Guidelines – Control of Substances Hazardous to Health and Danger

Issued by: Inspection Department – Operations Section

1.0 Introduction

Substances hazardous to health cover substances and preparations with the potential to cause harm if they are inhaled. Ingested or come into contact with or are absorbed through the skin. These include individual chemical substances or preparations such as paints, cleaning materials, metals, pesticides and insecticides. They can also be biological agents such as pathogens or cell cultures. Substances hazardous to health occur in many forms – solid, gas, liquid, fume, dust, vapor, mist and smoke. Chemicals covered would be classified as very toxic, toxic, harmful, corrosive, irritant, sensitizing, carcinogenic, mutagenic or toxic to reproduction. Substances not hazardous to health may still be classified as a dangerous substance by nature of being flammable, explosive or oxidizing (for example).

These notes form a Best Practicable Means Code of Practice for the handling and processing of substances which are Dangerous and Hazardous to Health.

2.0 Handling and Processing

2.1 A substance hazardous to health means any substance which is:

a. A substance which is included in the UN classification of dangerous goods and for which the general indication of risk is specified a very toxic, toxic, harmful, corrosive or irritant;

b. A substance for which a maximum exposure limit is specified in Table 15.1;

c. A microorganism which create a hazard to the health of any person;

d. Dust of any kind, when present at a substantial concentration in air; or

e. A substance not mentioned above, which creates a hazard to the health of any person which is comparable with the hazards created by substances mentioned above.

2.2 Employers have a duty to protect their employees and any other person, whether at work or not, who may be affected by the hazardous and dangerous work carried on by the employer. Contractors, sub-contractors and self-employed persons all have the duties of protection and so there must be collaboration. Visiting members of emergency services, e.g. fire fighters, must be made aware of any substance on the premises whish poses a danger or a risk to their health.

2.3 Prohibitions

a. Some substances are so hazardous to health that their use or importation is prohibited, whilst other substances are a health hazard when used in certain process, which are prohibited.

b. The importation into PCFC of the following substances is prohibited, and their use in any manufacturing process is also prohibited, namely: 2-naphthylamine, benzidine, 4-nitrodiphenyl, 4-aminodiphenyl, their salts and any substance containing any of those compounds in a total concentration exceeding 0.1 percent. Matches made with white phosphorous are prohibited.

c. Sand or other substances containing free silica shall not be used as an abrasive in any blasting apparatus for cleaning, smoothing, roughening or removing part of the surface of any article by the use as an abrasive of a jet of sand by the blast of compressed air or steam by a wheel.

d. The Authority may grant exemptions to these prohibitions, but only where it can be satisfied that the health of persons will not be prejudiced as a consequence.

Table 15.1 – List of Substances Assigned Maximum Exposure Limits

Reference Periods:
Long-term maximum exposure limit (8-hour TWA reference period)
Short-term maximum exposure limit (10-minute reference period)

Substance	Formula	ppm	mg / m^3	ppm	mg / m^3
Acrylonitrile	$CH_2 = CHCN$	2	4	-	-
Ammonia	NH_3	25	18	-	0.5
Arsenic & compounds except arsine and lead arsenate as Buta 1,3-diene	$CH_2 = CHCH = CH_2$	10	-	-	-
2-Butoxyethanol	$C_4H_9OCH_2CH_2OH$	25	120	-	-
Cadmium & cadmium compounds except cadmium oxide fume and Cd cadmium sulfide pigments (as Cd)	-	0.05	-	-	-
Cadmium oxide fume as (Cd) CdO	-	0.05	-	0.05	-
Cadmium sulfide pigments (respirable dust as Cd)	CdS	-	0.04	-	-
Carbon Disulfide	CS_2	10	30	-	dichloromethane
CH_2Cl_2		100	350	-	-
2,2 Dichloro-4,4' methylene dianiline (MbOCA)	$CH_2(C_6H_3ClNH_2)_2$	-	0.005	-	-

2-Ethoxyethanol	$C_2H_2OCH_2CH_2OH$	10	37	-	-
2-Ethoxvethvi acetate	$C_2H_5CCH_2CH_2OO$ CCH_3	10	54	-	-
Ethylene Dibromide	$BrCH_2CH_2Br$	1	8	-	-
Ethylene Oxide	CH_2CH_2O	1	2	-	-
Formaldehyde	HCHO	1	1.2	2	2.5
Hydrogen Cyanide	HCN	-	-	10	10
Isocyanates all (as NCO)		-	0.02	-	0.07
Manmade mineral fiber		-	5	-	-
1-Methoxypropan-2 ol	CH_3OCH_2CHOHC H_3	100	360	-	-
2-Methoxyethanol	$CH_3OCH_2CH_2OH$	5	16	-	-
Polychlorinated biphenyls (PCB's)	$C_{12}H_{10-n}Cl_n$	-	0.5	-	1.0
Rubber process dust		-	8	-	-
Rubber fume		-	0.75	-	-
Styrene	$C_6H_5CH=CH_2$	100	420	250	1050
1.1.1 Trichloroethane	CH_3CCl_3	350	1900	450	2450
Trichloroethylene	$CCl_2=CHCl$	100	535	150	802
Vinyl Chloride +	$CH_2=CHCl$	7	-	-	-
Vinylidene Chloride	$CH_2=CCl_2$	5	20	-	-
Wood dust (hard wood)		-	5	-	-

. Limit relates to cyclohexane soluble material
+ Vinyl chloride is also subject to n overriding annual maximum exposure limit of 3 ppm

Notes: A "substantial" concentration of dust should be taken as the values shown in the current Health, Safety and Environment Guidance Note EH/40 "Occupational Exposure Limits", or where such values are not shown lower, as a concentration of 10 mg/m^3, 8-hour time weighted average of total inhalable dust, or 5 mg/m^3 of respirable dust.

2.4 Control of Exposure to Substances Hazardous to Health

a. PCFC Environmental Rules and Requirements, the Health and Safety Manual, and UAE Ministerial Decision No. 32 of 1982 entitled "The Determination of Preventive Methods and Measures for the Protection of Labor from Risks of Works", lay down the responsibilities of employers for protecting employees and the environment. These include assessment of risks, measurements of pollution, training, information to employees, health measures and records, provision of protective clothing and other service facilities, etc. all these requirements must be implemented. The employer must also ensure that control measures and protective devices

are inspected and maintained at suitable intervals and that they are being used properly by employees.

b. An employer shall not carry on any work which is liable to expose any employees to any substance hazardous to health unless he has made a suitable and sufficient assessment of the risks created by that work to the health of those employees and of the steps that need to be taken. Employees or their representatives at the place of work should be informed of the results of the assessment.

c. Every employer shall ensure that the exposure of his employees to substances hazardous to health is either prevented, or is adequately controlled. The prevention or adequate control shall be secured normally by measures other than the provision of personal protective equipment. However, where such practicable measures are not adequate to give sufficient control of exposure, the employer shall provide, in addition, suitable personal protective equipment. In the case of any substance appearing in Table 16-A, it shall only be treated as adequate if the exposure is reduced below the maximum exposure limit, for which the employer shall undertake a monitoring program.

d. Every employer who provides any control measures, personal protective equipment or other facility shall take all reasonable steps to ensure that it is properly used or applied. Every employee shall make full and proper use of any control measure or personal protective equipment or facility.

e. Every employer who provides any control measures shall ensure that it is maintained in an efficient state, in efficient working order and in goof repair, by carrying out examinations and tests and by keeping a record.

f. Where it is appropriate for the protection of the health of his employees who are, or liable to be, exposed to a substance hazardous to health, the employer shall ensure that such employees are under suitable health surveillance and that a medical record is maintained.

g. An employer who undertakes work which may expose any of his employees to substances hazardous to health shall provide that employee with such information, instruction and training as is suitable and sufficient for him to know the risks to health created by such exposure and the precautions which should be taken.

h. Occupational cancer is a special case of the general provisions mentioned above and it may arise from various causes not yet properly defined as a casual link between a particular chemical and cancer in humans. The principles of occupational health are no different for carcinogenic substances that for those involving other health hazards. However, there are specific substances and processes with which a cancer hazard is associated and prevention of exposure must be the first object in view of the serious and often irreversible nature of the disease. It is particularly important that exposure should be controlled to as low a level as is reasonably practicable, bearing in mind the high risk of death. The following is a list of substances and processes which have been assigned the risk that they “may cause cancer”.

- Aflatoxins
- Arsenic and its inorganic compounds
- Benzo (∝) pyrene
- Beryllium and beryllium compounds
- Insoluble chromium (VI) compounds
- Mustard fas (B.B'Dichlorodiethyl sulfide)
- Inorganic nickel compounds arising during the refining of nickel
- Ortho-toluidine
- Coal soots, coal tar, pitch and coal tar fumes
- Non-solvent refined mineral oils and contaminated used mineral oils
- Auramine manufacture
- Leather dust in boot and shoe manufacture, arising during preparation and finishing
- Hard wood dusts
- Isopropyl alcohol manufacture (strong acid process)
- Rubber industry (processes giving rise to dust and fume)
- Magenta manufacture
- 3,3' Dimethoxy benzidine (Dianisidine) and its salts
- 1-nahthylamine and its salts
- 4-Nitrobiphenyl
- Ortholidine and its salts
- Vinyl Chloride Monomer (VCM)

For list of substance assigned maximum limits, see Table 15.1.

3.0 Storage

3.1 Introduction

This part of the note on best practicable means describes the methods to be practiced by the lessees in the Jebel Ali Free Zone for the storage of substances hazardous to health and danger.

3.2 Making and Labelling

Each receptacle containing dangerous goods shall be marked with the correct technical name and identified with a distinctive label or stencil of the label so as to make clear the dangerous character. Each receptacle shall be labelled according to the classification of dangerous goods as per UN regulation (Refer to Annex 15.1).

3.3 Documentation

In all documents relating to dangerous goods the correct technical name of the goods shall be used and the correct description given in accordance with the UN goods classification.

3.4 UN Classifications

In addition to the four-digit UN number, a substance must be assigned to a class depending on that substance's characteristics and the type of hazard involved during its transportation/handling and storage.

The UN has devised a classification system which forms the basis for the hazard classes of all the main transport codes. Where necessary, these classes further subdivide into divisions to allow more specific classification.

Class 1 : Explosives

Class 1 is divided into 5 classes as follows:

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

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

Class 1.3 : Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

Class 1.4 : Substances and articles which present no significant hazard.

Class 1.5 : Very insensitive substances which have a mass explosion hazard.

Class 2: Gases

Compressed, liquefied or dissolved under pressure. Class 2 is subdivided as follows:

Class 2.1 : Flammable Gases

Class 2.2 : Non-flammable Gases

Class 2.3 : Poisonous Gases

Class 3 : Flammable Liquids

Class 3 is subdivided as follows:

Class 3.1 : Low flash point group of liquids having a flash point of 18°C (0°F), closed cup test.

Class 3.2 : Intermediate flash point group of liquids having a flash point of -18°C (0°F) up to, but not including 23°C (73°F), closed cup test.

Class 3.3 : High flash point group of liquids having a flash point of 23°C (73°C) up to and including, 61°C (141°F), closed cup test.

Class 4: Flammable Solids

Class 4 is subdivided as follows:

Class 4.1 : Flammable solids, solid possessing the common property of being easily ignited by external sources such as sparks or flame and of being readily combustible.

Class 4.2 : Substances liable to spontaneous combustion. The substances in this class are either solid or liquids possessing common property of being liable spontaneously to heat and to ignite.

Class 4.3 : Substances emitting flammable gases when wet. The substances in this class are either solids or liquids possessing the common property, when in contact with water, of evolving flammable gas. In some cases these gases are liable to spontaneous ignition.

Class 5: Oxidizing Substances (Agents) and Organic Peroxides

Class 5 is subdivided as follows:

Class 5.1 : Oxidizing substances (agents): these are substances which although in themselves not necessarily combustible, may either be yielding oxygen or by similar processes, increase the risk and intensity of fire in other materials with which they come into contact.

Class 5.2 : Organic Peroxides: most substances in this class are combustible. They may act as oxidizing substances and are liable to explosive decomposition. In either liquid or solid form from they may react dangerously with other substances. Most will burn rapidly and are sensitive to impact or friction.

Class 6: Poisonous (Toxic) and Infectious Substances

Class 6 is subdivided as follows:

Class 6.1 : Poisonous (toxic) substances: the substances in this class are liable to cause death or serious injury to human health if swallowed, inhaled or by skin contact.

Class 6.2 : Infectious substances: these are substances containing disease-producing organisms.

Class 7: Radioactive Substances

Class 8: Corrosives

Class 9: Miscellaneous Dangerous Substances

3.5 Packing

The packing of dangerous goods shall be:

a. Well-made and in good condition;

b. Of such a character that any interior surface with which the contents may come in contact is not dangerously affected by the substance being conveyed; and

c. Capable of withstanding the ordinary risks of handling.

3.6 Material Safety Data Sheet (MSDS)

It is the responsibility of the lessees storing dangerous goods to obtain the appropriate MSDS and display them.

3.7 Storage of Chemical and Dangerous Goods

A variety of statutory regulations exists for the storage of chemicals and dangerous goods. It may however be advisable to restrict the accessibility of certain chemicals and dangerous goods to those whose job it is specially to handle them, particularly if careless handling can have serious consequences.

The precautions to be taken for different dangerous goods classes depending on their hazardous nature, could be keeping the dangerous good for example:

- Separate from other goods classes
- Keeping it cool
- Keeping in the dark
- Keeping it dry
- Keeping it in fireproof place
- Keeping it under inert gas
- Keeping it in ventilation along the floor
- Keeping it under inhibitors

a. Segregation

- Dangerous goods shall be segregated in the storage according to their dangerous classifications and requirements specified in Annex 15.2. Dangerous goods stored in above-ground tanks shall not share common bund areas unless the materials are of the same dangerous goods class.

- Dangerous goods storage areas shall where practicable be external to the work place. Where dangerous goods are stored within industrial premises, there shall be a minimum of 3 meters separation to any production facilities for non-flammable materials and 10 meters between flammable materials and any source of ignition.

- Dangerous goods shall be separated from areas frequented by the public in accordance with the following requirement.

Class	Minimum Separation (meters)
1	50
2.1	5
2.2	5
2.3	15
3.1	10
4.1 / 4.2 / 4.3	5
5.1 / 5.2	5
6.1 / 6.2 / 6.3	5
8	5

b. Flammable Materials

- Flammable liquids shall be stored under cover in a well-ventilated area.

- Flammable liquid storage areas shall be clearly marked in several languages understandable to the workers in particular premises and shall have warning signs against any flames sources, e.g., smoking, welding, etc.

- All electrical equipment located or used within 10 meters of flammable liquid storage areas shall be of explosive proof nature.

- Any drum stores, or above ground tanks holding in excess of 5,000 liters of flammable liquids, shall be equipped with firefighting services as approved by the Fire Department.

c. Spillages

All dangerous goods shall be stored on impervious surfaces capable of containing spills. Some means of limiting the effects of leakage are:

- Facilities for collecting spilled liquid
- Sand or suitable absorbing material for containment or absorption
- Provision to seal leaking drums

- Provision to rinse away spilled substance
- Ventilation

d. Cylinders

Cylinders of compressed gas or flammable gases shall be stored upright in secure racks and out of direct sunlight or heat source.

e. Bulk Storage of Dangerous Goods

All bulk above ground storage tanks shall be located in impervious bund areas where the volume of the storage bund is not less than 110% of the largest storage tank contained within the bund.

f. Underground Storage Tanks

- All new underground storage tanks, including petroleum storage, shall be equipped with the means of inspection for leakage or shall be of a double walled design to prevent leakage.

- All existing underground storage tanks shall maintain adequate inventory checks to identify any leaking tanks and shall undertake tank tests if so directed by a Trakhees inspector.

g. Housekeeping and Site Management

- Dangerous goods shall be stored in a safe manner with sufficient space for the safe movement of forklift vehicles or personnel.

- Lessee storing dangerous goods shall maintain stocks of materials and equipment for the clean-up of any spills.

- Lessees storing dangerous goods shall ensure that its staff is aware of the hazardous nature of the goods, provided with personal protective equipment as required and trained in the procedures for handling spills.

4.0 Guidance

4.1 Liquefied Gas Storage

Bulk storage of liquefied gases can be a serious safety hazard unless correctly designed, erected and maintained. Cost and safety are the two important factors.

Storage for liquefied gases can be:

- Fully refrigerated, where the liquid is stored at its bubble point at near atmospheric pressure;
  or
- Full pressure, where the liquid is stored at ambient temperature;
  or
- Semi-refrigerated, an intermediate approach where the liquid is stored below ambient temperature but at a vapor pressure above atmospheric.

Following Table 15.2 lists the gases which are commonly stored in liquid form.

Table 15.2 – Products Commonly Stored as Liquefied Gases

Gas	Boiling Point at 1 bar absolute (1°C)	Liquid Density at boiling point (kg / m^3)	Vapor Pressure at 30°C (bar bas)	Critical Temperature (°C)
Can be stored without refrigeration				
Ethylene Oxide	11	883	2.7	195
n-butane	0	602	3.6	152
Butadiene (1, 3)	- 4	650	4.1	152
Butylene (°C)	- 6	626	4.3	146
Isobutane	- 12	595	5.0	135
Ammonia	- 33	682	14.6	133
Propane	- 42	582	13.0	97
Propylene	- 48	614	15.7	92
Requires refrigeration				
Ethane	- 89	546	-	32
Ethylene	- 104	568	-	9
Methane (LNG)	- 162	424	-	- 82
Oxygen	- 183	1140	-	- 119
Nitrogen	- 196	808	-	- 147

4.2 Fully Refrigerated Storage

Single containment tanks are not suitable for fully refrigerated storage. It is normal practice to surround the primary liquid containment with a secondary shell, separated from it by a gas of up to six (6) meters. The outer shell is capable of holding liquid but it is not designed to contain vapour released by a product leaking from the inner shell. It is known as the double containment tank.

If the outer shell is designed to hold vapour as well as liquid, the result is a full containment tank. In this case the gap between the two shells is one to two meters.

The material of the inner tank depends on the product to be stored and the design code applicable. For the outer shell one of three materials is generally used: steel pre-stressed concrete, or reinforced concrete with an earthen embankment. A modern technique is to line a structural shell of pre-stressed concrete with a thin gas- and liquid-tight membrane of 304 stainless steel, or a low-expansion nickel alloy such as Invar, supported on load-bearing insulation. The maximum capacity of fully-refrigerated tanks is normally up to 100,000 m^3, although some up to 150,000 m^3, have been constructed.

4.3 Full Pressure and Semi-refrigerated Storage

Full pressure storage tanks are either cylinders or spheres. The modern tendency is to use cylinders for reasons of safety, spheres being more vulnerable to mechanical damage and they also suffer from cracking if the stress-relieving is imperfect. Full-pressure tanks are made from carbon steel or high-impact carbon steel, with insulation only provided to protect against fire and solar heating. The pressure vessel design code specifies the design pressure.

Semi-refrigerated storage uses cylinders or spheres, depending on the required capacity. The tanks are insulated and the product temperature is maintained by re-liquefying the vapor which boils off. Carbon steel, normally killed, is the usual material of construction. For spheres, the maximum plate thickness which can be welded is normally 50-60 mm and this, with the design pressure, the grade of steel, and the design code, fixes the maximum capacity, usually within the range 1,000 – 5,000 m^3, depending on the type of gas. For cylindrical tanks the usual maximum capacity is about 600m3, but much bigger tanks have been built for special purposes.

4.4 Tanks to Suit the Product

Nitrogen, oxygen and LPG are best stored at their boiling points at near-atmospheric pressure. Thus, fully refrigerated storage is appropriate.

For ethane and ethylene, their critical temperatures (32°C and 9°C respectively) exclude full-pressure storage at ambient temperature. For small capacities, semi-refrigerated storage in spheres of low-carbon steel is usual. For large capacities, fully refrigerated tanks are used.

Propane, propylene, butane, butylene and ammonia can only be stored in full pressure tanks up to a certain capacity because of the limitation of plate thickness. Larger capacities commonly use semi-refrigerated storage in insulated spheres and the largest capacities use fully refrigerated storage.

Certain products need special attention during storage. Butadiene, for instance, must be stored at low temperatures to retard the formation of dimmers, even in the presence of an inhibitor. It is also important to keep an oxygen-free atmosphere to prevent the formation of explosive peroxides, and to circulate the liquid to prevent stratification and hence polymerization.

Ethylene oxide is so unstable that it cannot be stored at ambient temperatures and is commonly maintained at about 5°C. The vapour space should be inerted with nitrogen or methane.

4.5 Insulation

A refrigerated tank is insulated to limit the leakage of heat into the tank and thus reducing to an acceptable level the rate at which product boils off. Insulation for single containment LPG tanks is often polyurethane foam applied to the outside of the shell and roof and rain-proofed. Double-compartment tanks used for low temperatures, and single-containment tanks of the double-wall type, typically use loose-fill insulation such as expanded perlite in the gap between inner and outer shells. Polyurethane or glass foam insulates the roof.

For full containment tanks the insulation is typically sprayed polyurethane foam specially designed for cryogenic service.

All flat-bottomed cylindrical tanks require insulation to limit heat transfer through the base.

4.6 Pressure Relief

All tanks must be protected by safety valves from overpressure. For tanks at atmospheric pressure the safety valves should generally be of the pilot-operated type and the discharge should point upwards to terminate at least 3 meters above the top of the tank. Some safety valves discharge to a closed system to catch liquid and in that case there must be no liquid traps in the discharge line nor must the back-pressure be excessive. To avoid excessive pressure, there should be a safety valve relieving to atmosphere and set at a slightly higher pressure than that to the closed system. It is also more important to avoid collapsing the tank under an internal vacuum, and pressure/vacuum valves are usually fitted.

4.7 Fire Protection

Various codes and regulations define the separation distances between storage tanks, and between groups of tanks and other facilities. Proper spacing can avoid disasters and is very important. Bunds are necessary to contain spills and should be low enough to give easy access in an emergency and to facilitate ventilation. The ground within a bund should slope away from the storage area to the remotest point practical.

The Engineering Equipment and Materials Users Association (EEMUA, London) has published new recommendations for the design and construction of liquefied gas storage. It includes the latest requirements for refrigerated storage, giving special attention to environmental concerns and to the safety of surrounding areas.

5.0 Information to be Provided in the Place of Work

5.1 Material Safety Data Sheet (MSDS)

a. MSDS provide the information needed to allow the safe handling of particular substances hazardous to health in the workplace. Employers should ensure that all employees have ready access to MSDS and have a clear understanding of safe handling requirements.

b. Where a new substance is to be used in a place of work, the MSDS should be obtained in advance to allow an assessment of the controls required.

c. At each place of work, employees should have ready access to the current MSDS for substances used.

d. A computer database provides a practical option for an organization using a large number of products containing substances hazardous to health.

5.2 Labelling

a. All containers of substances hazardous to health or handled in a place of work should be labelled to allow the substances to be used safely. Containers into which a substance hazardous to health has been decanted should also be clearly labelled to identify the contents.

b. The selection of the container and the information on the label should be designed to minimize the risk of inadvertently mixing incompatible substances.

c. Where a substance hazardous to health is contained in an enclosed system, such as piping or reactor vessel, it must be identified who may be exposed to the contents. Methods for identifying the contents of piping, conduits and ducts can be done by the use of colours, letters and symbols.

d. If a container does not have a label or it has been improperly labelled, action should be taken to correctly label the container.

e. If the contents are unknown, the container should be marked *"Caution: Do not use – Unknown Substance"* until the contents can be identified or suitably disposed of.

6.0 General Guidelines for Dangerous / Hazardous Materials Handling and Storage

6.1 Areas for storage of hazardous material in any form (tanks, drums, solids, stockpiles, etc.) shall have a containment system for collecting and holding spills and leaks. The entire area shall be impervious to the waste or its waterborne constituents.

6.2 Storage sites shall be designed such that storm water runoff from the rest of the site is diverted around storage areas. The runoff from the dike-enclosed storage areas shall be held for monitoring and treatment (if required) prior to discharge. The runoff water from

storage areas shall meet the point source discharge criteria (see relevant Table if it is to be discharged to the harbor and be treated on site if the above criteria cannot be met).

6.3 The storage area shall be operated in such a manner that the spreading of hazardous material within or outside the area is eliminated or minimized.

6.4 Tanks shall be equipped with an alarm or warning device which will sound an audible warning or other suitable device in the event the liquid level is exceeded.

6.5 A container holding hazardous material shall always be closed during storage except when it is necessary to remove or add material.

6.6 Provision shall be made, if necessary, to prevent dust from hampering site operations and from causing health or safety hazards or nuisances.

6.7 Containment curbs shall be maintained around loading and unloading areas, with controlled discharge as noted above.

6.8 Containers and storage tanks shall be designed and made of suitable materials permanently to contain the hazardous materials. Storage facilities shall be inspected regularly for leakage.

6.9 Incompatible materials shall not be placed in common containment areas or the same containers.

6.10 Storage facilities for volatile substances shall be covered, and venting systems shall be designed to prevent violation of air pollutant source emission criteria.

6.11 Surface impoundments used to store hazardous materials shall be hard surfaced and underlined with impervious line and shall be designed with leakage monitoring and collection systems. Lining systems shall be liquid tight, shall be compatible with the structure material and the substance stored in the structure, and shall generally comply with the criteria for construction and operation of surface impoundments shall be to Authority's satisfaction. Surface impoundments shall not be used to store volatiles, ignitable or reactive materials.

6.12 Where groundwater pollution potential exists, monitoring of the aquifers is required. (see relevant Table for monitoring parameters).

6.13 Contingency plans shall be established to deal with emergencies arising from the accidental discharge of hazardous materials. Adequate fire-fighting, safety, and spill control equipment shall be readily available. Personnel shall be trained to handle emergency procedures. In the case of bulk storage of corrosive chemicals, adequate supplies of neutralizing agents shall be kept on hand. The contingency plan should also be developed so as to provide for coordination with the Authority and other government agencies.

6.14 The volume of the bund areas for the bulk storage tanks shall be 110% of the volume of the largest tank within the bunded area.

7.0 PCFC Requirements for Handling, Import and Export of Radioactive Substances

7.1 Form S1 (Trakhees Inspection Department – Operations Section) to be duly filled and signed by the company's authorized person along with "Civil Defence" approval should be submitted to Trakhees Inspection Department – Operations Section.

7.2 Trakhees Officer will then check all submitted papers for approval.

7.3 Trakhees Officer to go and personally check the following:

a. Radiation warning sign boards are placed on the vehicle.

b. Driver of transporting vehicle should have TLD wrist / chest badge;

c. To check the radiation level outside the box, stand at least 1 meter distance from the box and record it on Form S1.

7.4 Enter all details in the Radioactive Transportation Permits register and write drown the permit number on the form, sign and release it.

7.5 Copies of Form S1 and all relevant papers shall be filled in respective company and radioactive materials file.

8.0 Procedure for Re-exporting and Disposal of Spent Source

8.1 Form S2 (Trakhees Inspection Department – Operations Section) to be duly filled and signed by company's authorized/competent person along with "Civil Defence" approval for re-exporting to other countries or for disposal of spent source back to the original supplier, should be submitted to Trakhees Inspection Department – Operations Section.

8.2 Trakhees Inspector to check all the submitted papers and "Civil Defence" approval.

8.3 Same procedures as for importing.

8.4 Same procedures as for importing.

8.5 Follow up with the company for submission of proof of disposal/air way bill for the same. (It should be submitted within 30 days).

8.6 Copies of form S2 and all relevant papers shall be filled in the respective company and radioactive materials file.

Note: All companies shall forward a monthly tracking report to Trakhees Inspection Department – Operations Section).

Guidelines – Control of Substances Hazardous to Health and Danger

References: PCFC has based its requirements for the handling and storage of dangerous materials on the Gulf and United Arab Emirates standards and requirements.

a. Gulf Standard No. 62/1987 (U.A.E. Standard No. 69/1988). Industrial Safety and Health Regulations – Hazardous Materials – Flammable and Combustible liquids. Part 1: Tanks, Piping and Accessories.
b. Gulf Standard No. 63/1987 (U.A.E. Standard No. 70/1988). As above Part 2: Container and Portable Tank Storage.
c. Gulf Standard No. 55/1987 (U.A.E Standard No. 62/1988). As above. Gases. Part 1: General Requirements.