and clean or dispose of accordingly.

- Leaked product, used absorption material, cleaning material and contaminated package are to be disposed of correctly. Contaminated water must be disposed of in a correct manner.

Attention must be paid to good ventilation at all times when carrying out measures to clear away leakages. Leaked products may only be cleared away by appropriately instructed personnel wearing suitable personal protective equipment.

18. GLOBALLY HARMONIZED SYSTEM (Classification and labeling of Chemicals)

GHS and Consumer Products

GHS uses hazard class and hazard category to describe the nature and severity of the hazard of a chemical product. There are currently 29 hazard classes in GHS, among which the following hazard classes are commonly related to chemical consumer products.

- Flammability;
- Acute Toxicity;
- Skin Corrosion/Irritation;
- Serious Eye Damage/Eye Irritation;
- Skin/Dermal Sensitization;
- Acute and Chronic Aquatic Hazards.

After a chemical has been classified using GHS classification criteria, a typical GHS label is prepared with the following basic elements to communicate hazard information:

- **Product identifier:** Chemical identities of a substance or hazardous ingredients in a mixture;
- **Supplier identification:** The name, address and telephone number of a supplier;
- **Signal word:** Danger or Warning;
- **Hazard pictogram:** conveying different types of chemical hazards;
- **Hazard statements:** standardized and assigned phrases that describe the hazard(s) as determined by hazard classification;
- **Precautionary statements:** standardized phrases that describe measures to minimize or prevent adverse effects;

An example of a typical GHS label can be found below. It can be easily modified for consumer product label use by adding more non-obligatory information such as net quantity, instructions for use, product feature, expiration date, barcode, etc.



Please note that

- Since chemical consumer products are usually supplied in small packages, a label may not be big enough to include all GHS relevant info. Please read GHS label for small containers.
- GHS labeling is usually hazard-based. However, UN GHS does allow risk-based labeling for consumer products in which case certain chronic health hazards can be excluded from labeling if their risks can be excluded based on risk assessment.

GHS describes the nature and severity of a chemical hazard by hazard class and hazard category:

- **GHS hazard class** represents the nature of a chemical hazard, i.e., flammable liquids, carcinogen.
- **GHS hazard category** is the division of criteria within each hazard class. For example, hazard class flammable liquids can be divided into 4 categories among which flammable liquids category 1 represents the most severe hazard.

The 29 GHS hazard classes are used to describe 3 main types of chemical hazards: physical hazards, health hazards and environmental hazards.

Physical Hazards(17 classes)	<ul style="list-style-type: none"> • Explosives • Flammable Gases • Aerosols • Oxidizing Gases • Gases Under Pressure • Flammable Liquids • Flammable Solids • Self-Reactive Substances • Pyrophoric Liquids • Pyrophoric Solids • Self-Heating Substances • Substances which, in contact with water emit flammable gases • Oxidizing Liquids • Oxidizing Solids • Organic Peroxides • Corrosive to Metals • Desensitized explosives
Health Hazards(10 classes)	<ul style="list-style-type: none"> • Acute Toxicity (Oral/Dermal/Inhalation) • Skin Corrosion/Irritation • Serious Eye Damage/Eye Irritation • Respiratory or Skin Sensitization • Germ Cell Mutagenicity • Carcinogenicity • Reproductive Toxicology • Target Organ Systemic Toxicity - Single Exposure • Target Organ Systemic Toxicity - Repeated Exposure • Aspiration Toxicity
Environmental Hazards(2 classes)	<ul style="list-style-type: none"> • Hazardous to Aquatic Environment (Acute/Chronic) • Hazardous to the Ozone Layer

Determination of GHS Hazard Class and Hazard Category

GHS has provided standard chemical classification criteria which are used to determine the hazard class and hazard category of a chemical. The picture below is an example of GHS classification criteria for flammable liquids. A liquid with a flash point between 23 and 60 Celsius degrees will be classified as flammable liquid category 3. A liquid with a flash point above 93 Celsius degrees does not meet GHS classification criteria and will not be regarded as a hazardous chemical.

Category	Criteria
1	Flash point < 23 °C and initial boiling point ≤ 35 °C
2	Flash point < 23 °C and initial boiling point > 35 °C
3	Flash point ≥ 23 °C and ≤ 60 °C
4	Flash point > 60 °C and ≤ 93 °C

GHS PICTOGRAMS

Health Hazard Carcinogens, respiratory sensitisers, reproductive toxicity, target organ toxicity, germ cell mutagens		Flame Flammable gases, liquids, & solids; self-reactives; pyrophorics;		Exclamation Mark Irritant, dermal sensitisier, acute toxicity (harmful)	
Gas Cylinder Compressed gases; liquefied gases; dissolved gases		Corrosion Skin corrosion; serious eye damage		Exploding Bomb Explosives, self-reactives, organic peroxides	
Flame Over Circle Oxidisers gases, liquids and solids		Environment Aquatic toxicity		Skull & Crossbones Acute toxicity (severe)	

19. LABELING

All stored chemicals must be identifiable through their packaging/container with at least their substance name. Substances and mixtures classified as hazardous must also be labeled in accordance with the legislation on hazardous substances and/or dangerous goods that contains information on the main hazards and handling. Decisive in this respect is the information contained in the safety data sheet. Hazardous labels on packages must never be obscured with other labels or markings.



Example of container labeling

Hazard Pictograms	GHS Hazard	Dangerous Goods class labels (pictograms)	Dangerous goods classes
	Explosives Self-reactives Organic peroxides		Explosive
	Flammables Self-reactives Pyrophorics Self-heating Emits flammable gas on contact with water	 	<ul style="list-style-type: none"> Flammability (Liquid, Solid or Gas) Pyrophoric, Emits Flammable Gas
	Oxidisers Organic peroxides		<ul style="list-style-type: none"> Oxidiser Organic Peroxide Oxidising gas
	Gases under pressure		Non-toxic non-flammable gas
	Acute toxicity		<ul style="list-style-type: none"> Acute toxicity Acute Toxic gas
	Acute toxicity (harmful) Skin irritation Eye irritation Skin sensitisers	No equivalent	
	Carcinogens Respiratory sensitisers Reproductive toxicity Target organ toxicity Germ cell mutagens	No equivalent	
	Eye corrosion Skin corrosion Corrosive to metal		Corrosive to Metals
	Aquatic toxicity		Environmental hazard
No equivalent hazard pictogram			Misc. Dangerous Goods
Not covered within the scope of workplace hazardous chemicals requirements			Infectious
Not covered within the scope of workplace hazardous chemicals requirements			Radioactive

SIGNAL WORD: Danger or Warning

HAZARD STATEMENT: eg H224 Extremely flammable liquid and vapour

PRECAUTIONARY STATEMENTS:

- Prevention eg P210 Keep away from heat/sparks/open flames/hot surfaces – No Smoking
- Response eg P303 IF ON SKIN (or hair) remove immediately all contaminated clothing. Rinse skin with water.
- Storage eg P403 Store in well-ventilated place. Keep cool.
- Disposal eg P501 Dispose of contents / container to ...

HAZARD PICTOGRAM

20. PACKAGING

Packaging or containers (hereinafter referred to as “packaging”) are the primary protective measures when storing hazardous substances. Their design must be such that none of the contents can escape unintentionally. Wherever possible, hazardous substances should be stored in the original containers or in the original packaging. Empty packaging that still contains residual material is subject to the same regulations as filled packaging unless appropriate steps have been taken to exclude any danger.

The requirements for the selection of packaging, packing and handling shall be deemed to have been met if the packaging meets the requirements for the transport of dangerous goods. If packaging is changed all labels must be changed to conform to the product.

Mechanical stability

Shocks, handling or stacking loads, vibrations, temperature changes, moisture or pressure changes under storage conditions – including placement into and removal from storage and internal transport – can lead to packaging failure. This is why it must be of adequate strength and made of suitable materials.

Sustaining the protective function of packaging

Further protective measures include all organizational and technical measures that are suitable for sustaining the protective function and stability of the packaging. These include:

Avoiding contamination

No hazardous residue or product shall adhere to the outside of packaging's during storage so that there is no danger to warehouse personnel or reduction in the mechanical stability (e.g. through corrosion).

Package orientation

Packages with orientation arrows must be stored according to these markings in order to prevent any package leaking as a result of permanent pressure from fluids on the closure, vents or sealing materials.



Restriction of storage period

The protective properties of the packing materials, in particular plastics, cardboard and paper, can suffer considerably as a result of physical or chemically induced ageing. A maximum storage period is to be stipulated in order to avoid leakages. The permitted period of use for drums and jerricans made of plastic, rigid plastic IBC and combination IBC with plastic inner receptacles is a maximum of five years according to the requirements for the transport of dangerous goods, unless a shorter period of use is prescribed because of the type of substance being transported (e.g. hydrofluoric acid). The year of manufacture of design-certified packaging can be established by means of the packaging's UN labeling.

Light, UV protection and temperature

Products being stored are to be protected against direct sunlight and UV radiation by protective roofs, sunblinds or tinted window glass if the effects of intensive sunlight and UV and heat radiation could not only reduce the usage period of plastic, cardboard and paper packaging through embrittlement but also change the properties of the product. For example by drying out of phlegmatizers, peroxide formation with ethers or triggering of decomposition of thermally unstable products. Temperature fluctuations can have effects on the packing material and lead, for example, to embrittlement, softening, pressure increases, freezing.

Protection against moisture

Moisture can cause corrosion and mould formation which reduces the mechanical stability of the packaging. Appropriate measures are to be taken to prevent any penetration by condensation or the formation of high humidity.

Avoiding mechanical damage

During transportation, entry into and removal from storage, as well as manual handling, attention must be paid at all times that the packaging is not damaged, for example by falling down, crushing or crashing into.

Securing palletized load units

The correct condition of the load is an important requirement for safe working whilst transporting, entering into and removing from storage, stacking and unstacking. The load must be packed in such a way that it does not fall apart, becomes dislodged or has parts fall off when picked up, transported and set down.

Choice of load carrier

The secure structure of a palletized load unit commences with the load carrier (e.g. flat pallets, wire-mesh box pallets). The "Chemical Pallet System" (CP-System) has established itself in this respect in the chemical industry. The europallet has also proven to be successful for this.



Flat pallets are not suitable for use (see fig. above) for example if:

1. a board is missing or broken at an angle or broken crossways,
2. more than two bottom edge or top edge boards or a cross-board have broken away to such an extent that more than one nail or screw shaft is visible per board,
3. a block is missing, broken or broken away to such an extent that more than one nail or screw shaft is visible,
4. main marking is missing or non-legible,
5. apparently non-permitted components have been used for repair (boards or blocks which are too thin, too narrow or too short),
6. the general condition is so bad that the load bearing capacity can no longer be guaranteed (rotten, moldy, or several broken-away boards or blocks).

The weight of the packaging is often insufficient to prevent slipping, tipping over or falling down. In most cases, auxiliary appliances for pallet securing are necessary for putting together load units. The following points must be observed, irrespective of the type of pallet securing:

- The stacking load of the packaging must not be exceeded.
- The packaging should be standing upright and plumb on the pallet.
- The packaging mustn't protrude beyond the outer dimensions of the pallet.
- The height of the load unit must be such that there is still sufficient free space for entry into and removal from storage.

21. WAREHOUSE INSPECTION PROCEDURES

A designated employee should check when carrying out an inspection tour of the warehouse. Some points can be checked during the careful execution of daily work ("going through the plant with eyes open"). Draw up an individual checklist on the basis of the points below. This must be used for inspection tours at regular intervals, and to record the results. General points:

Order and cleanliness

- Does the warehouse create an overall clean and tidy impression?
- Are items/tools/appliances lying around?
- Are the workplaces tidy?
- Are storage items stored in correct places?
- Are passageways, warehouse aisles and access routes free of obstructions?
- Is there risk of stumbling points and are those places marked?
- Is there any waste lying around? Is waste collected in an orderly fashion at prescribed points?
- Are cleaning rags lying around (outgassing hazardous substances)?
- Is the floor unclean? In particular, oil and grease must be cleaned up immediately.
- Are operating instructions provided, easily accessible and up-to-date?

General work hygiene

- Are the sanitary, changing and social rooms in a clean and orderly condition?
- Do employees wear suitable work clothes and are those in an appropriate condition?

- Is the ban on smoking observed?
- Do employees eat/drink etc. in the warehouse?

First-aid

- Have an adequate number of employees been trained as first-aiders against DG products?
- Are the means for first-aid available in adequate numbers?
- Are the means for first-aid easily accessible?

Access to the warehouse, warehouse sections and traffic routes

Signposting

- Are DG signs in place and legible?
- Is the warehouse section for DG clearly identifiable?

Access restrictions

- Are the respective areas (e.g. for the storage of toxic and very toxic substances) locked?
- Do unauthorized persons have access to this area?

Traffic routes, loading ramps and storage spaces

- Are traffic routes and storage spaces signposted?
- Are the traffic routes freely accessible or are they obstructed?
- Is there any damage?
- Are the railings in order?

Warehouse installations, equipments and tools

- Condition of the shelving
- Are shelves damaged?
- Are collision guards in place and undamaged?

Equipments/Tools for DG goods

- Are equipments/tools functioning, in good condition and have they been inspected?
- Ladders?
- Industrial trucks?
- Hoists/Loading equipment?
- Packing machines?

Ventilation systems/Extractors/Heating/Air-conditioning

- Are the ventilation systems operating?
- Is the heating/air-conditioning operating correctly?

Maintenance plans

- Do maintenance plans exist? Are they up-to-date and are they followed?

Stored goods

Storage plan

- Are only approved substances placed in storage?
- Are the substances in the correct warehouse sector?
- Is the joint storage prohibition observed?
- Are the permitted quantities observed?
- Are there critical substances that have to be placed under special control?

References:

1. Code of Practice for Storage of Dangerous Substances (Europe)
2. Safety in the use of chemicals at work - International Labor Office (ILO)
3. Globally Harmonized System (GHS) of Classification and Labeling of Chemicals – United Nations Organization
4. United Nations Model Regulations for the Transport of Dangerous Goods
5. Dangerous Goods Storage Requirements – Saudi Civil Defense

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