Dangerous Goods Management Manual

Prepared for Chiang Saen Commercial Port Area

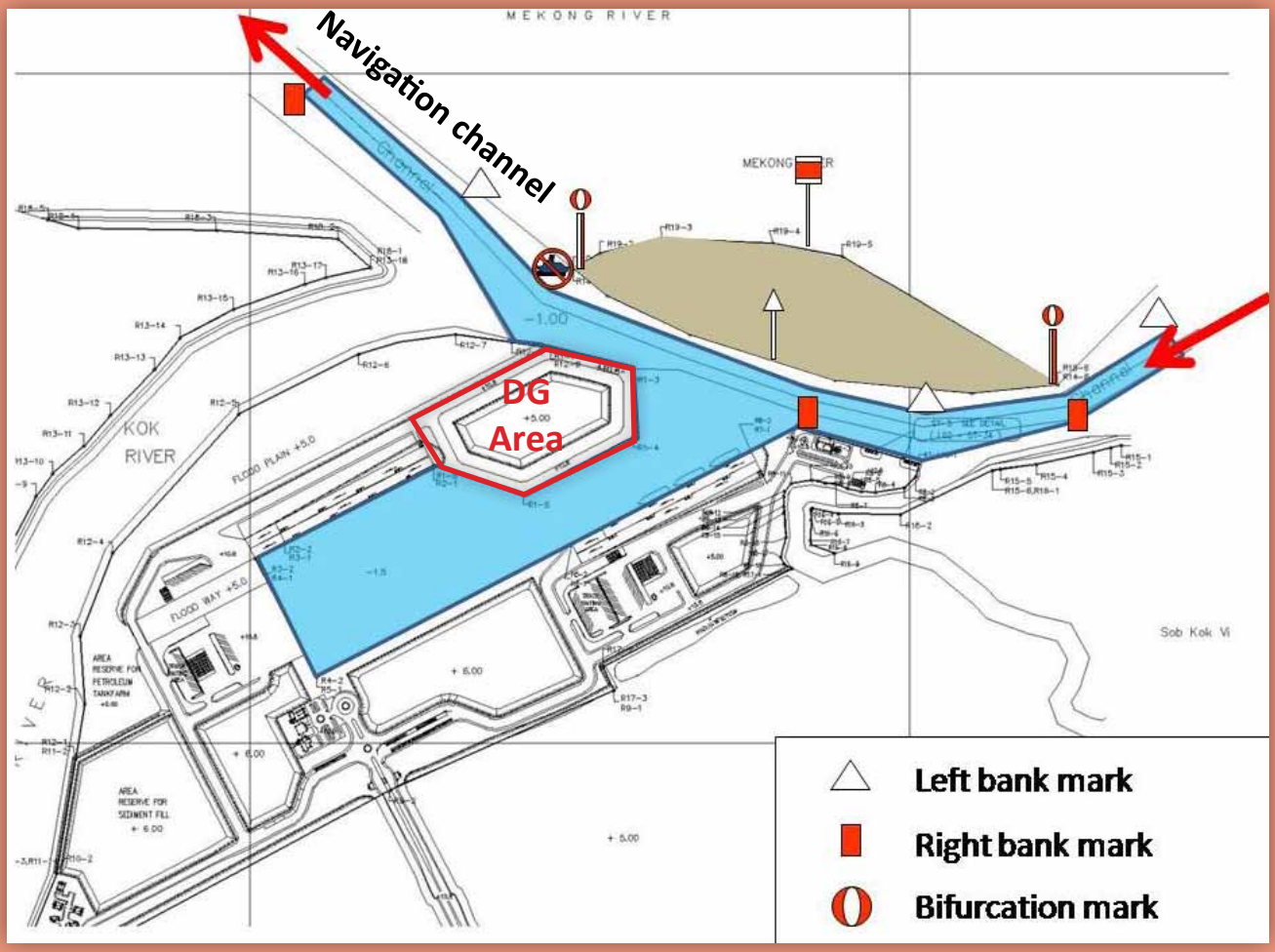
Mekong River Commission

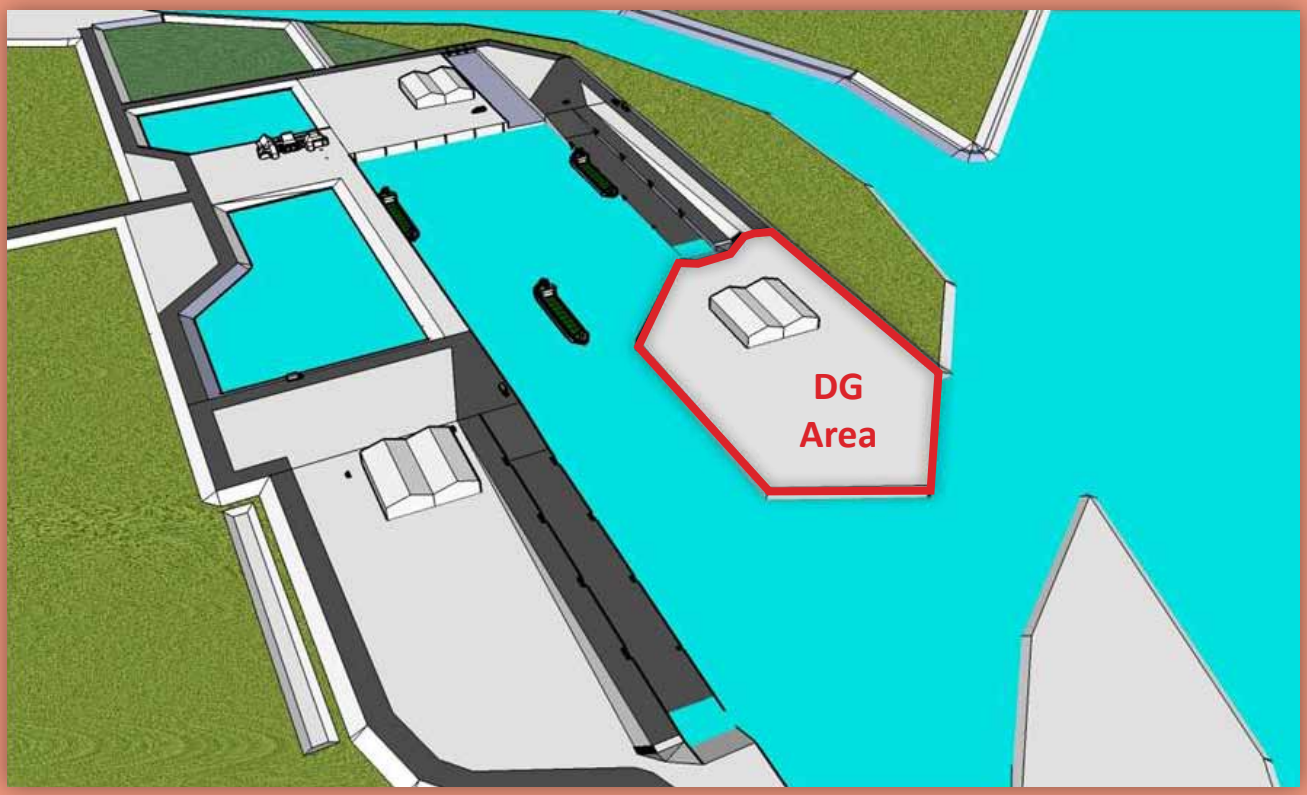
Navigation Programme

Cambodia • Lao PDR • Thailand • Viet Nam

For sustainable development

Chiang Saen Port II





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Acknowledgments

Key MRC staff, members of the consulting team and National Working Groups in Thailand who helped in the preparation of the Dangerous Goods Management Manual for Chiang Saen Port Area.

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Contents


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Acronyms and Abbreviations

ADN	Accord Européen relative au transport international des marchandises dangereuse par voie de navigation intérieur (European Agreement concerning the international carriage of dangerous goods by inland waterways)
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
B.E.	Buddhist Era
CBT	Computer Based Training
CCNR	Central Commission for the Navigation of the Rhine
CCTV	Closed Circuit Television
CDI	Chemical Distribution Institute
CHEM	Chemical Hazards and Emergency Management
Circ.	Circular
CPPI	Canadian Petroleum Products Institute
CSCP	Chiang Saen Commercial Port
CSC	International Convention for Safe Containers
CTU	Cargo Transport Unit
DCD	Dangerous Goods Declaration
DEQP	Department of Environmental Quality Promotion
DG	Dangerous Goods
DGMM	Dangerous Goods Management Manual
DGN	Dangerous Goods Note
EBIS	European Barge Inspection Scheme
ECOSOC	United Nations Economic and Social Council
FRL	Fire Resistance Level
GHS	Globally Harmonized System
HCCP	Hachiang Commercial Port
HFO	Heavy Fuel Oil
HSE	Health and Safety Executive
HSEM	Health, Safety and Environmental Management
IBC	Intermediate Bulk Container

ICS	International Chamber of Shipping
IFO	Intermediate Fuel Oil
ILO	International Labour Organization
IMSBC	International Maritime Solid Bulk Cargoes
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
ISGINTT	International Safety Guide for Inland Navigation Tank-Barges and Terminals
ISGOTT	International Safety Guide for Oil Tankers and Terminals
ISPS	International Ship and Port facility Security
JCCCN	Joint Committee on Coordination of Commercial Navigation on the Lancang - Mekong River
LEL	Lower Explosive Limit
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LOA	Length Over All
MAWP	Maximum Allowable Working Pressure
MD	Marine Department
MDGF	Multimodal Dangerous Goods Form
MDO	Marine Diesel Oil
MEGC	Multiple-Element Gas Container
MEKP	Methyl Ethyl Ketone Peroxide
MFAG	Medical First Aid Guide
MONRE	Ministry of Natural Resources and Environment
MOT	Ministry of Transport
MOU	Memorandum of Understanding
MRC	Mekong River Commission
MSDS	Material Safety Data Sheet
MSC	Maritime Safety Committee (IMO)
MVIS	Mekong Vessel Inspection Scheme
NAB	Navigation Advisory Body
NAP	Navigation Programme
N.O.S.	Not Otherwise Specified
NWG	National Working Group

OCIMF	Oil Companies International Marine Forum
ONEP	Office of Natural resources and Environmental Policy and Planning
PAT	Port Authority of Thailand
PCD	Pollution Control Department
PDF	Portable Document Format
PG	Packing Group
POP	Performance Oriented Packaging
POPS	Persistant Organic Pollutants
PPE	Personal Protective Equipment
PR	Peoples Republic
PSA	Port Security Assessment
PSN	Proper Shipping Name
PSO	Port Security Officer
PSP	Port Security Plan
RA	Risk Assessment
RM	Risk Management
SDS	Safety Data Sheet
SIGTTO	Society of International Gas Tanker and Terminal Operators
SOLAS	Safety of Life at Sea
STS	Ship to Ship
TAC	Terminal Audit Checklist
TMD	Thailand Marine Department
UEL	Upper Explosive Limit
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNSCETDG	United Nations Sub-Committee on the Transport of Dangerous Goods
VOC	Volatile Organic Compounds
VPQ	Vessel Particulars Questionnaire
WHO	World Health Organization


当心坠落

1 INTRODUCTION

1.1 Overview

From the **'Risk Analysis of the Carriage, Handling and Storage of Dangerous Goods'** project it was determined that a number of inland ports and terminals had limited capacity in the following areas - management of dangerous goods, waste management, environmental protection and insufficient emergency response planning. Furthermore, awareness and understanding of the treatment of dangerous goods in port management and workers safety needs to be enhanced. The recommendations called for ports to implement management systems for handling of dangerous goods, environmental protection, emergency and oil spill response and to develop training for management and workers.

At the 10th Navigation Advisory Body (NAB) meeting, Thailand requested the assistance of the Mekong River Commission (MRC) to implement a 'Pilot Project for Sustainable Management of Dangerous Goods at Chiang Saen Commercial Port (CSCP)'. The proposal was accepted by the other Member Countries as the training and management systems developed at CSCP can be applied to other inland ports in the Mekong Basin. In this regard the Navigation Programme travelled to CSCP in February 2012 to meet with representatives from the Thailand Marine Department (TMD) and the Port Authority of Thailand (PAT).

It was decided for the pilot project at CSCP to focus on the management of dangerous goods. The Navigation Programme infrastructure costs will be provided by PAT. The employees at the operational and management level at PAT will receive training on dangerous goods and risk assessment. It was agreed that both a national and international expert for Ports will be engaged to undertake the risk assessment, deliver training and prepare a manual on dangerous goods management.

In May 2012 the National Working Group (NWG), International Consultants and NAP completed the first two objectives of the CSCP pilot project:

1. To prepare and develop a dangerous goods risk assessment for activities and operations at Chiang Saen Commercial Port including port operations and vessel management; and
2. To review existing facilities for port and vessel waste management and develop a comprehensive waste management plan for Chiang Saen Commercial Port.

During the mission to CSCP, it became apparent that due to the low water levels at the port and in the navigation channel, vessels are choosing instead to import and export cargo through the Hachiang Commercial Port (HCCP). Therefore, the export of fuel through CSCP remains uncertain in the short term. This provides an opportunity for the TMD and PAT to ensure the port is ready for the storage and handling of petroleum products and to improve safety, pollution prevention, emergency preparedness and response capacity at both CSCP and HCCP.

During the second week of the mission the team consisting of the NWG, international consultants and NAP traveled to Bangkok to update the Thailand Marine Department, Port Authority of Thailand and Thai National Mekong Committee on the progress of the pilot project and review the key outcomes from the risk assessment and inspections completed at Chiang Saen. The NWG, International consultants and NAP worked at the Thailand Marine Department in Bangkok to start preparing the 3 main outputs for the project:

1. Dangerous Goods Management Manual (DGMM);
2. Waste Management Plan (WMP) Manual; and
3. Mekong Vessel Inspection Scheme (MVIS) Manual.

In the short term diesel and gasoline will be exported through HCCP. Therefore the DGMM will be applied to both CSCP and HCCP. The port workers and management from HCCP will also be invited to participate in the Dangerous Goods training. It is important that the Thailand Marine Department plays an active role with private ports and terminals along the Mekong River to minimise waste and reduce pollution and accidents. The Terminal Audit Checklist (TAC) for both ports was analysed to determine the content and structure of the DGMM. The manual will provide an overview of the international, regional and national rules and regulations related to the safe handling and storage of dangerous goods.

This dangerous goods management manual outlines the relevant criteria for dangerous goods cargo either as break-bulk or packaged dangerous goods and covers the import, export and transshipment of dangerous goods in transit.

This manual is not intended to provide a complete, comprehensive review of all statutory requirements. Nor does the manual detail all the requirements for stevedore(s), shipping lines and other personnel involved in the transport of dangerous goods.

1.2 Current Situation

From 2004 to 2012 petroleum products (diesel and gasoline) where mainly exported through Keawalee terminal to the People's Republic of China and the Union of Myanmar. The petroleum products where transferred from tank trucks to barges and then transported to PR China and Union of Myanmar. Exports increased from just over 4 million litres in 2004 to almost 17 million litres in 2011. Operations were to be phased out at Keawalee terminal in 2012 and transferred to CSCP. Export levels from CSCP were planned to increase to 100 million litres in the future. However the transfer to CSCP was unable to commence due to low water levels at the port and in the navigation channel. Therefore, operations were temporarily shifted to HCCP. As a result, the export of petroleum products through CSCP remains uncertain in the short term.

As a result of the low water level at CSCP and in the navigation channel, HCCP started exporting petroleum products (diesel and gasoline) in 2012. The petroleum products are mainly exported to mainland PR China and the Union of Myanmar and partly used for bunkering. These bunkering operations take place at Wan Pong anchorage, Union of Myanmar, just across the border.

Table 1: **Export of petroleum products at HCCP in 2012**

Month 2012	Ship calls	Amount (million Litres)		Total
		Diesel	Gasoline	
January	13	938,000	0	938,00
February	14	1,111,000	0	1,111,000
March	11	914,00	0	914,000
April	10	677,000	0	677,00
May	12	699,000	111,000	810,000
June	14	966,00	156,000	1,122,00
Total	74	5,305,000	267,000	5,572,000

It was reported by the Thai Ministry of Transport (MOT) that the first Chiang Saen Port had become too small to accommodate the rapid growth of trade and transportation between Thailand and PR China. The expansion of the first port is not allowed, since it is located in a designated historical site and must be preserved as part of national heritage regulations. Moreover, the Treasury Department is developing this district to be registered as a World Cultural Heritage Site. This historical site will be promoted as a major tourist destination in northern Thailand.

The construction of CSCP began in 2008 and all major work at the port was completed by the beginning of 2012. The port was officially opened at the end of March 2012. The port is located about 10 km south of the existing Chiang Saen Port, with the total area of 640,000 square metres (approximately 4 times bigger than the existing port). The port's location is in the Mae Nam Kok estuary, which is not adjacent to the bank of the Mekong River. The port has the ambition of becoming a centre of investment, trade and transport in the Upper Mekong Region and a major gateway between Thailand and Southern China for the trade of goods.

Figure 1: **Hachiang Commercial Port – Google Earth**

Figure 2: **Hachiang CP – Transfer point for dangerous goods**

The port has the necessary infrastructure for the transfer of dangerous goods and is remotely located with no populated areas in the near vicinity. Most security measures are in place and the installation of a CCTV system covering the entire port is in progress. A separate, sufficiently large, dangerous goods area has been built at the new port, well away from office buildings and other cargo operations. In the event of an emergency, the area is easily accessible by emergency services. In case of emergency, vessels are close to the exit of the port.

Another advantage of the port is that it is not located on the river. As a result there is much less turbulence than on the river itself. In case of an oil spill the port can be boomed much more easily and effectively. The recovery of spilled oil is much easier in less turbulent waters. Therefore, the clean up equipment required is less complex and more cost effective.

As a result of the low water level in the early months of 2012, the level of traffic was disappointing and lower than expected. Currently the port is not handling any dangerous goods and there are no prospects for this to change in the short term. However this temporary setback will give the port the necessary additional time to complete all outstanding items in order to be ready to transfer dangerous goods when fully operational. The port should focus on the following points:

- Develop a Health, Safety and Environmental (HSE) management system;

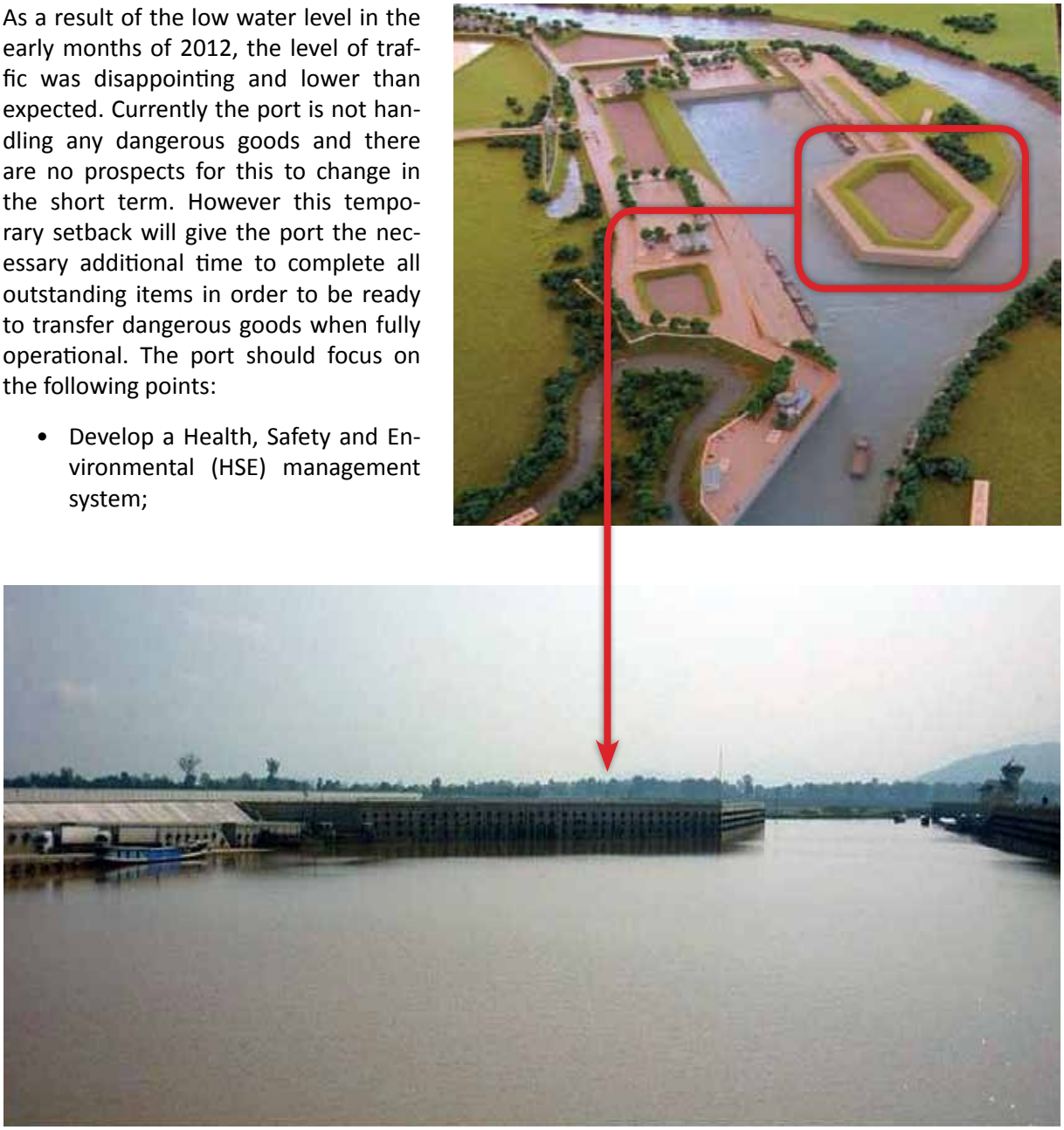

Figure 3: **Chiang Saen CP – Dangerous goods Area**

- Provide training in the following subjects:
  - The handling of dangerous goods;
  - The use of personal protective equipment (PPE); and
  - Waste management.
- Complete the installation of fire protection measures at the port in general and especially in the dangerous goods area;
- Prepare an emergency response plan and provide the necessary response equipment;
- Prepare written procedures and checklists concerning the transfer of dangerous goods (especially transfer from truck to vessel); and
- Develop a waste management plan for the port.

บัญญัติ 10 ประการ

ป้องกันโรคและภัยที่มากับน้ำ

1. สวมเสื้อชูชีพ ก่อนลงน้ำ
   เท้าสวมถุงพลาสติก ก่อนลุยน้ำ

2. ไม่กินอาหารค้างมื้อ ดื่มน้ำสะอาด
   ล้างมือหรือทำความสะอาดด้วยแอลกอฮอล์เจล

3. ป้องกันไม่ให้ยุงกัด

4. ทิ้งเศษอาหารและขยะในถุงพลาสติก
   มัดปากถุงให้แน่น

5. ถ้ามีโรคเรื้อรัง อย่าลืมรับประทานยาประจำตัว

6. หากิจกรรมทำ เพื่อผ่อนคลายความเครียด

7. ถ้าป่วย รีบแจ้งหน่วยแพทย์ อย่าปล่อยไว้เกิน 2 วัน

8. สวมหน้ากากอนามัยเวลาเป็นหวัด

9. ดื่มน้ำตาลเกลือแร่ (ORS) เมื่อมีอาการท้องเสีย

10. ระวังอันตรายจากไฟฟ้าดูด

กรมควบคุมโรค กระทรวงสาธารณสุข
www.ddc.moph.go.th หรือโทร.1422

2 REGULATIONS CONCERNING DANGEROUS GOODS

2.1 International Regulations and Recommendations

2.1.1 UN Recommendations on the Transport of Dangerous Goods - Model Regulations - Seventeenth revised edition ("Orange book")

Before UN recommendations were first published each nation developed its own regulations for identifying, classifying and transporting dangerous goods. Obviously this caused several problems for international transport. The first version of the Recommendations on the Transport of Dangerous Goods was produced by the United Nations Economic and Social Council (ECOSOC) in 1956. From 1996, the Recommendations were effectively split into two parts: the Model Regulations, which form suggestions for drafting of laws and regulations on the transport of dangerous goods; and the Manual of Tests and Criteria, which contain technical information about methods of testing products to ascertain their hazards.

The UN recommendations cover the transport of dangerous goods by all modes of transportation except bulk tanker. They are not obligatory or legally binding on individual countries, but have gained a wide degree of international acceptance: they form the basis of several international agreements and many national laws. The UN recommendations are updated every two years.

Figure 4: **International Regulations**

The UN Model Regulations cover all aspects of transportation necessary to provide international uniformity. They include a comprehensive criteria based classification system for substances that pose a significant hazard in transportation. Hazards addressed include explosiveness, flammability, toxicity (oral, dermal and inhalation), corrosiveness to human tissue and metal, reactivity (e.g. oxidizing materials, self-reactive materials, pyrophoric substances, substances that react with water), radioactivity, infectious substance hazards and environmental hazards. They prescribe standards for packaging and multimodal tanks used to transport hazardous materials. They also include a system of communicating the hazards of substances in transport through hazard communication requirements which cover labelling and marking of packages, placarding of tanks, freight containers and vehicles, and documentation and emergency response information that is required to accompany each shipment.

The International Maritime Organisation (IMO) has developed the International Maritime Dangerous Goods Code ("IMDG Code", part of the International Convention for the Safety of Life at Sea) for transportation of dangerous goods by sea that are based upon the UN Model but modified to accommodate unique aspects of sea transport.

Regulations concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) were developed for the transportation of dangerous goods based on the UN model but modified to accommodate unique aspects of transport by inland waterways.

From the following page it is possible to view and download the text of the seventeenth revised edition (latest version) of the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, in PDF format

http://www.unece.org/trans/danger/publi/unrec/rev17/17files_e.html

2.1.2 European Agreement concerning the International Carriage of Dangerous Goods (ADN)

A Diplomatic Conference convened jointly by the United Nations Economic Commission for Europe (UNECE) and the Central Commission for Navigation of the Rhine (CCNR) adopted on 25 May 2000 a European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN).

ADN consists of a main legal text (the agreement itself) and annexed regulations, and aims at:

- Ensuring a high level of safety of international carriage of dangerous goods by inland waterways;
- Contributing effectively to the protection of the environment, by preventing any pollution resulting from accidents or incidents during such carriage; and
- Facilitating transport operations and promoting international trade in dangerous goods.

From the following page it is possible to view and download the text of the European Agreement concerning the International Carriage of Dangerous Goods (ADN) in PDF format:

http://www.unece.org/trans/danger/publi/adn/adn2011/11files_e.html

2.1.3 International Maritime Dangerous Goods (IMDG) Code

The development of the IMDG Code dates back to the 1960 Safety of Life at Sea Conference, which recommended that Governments should adopt a uniform international code for the transport of dangerous goods by sea to supplement the regulations contained in the 1960 International Convention

for the Safety of Life at Sea (SOLAS). A resolution adopted by the 1960 Conference said the proposed code should cover such matters as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances.

A working group of IMO's Maritime Safety Committee began preparing the Code in 1961, in close cooperation with the United Nations Committee of Experts on the Transport of Dangerous Goods, which in a 1956 report had established minimum requirements for the transport of dangerous goods by all modes of transport.

Amendments to the IMDG Code originate from two sources: proposals submitted directly to IMO by Member States, and amendments required to take account of changes to the United Nations Recommendations on the Transport of Dangerous Goods which sets the basic requirements for all the transport modes.

Amendments to the provisions of the United Nations Recommendations are made on a two yearly cycle approximately two years after their adoption, they are adopted by the authorities responsible for regulating the various transport modes. In this way a basic set of requirements applicable to all modes of transport was established and implemented, thus ensuring that difficulties are not encountered at intermodal interfaces.

The Code lays down basic principles; detailed recommendations for individual substances, materials and articles, and a number of recommendations for good operational practice including advice on terminology, packing, labelling, stowage, segregation and handling, and emergency response action.

2.1.4 International Maritime Solid Bulk Cargoes (IMSBC) Code and Supplement, 2009 Edition

The primary aim of the International Maritime Solid Bulk Cargoes (IMSBC) Code, which replaces the Code of Safe Practice for Solid Bulk Cargoes (BC Code), is to facilitate the safe stowage and shipment of solid bulk cargoes by providing information on the dangers associated with the shipment of certain types of solid bulk cargoes and instructions on the procedures to be adopted when the shipment of solid bulk cargoes is contemplated.

The IMSBC may be applied from 1 January 2009 on a voluntary basis. The IMSBC Code, and amendments to SOLAS chapter VI to make the Code mandatory, were adopted by IMO's Maritime Safety Committee in December 2008.

The IMSBC Code includes:

- fully updated individual schedules for solid bulk cargoes;
- new individual schedules for such cargoes as direct reduced iron fines, spent cathodes and granulated tire rubber;
- new provisions about sulphur;
- references to the most recent SOLAS amendments; and
- relevant updated information from the 2008 edition of the International Maritime Dangerous Goods (IMDG) Code.

Figure 4: **IMSBC Code**

2.1.5 The International Safety Guide for Inland Navigation Tank-Barges and Terminals (ISGINTT)

The main purpose of International Safety Guide for Inland Navigation Tank-Barges and Terminals (ISGINTT) is to improve the safe transportation of dangerous goods at the interface of inland tank barges with other vessels or shore facilities (terminals). ISGINTT incorporates best practices as recommended by the participating industry associations. The safety guide is compatible with international maritime guidance for sea going vessels (e.g. “International Safety Guide for Oil Tankers and Terminals (ISGOTT)”, “Liquefied Gas Handling Principles on Ships and in Terminals”). The project was initiated in January 2006 by the Central Commission for the Navigation of the Rhine (CCNR), and the Oil Companies International Marine Forum (OCIMF), has involved all industry associations concerned with the transport of dangerous goods on European inland waterways. In 2007 the Society of International Gas Tanker and Terminal Operators (SIGTTO) joined the project[1]. The ISGINTT can be downloaded free of charge in PDF format from the following location:

http://www.isgintt.org/300-nl.html.

2.1.6 The revised recommendations on the safe transport of dangerous cargoes and related activities in port areas

The revised recommendations on the safe transport of dangerous cargoes and related activities in port areas were approved as MSC.1/Circ.1216 by the Maritime Safety Committee at its 82nd session (29 November to 8 December 2006), recognising the need to align the relevant provisions of the recommendations with those of the IMDG Code, as amended, and with the ISPS Code concerning security provisions. A copy of these recommendations can be downloaded free of charge in PDF format from the following location:

http://www.imo.org/blast/blastDataHelper.asp?data_id=18089&filename=1216.pdf

2.2 Regional Agreements

2.2.1 Quadripartite Agreement on Commercial Navigation on the Lancang-Mekong River

The Agreement on Commercial Navigation on Lancang-Mekong River among the governments of the People’s Republic of China, the Lao People’s Democratic Republic, the Union of Myanmar and the Kingdom of Thailand (“Quadripartite” Agreement, hereinafter referred to as "the Agreement"), signed on 20 April 2000 at Tachileik, forms the legal basis for opening the upper Mekong for International navigation.

The aim of the agreement is to develop international passenger and cargo transportation between the contracting parties on the Lancang-Mekong River, and to promote and facilitate trade and tourism, and strengthen cooperation in commercial navigation on the basis of respect for sovereignty, equality, and mutual-benefit.

Vessels of any Contracting Party are entitled to sail freely between Simao in the People's Republic of China and Luangprabang in Lao People’s Democratic Republic in conformity with the provisions of this Agreement and their relevant rules and regulations jointly adopted by the Contracting Parties.

[1] http://www.isgintt.org/

Article 17 of the Agreements reads:

"For the safety of life, health and the protection of the environment the carriage under this Agreement of hazardous materials such as toxic chemicals, explosives and radioactive material shall be prohibited. However the carriage of some other types and categories of dangerous goods and the safety measures thereof may be agreed upon consultation among the Contracting Parties."

Meaning that the agreement prohibits the carriage of toxic chemicals, explosives and radioactive material on the Mekong. The carriage of other types and categories of dangerous goods is only allowed when agreed upon among the Contracting Parties.

2.2.2 Memorandum of Understanding concerning the Implementation of the Quadripartite Agreement on Commercial Navigation on the Lancang-Mekong River

This Memorandum of Understanding (hereinafter referred to as "the MOU") was signed in Beijing on March 15, 2001 and entered into force from the date of its signature.

In accordance with Article 2 of the Agreement, the Parties adopt 6 Rules, Regulations and Guidelines attached as annexes to this Memorandum of Understanding. The 6 Rules, Regulations and Guidelines which form an integral part of the MOU are as follows:

Annex I: Regulations on Safe Navigation of Vessels on the Lancang-Mekong River.

Annex II: Rules on Water Transport Administration on the Lancang-Mekong River.

Annex III: Guidelines on the Maintenance and Improvement of the Navigability of the Lancang-Mekong River.

Annex IV: Regulations on the Investigation and Handling of waterborne Traffic Accidents on the Lancang-Mekong River.

Annex V: Regulations on Management of Search & Rescue, Salvage and Wreck Removal on the Lancang-Mekong River.

Annex VI: Technical Regulations on Surveys of Commercial Ships on the Lancang-Mekong River.

Annex II Article 17 of the MOU reads:

The protection requirements for each packaging group and each type of package as required in the carriage of dangerous goods shall be in compliance with the provisions for packaging type, packing method, specifications and performance tests in the IMDG Code.

The proper shipping name of the goods shall be displayed on the package of dangerous goods and the name used shall be in compliance with the individual schedules of dangerous goods in the IMDG Code. Labels and marks as required by the provisions of the IMDG Code shall be adhered to on an evident place of the package either by pasting, printing or fastening.

The UN number of the dangerous goods contained shall also be displayed on their packages.

The documents used for the transport of dangerous goods shall meet the requirements stipulated in the IMDG Code.

In other words the packing, labelling, marking and documents for the carriage of dangerous goods shall all be in compliance with the IMDG code.

Annex II Article 20 of the MOU reads:

"The loading and carriage of ruptured and leaked packages and contaminated dangerous goods shall be prohibited."

2.3 National Provisions

2.3.1 Navigation in Thai Water Act B.E. 2456

The most important provisions here are:

Title III: Special Regulations:

- **Chapter I:** Regulations for Rua Khampans and boats carrying anything that could cause danger – Section 189 to Section 196.
- **Chapter II:** Regulations in Relation to Petroleum in bulk – Section 199 to 208.

2.3.2 The Enhancement and Conservation of the National Environmental Quality Act B.E. 2535

The Act consists of six main sections: Introduction, Approaches to the National Environmental Act, Environmental Protection, Pollution Control, Promotion Measures and Civil and Penal Liability.

The Environmental Quality Board is established in accordance with the Act. The Environmental Quality Board has powers and duties in submitting policy and governing related agencies in environmental quality management. Examples of the powers and duties of the board are the submission of policy and planning, consideration and approval of the environmental quality management plan, the provincial action plan for environmental quality management, the action plan for prevention and remedy of danger caused by contamination of pollutants, the setting of emission of effluent standards and the specification of measures for the strengthening and fostering of cooperation and coordination among government agencies and the private sector.

To implement this Act effectively, the Government of Thailand has formulated the 'Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality (1997-2016)' and established three environmental organisations, namely, the Office of Natural Resources and Environmental Policy and Planning (ONEP), the Pollution Control Department (PCD) and the Department of Environmental Quality Promotion (DEQP) under the Ministry of Natural Resources and Environment (MONRE). These governmental organisations are further divided into several divisions and regional offices, which take charge of special natural resources and environmental concerns at national and provincial levels.

2.3.3 Hazardous Substance Act B.E. 2535

This Act contains provisions for the control and trade of hazardous substances. The Act consists of 4 chapters divided into 93 sections, and of 1 Schedule. Chapter 1 outlines the establishment of the Committee on Hazardous Substances, and defines its powers and duties. Chapter 2 contains information concerning the classification of Hazardous Substances in accordance with their use, production, import, export, etc., as provided for in section 18. Duties and civil liabilities of producers, importers, carriers, etc., of hazardous substances are outlines in Chapter 3. Chapter 4 contains penal provisions.

Ministerial Regulation (B.E. 2537) carries into effect the Hazardous Substance Act B.E. 2535. This Regulation lays down procedures to apply for permission to produce, import, export, or possess a hazardous substance of the 3rd type as specified in the principal Act. Buildings and places involved in the production or storage of hazardous substances must be in a suitable location to allow for the safe transportation of hazardous substances. Furthermore, they shall not cause any pollution or impact on rivers, canals, public water sources or natural and environmental conservation sources, and must not be located near public places, residential areas, etc., as specified in the text. The Regulation also provides for licensee's duties and for procedures for the amendment or renewal of licenses.

2.3.4 Factory Act B.E. 2535

The Factory Act, B.E. 2535 (1992) and its amendments are the legal instruments which set out regulations for factory construction and operation, factory expansion, and safety requirements. The Act is administered by the Department of Industrial Works of the Ministry of Industry.

2.3.5 Regulation of the Prime Minister Office on the Prevention and Combating of Oil Pollution B.E. 2547 (2004)

This regulation provides an update of the Regulation of the Prime Minister Office on the Prevention and Combating of Oil Pollution 1995. The regulation aims to achieve a more effective response by virtue of clause 11 (8) of the Administration Organisation of the State Act B.E. 2534 (1991) through the establishment of a Committee on the Prevention and Combating of Oil Pollution, consisting of the Minister of Transport as Chairperson and the Permanent Secretary of the Ministry of Transport as Vice-Chairperson. The Marine Department acts as the Coordination Centre under this regulation. Bodies and functions of operation units are also defined under this regulation. The Minister of Transport is in charge of the implementation of this regulation.

2.3.6 Notification of Marine Department No. 3/2555 – Classification of Dangerous substances and Articles

This notification gives a comprehensive description on the different classes of dangerous goods. The marking and labelling of classes and sub-classes should be in accordance with the annex of this notification. Further this notification states that classification of any other substance should be in accordance with the International Maritime Dangerous Goods Code (IMDG code). The Notification of Marine Department no. 3/2555 is an update from the Notification of Marine Department no. 353/2529.

2.3.7 Notification of Marine Department No. 411/2543 – Safety Measures for the Loading/Discharging of Oil Chemicals

This notification provides guidelines for the loading/discharging of oil and chemicals as these operations are risky activities which may cause marine pollution and damage to the marine environment. The notifications contains 3 parts, that can be summarised as follows:

- Owner or operator of a port that loads/discharges oil or chemicals shall develop an action plan for the prevention and response of marine pollution caused by oil or chemical spillage. This

plan should be developed using the Marine Department's guidelines (Notification of Marine Department No. 412/2543, mentioned below) and approved by the Marine Department before implementation.

- Owner or operator of a port that loads/discharges oil or chemicals shall have all appliances/ equipment necessary for the oil spill response in accordance with the action plan approved by the Marine Department. These equipment/appliances must be ready for use at all times.
- Before the loading of oil/chemicals a ship/shore safety checklist must be completed. The ship/ shore safety checklist recommended by the International Safety Guide for Oil tankers and Terminals (ISGOTT) should be used; the completed checklist should be filed and kept for at least 3 months. In case of transshipment the operations should be carried out according to the Ship to Ship Transfer Guide, developed jointly by the International Chamber of Shipping (ICS) and the Oil Companies International Marine Forum (OCIMF).

2.3.8 Notification of Marine Department No. 412/2543 – Guidelines for the Action Plan for Combating Marine Pollution at Ports where Dangerous Goods are Loaded/Discharged

This Notification was imposed by the Marine Department to ensure uniformity and consistency of the action plan for combating marine pollution caused by the spillage of oil or chemicals at ports. The notification contains 2 parts which can be summarised as follows:

The action plan should be developed with a view to providing an immediate response to a marine pollution incident so that the incident is controllable and does not cause serious damage to lives, properties and the environment.

Part 2 describes the different components of the action plan.

2.3.9 Marine Department Safety Measures for Transportation of Petroleum Products on the Mekong River (Thailand)

These safety measures have been developed to serve as a guideline for management and control in order to ensure safe transportation, respond to unexpected incidents of oil spill and establish how to claim for compensation of operational expenses and damages caused by marine pollution as a result of an oil spill.


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3 CLASSIFICATION OF DANGEROUS GOODS

3.1 Definition of Dangerous Goods Based on UN Recommendations

Dangerous goods are solids, liquids, or gases that can harm people, other living organisms, property, or the environment.

The United Nations Sub-committee on the Transport of Dangerous Goods (UNSCETDG) has devised test criteria to determine which substances should be identified as dangerous goods in transport. This has been done to accommodate the large number of different dangerous goods, rapid development of new substances, the unusual chemical names to describe the goods and the different emergency response requirements for each dangerous good. The UNSCETDG has devised a system of nine classes for substances with the objective of dividing all current and future dangerous goods into these classes. The system of classes was established keeping in mind the type of containment to be used, the chemical and physical characteristics of the substances and response procedure that would be most appropriate in the event of an accidental release. Consequently, in the UN Model Regulations each substance has a name (called a Proper Shipping Name) and a four digit UN number and, according to its chemical and physical characteristics, is assigned to a class and a packing group.[2]

The Dangerous Goods List lists the proper shipping names and UN numbers of most substances that are most commonly transported. The list is not exhaustive but is intended to include, as much as possible, proper shipping names and UN numbers of substances that are of commercial importance. A “generic” (e.g. UN 3010, COPPER BASED PESTICIDE, LIQUID, TOXIC) or “not otherwise specified“ (N.O.S.), (e.g. UN 1481, PERCHLORATES, INORGANIC, N.O.S.) entry may be used to permit the transport of substances or articles which do not appear specifically by name in the dangerous goods list. The concept of generic and “N.O.S.” entries in the list is important mainly because the Dangerous Goods List in not exhaustive. The entries on the list represent millions of substances. Therefore the list cannot be considered a list of all dangerous goods.

Note: The Dangerous Goods List does not include goods which are so dangerous that their transport, except with special authorisation, usually from competent authority is prohibited.[3]

3.2 Dangerous Goods Classification

Substances, including mixture and solutions, and articles that are subject to the provisions of the IMDG Code are assigned to one of nine classes according to the hazard they pose in transport. These classes or divisions are:

[2] Guiding principles for the development of the UN Model Regulations, second version (2010), p.7-8

[3] Guiding principles for the development of the UN Model Regulations, second version (2010), p.9

Table 2: **Classification of Dangerous goods**

Class 1: Explosives	
	**Division 1.1:** Substances and articles which have a mass explosion hazard **Division 1.2:** Substances and articles which have a projection hazard but not a mass explosion hazard **Division 1.3:** Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard
	**Division 1.4:** Substances and articles which present no significant hazard
	**Division 1.5:** Very insensitive substances which have a mass explosion hazard
	**Division 1.6:** Extremely insensitive articles which do not have a mass explosion hazard

Examples: Ammunition, fireworks and blasting explosives

Class 2: Gases	
	**Class 2.1:** Flammable Gases

Examples: Liquefied Petroleum Gas (LPG), Liquefied Natural Gas (LNG), Disposable cigarette lighters and refills for gas lighters, acetylene (for oxy-acetylene welding and brazing), ethylene (for ripening fruit) and hydrogen (for university and some industry use).

	**Class 2.2:** Non-Flammable, non-toxic Gases

Examples: Carbon dioxide (found in soft drink dispensing machines), oxygen (for hospitals and oxy-acetylene welding), compressed air, freons (for refrigerating, air conditioning and polyurethane manufacture), compressed nitrogen and argon (for welding), liquid oxygen and nitrogen (for industrial applications).

	**Class 2.3:** Toxic Gases

Examples: Methyl bromide and ethylene oxide (for fumigation), chlorine (for commercial swimming pools water sanitation) and ammonia (for industrial freezing works).

Class 3: Flammable Liquids

Examples: Gasoline, kerosene, unleaded Petrol, Acetone, enamel paints, car lacquers, polyurethane varnish, methanol polyester resin kits and petrol.

Class 4: Flammable solids; substances liable to spontaneous combustion; substances which in contact with water emit flammable gasses

	**Class 4.1:** Flammable solids, self-reactive substances and desensitised explosives

Examples: Matches and synthetic camphor and naphthalene (moth balls).

	**Class 4.2:** Substances liable to spontaneous combustion

Examples: Unstabilised fish meal and cotton waste.

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

Examples: Sodium and potassium metals and calcium carbide (liberates acetylene on contact with water).

Class 5: Oxidising Substances and organic peroxides

	**Class 5.1:** Oxidising Substances

Examples: Calcium hypochlorite (pool chlorine HTH), some home bleaches and nappy sanitisers, hydrogen peroxide for swimming pool treatment and some fertilisers such as ammonium nitrate.

Class 5.2: Organic Peroxides

Examples: The hardeners from products such as Plastibond, Bondofill etc., and Methyl Ethyl Ketone Peroxide (MEKP).

Class 6: Toxic and infectious substances

Class 6.1: Toxic Substances

Examples: Some pesticides (e.g. most agriculture insecticides and some weed killers), and industry products such as sodium cyanide for metal treatment. Copper and chrome arsenate mixtures for timber preservatives.

Class 6.2: Infectious Substances

Examples: Blood samples from people with infectious diseases, septic tank effluent wastes and biomedical waste.

Class 7: Radioactive Material

Examples: Cobalt, uranium and other radioactive materials used for the sterilisation of medical products and as a treatment for cancer.

Class 8: Corrosive Substances

Examples: Car and truck batteries, glacial acetic acid used for peeling processed fruit, caustic soda acids such as hydrochloric, sulphuric and nitric used in many industrial processes.

Class 9: Miscellaneous dangerous substances and articles	
	

Examples: Dry ice, asbestos and molten bitumen.

Note: *The numerical order of the classes does not indicate the degree of danger.*

3.3 Dangerous Goods Packing Groups

As well as a the nine different 'Class' designators indicating the type of hazard a dangerous goods presents, a 'Packing Group' is assigned to dangerous goods in accordance with the degree of danger they present:

Packing Group I : substances presenting high danger

Packing Group II : substances presenting medium danger

Packing Group III : substances presenting low danger

Classes 3, 4, 5.1, 6.1 and Class 8 and some Class 9 substances have Packing Groups assigned to them. Packing Group designators are always written in Roman numerals (I, II or III) to differentiate them from the Class numbers. Testing conducted on a package for a **Packing Group I** product is considerably more stringent than the testing requirements for a **Packing Group III** product.

Note: *Even though there are no packing groups assigned to explosives, Class 1 packages intended to carry explosives under the IMDG Code must be tested to confirm the performance requirements for Packing Group II.*

It is possible for a substance to appear in more than one Packing Group, depending on its concentration. For example, concentrated sulphuric acid is Class 8, Packing Group II. A mild solution of the same acid, which might be marketed as a domestic drain cleaner, is still allocated to Class 8, but because of its lesser corrosivity could be assigned to Packing Group III.

3.4 Dangerous Goods Handled

At Keawalee terminal the export of fuel (diesel and gasoline) increased to about 17 million litres in 2011. The fuel was mainly transferred from truck to barge. These transfers have however been phased out and were going to be transferred to CSCP. However as a result of the low water level in early 2012, these transfers could not take place at CSCP and were moved to HCCP. Currently the port has completed about 60 transfers, representing a total amount of about 4.5 million litres of fuel (about 4.4 million litres of diesel and 0.1 million litres of gasoline).

Table 3: **Dangerous goods currently handled**

UN No.	Proper Shipping Name (PSN)	Class Or Division	Label
0336	Fireworks	1.4	
1202	Gas Oil or Diesel Fuel or Heating Oil, Light	3	
1203	Motor Spirit or Gasoline or Petrol		

The primary danger when handling petroleum products such as diesel and gasoline is the chance of a fire or explosion.

Diesel fuels will not ignite at normal storage temperatures unless they are contaminated with a more volatile product. They easily ignite if heated above their flash points. Once ignited, they produce a hot fire that may be hard to put out. These fuels spread quickly on both land and water and burn completely. An open flame or hot exhaust manifold can easily ignite a spray of diesel fuel from a leak or a sudden tank overflow.

Diesel fuel is a chemical that negatively impacts the environment. Liquid diesel is poisonous and when spilled or leaked, threatens plant and animal species, particularly aquatic life, that come into contact with it.

There is limited evidence from animal studies that prolonged exposure may increase the risk of developing skin cancer. There is thought to be no risk of cancer from short-term, occasional exposure. Diesel is harmful and my cause lung damage if swallowed. Repeated exposure may cause skin dryness or cracking.

Note: *Recently the World Health Organisation (WHO) has confirmed that diesel engine exhaust fumes are carcinogenic. The WHO says that diesel emissions cause lung cancer and increase the risk of bladder cancer*[4]*.*

Gasoline is a greater fire and explosion hazard than Diesel. Gasoline forms explosive mixtures above its surface, at gauge openings or vents. Vapours from any size gasoline spill easily form explosive mixtures. Gasoline vapours, as in all petroleum vapours, are heavier than air. This causes them to spread for long distances along the ground and collect in low places. Such vapours ignite easily. The resultant flash and explosion will travel back to the fuel source igniting it. Preventing small gasoline leaks is difficult. Therefore, there is always a danger of ignition from sparks and flames. It is important to prevent gasoline vapour accumulation. Never allow gasoline to enter any drain line or sewer not designed to handle petroleum products.

[4] http://www.abc.net.au/news/2012-06-13/diesel-fumes-carcinogenic/4068414?WT.mc_id=newsmail

Gasoline is a chemical that negatively impacts the environment. Gasoline is toxic for aquatic organisms and may cause long term adverse effects on the aquatic environment. Gasoline is potentially bioaccumulable due to the presence of certain hydrocarbon compounds.

Gasoline is a toxic chemical that can cause irritation and burns (to eyes). Inhalation at strong concentrations affects the central nervous system leading to possible loss of consciousness. Ingestion can cause irritation to the gastrointestinal mucosa and can be complicated by pulmonary aspiration, resulting in chemical pneumonitis. Prolonged or chronic exposure can lead to intoxication by benzene.

Note: *Always consult the corresponding Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) based on the Globally Harmonised System (GHS) of classification and labelling of chemicals to obtain detailed and up to date information concerning the product in use. The above description is a brief general description of diesel and gasoline properties and originates from generic MSDS/SDS. Generic MSDS/SDS may be used for reference purposes only.*

Fireworks Class 1.4 G (Consumer or Common Fireworks) are imported through a private port a little further downstream of HCCP called Techona. These fireworks are not allowed to be stored in port but are immediately transferred outside the port area. The import depends on the time of the year, in 2011 a total of 3.7 tonnes was imported from China.

4 CONTAINMENT OF DANGEROUS GOODS

4.1 Forms of Containment Systems of DG

4.1.1 Conventional packaging

Examples: drums, bags, fibreboard boxes, gas cylinders, …

Figure 5:
Examples of conventional packagings[5]

4.1.2 Intermediate Bulk Containers (IBCs)

An Intermediate bulk container (IBC) is a container used for transport and storage of fluids and bulk materials. The construction of the IBC container and the materials used are chosen depending on the application.

There are different categories of IBCs: metal, flexible, rigid plastic, composite, fibreboard and wooden IBCs.

Figure 6:
Intermediate Bulk Containers (IBCs)

[5] http://www.jk-media.co.kr/html/sub_02_1.html

4.1.3 Large packaging

Large packaging refers to packaging designed for mechanical handling and exceeding 400 kg net mass or 450 litres capacity but with a volume of not more than 3 cubic metres.

4.1.4 Portable tanks and Multiple-Element Gas Containers (MEGCs)

The IMDG code refers to existing IMO type tanks and road tank vehicles for the transport of dangerous goods. These tanks are divided into 8 types depending on the class of dangerous goods they can carry, the Maximum Allowable Working Pressure (MAWP), the presence of a pressure relief device and whether or not they are thermal. IMO types 4, 6 and 8 are road tank vehicles and include a semi-trailer with a permanently attached tank.

Figure 7: **IMO type 5 portable tank**[6]

Multiple-element gas containers are multimodal assemblies of cylinders, tubes and bundles of cylinders which are interconnected by a manifold and assembled within a framework.

Figure 8:
Multiple-element gas container[7]

4.1.5 Bulk Containers

Bulk containers are containment systems (including any liner or coating) intended for the transport of solid substances which are in direct contact with the containment system. Bulk containers have a capacity of not less than one cubic metre. Examples of bulk containers are freight containers, offshore bulk containers, skips and bulk bins.

[6] http://www.himfr.com/d-p4205269-un_portable_tank_container_type_t50_imo5/

[7] http://www.fibatech.com/products_and_services/tube_trailers_and_skids/ABS_ISO_skids

Figure 9:
Freight container with dangerous goods[8]

4.2 UN Mark and Performance Test of Packages

All dangerous goods in marine and international or domestic transport are required to be in packaging displaying the "UN marking". The mark indicates that the packaging design has been tested in accordance with the recommendations ("Specification") of the "United Nations Committee of Experts on the Transport of Dangerous Goods".

"UN Certified" or "UN Approved" packages must have first passed rigorous testing procedures. These test procedures are intended to ensure that packaging which will contain dangerous goods can withstand normal conditions of transportation, and are considered to represent the minimum acceptable design standards/requirements.

The design requirements consist of a number of performance oriented tests related to packaging integrity. The severity of the tests varies according to the Packing Group. The purpose of the tests is to prove the performance level of each Packing Group. The objective is a design that, when filled and closed for shipment, will consistently perform at that level. The tests are not intended to represent all transport conditions, but are rather a supplement to an overall design process that must take into account the particular application of the packaging.

Design qualification testing is performed to determine the capabilities of a packaging. The following are the required tests for Performance Oriented Packaging (POP):

Drop Test: To ensure and protect against Hazardous Materials from leaking or escaping if the package is dropped during conditions of transport.

Leakproofness Test: To ensure that the package will not leak or permit liquids to escape as a result of the normal buildup of air pressure within the packaging under conditions of transport.

Hydrostatic Pressure Test: To ensure that the packaging will not leak under pressure.

Stack Test: To ensure the ability of the packaging to remain intact and hold its contents under normal stacking conditions during transport.

Each of these four tests have specific guidelines set up to ensure that the packaging being tested will conform to the respective packing group requirement. Only after all these tests have been successfully

[8] http://www.containerhandbuch.de/chb_e/stra/index.html?/chb_e/stra/stra_03_08_00.html

completed can the testing body issue the UN Certification and the manufacturer can include the appropriate "UN marking" on the packaging to indicate that it complies with the UN Specification. Packages that do not display the UN certification mark must not be used for dangerous goods.

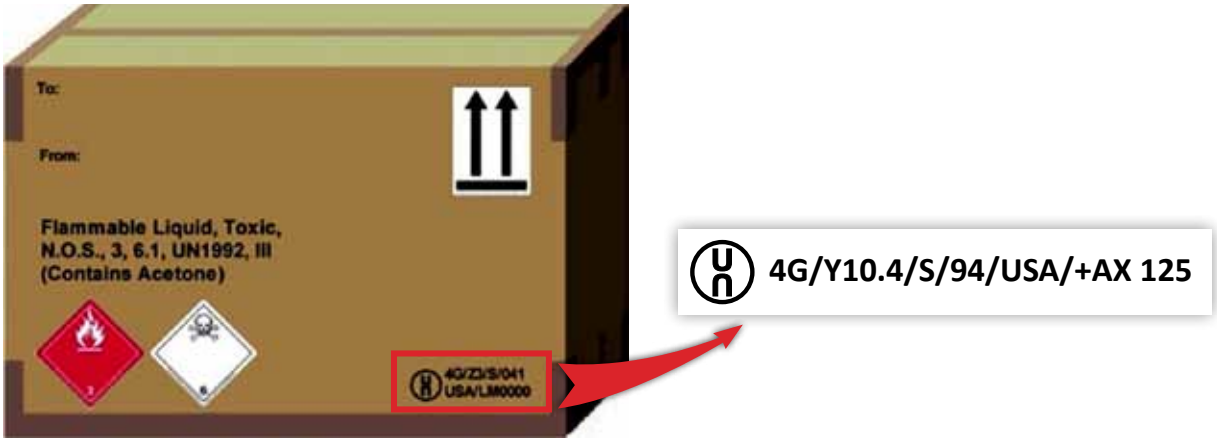
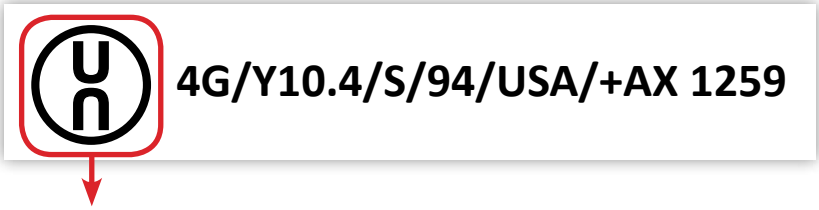
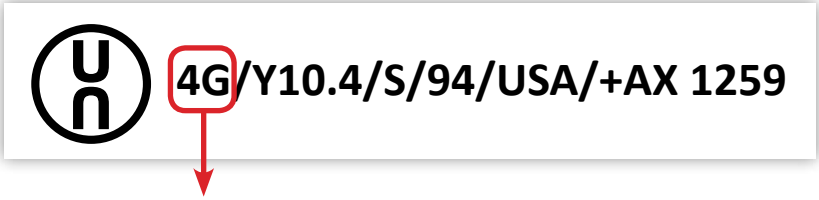


Figure 10: **Packaged Dangerous goods – UN Mark**[9]



UN Packaging symbol: The symbol signifies that a package has been tested and has passed UN packaging performance tests.



Packaging Identification Code: This code identifies the type of packaging, the material of construction, and a category within the type when applicable.

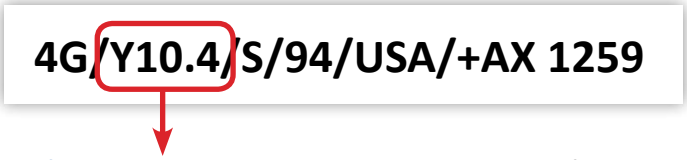
Table 4: **Designatory code system**

Type of package	Material	Category
1 – Drum	A – Steel	**A, B, or H Drum - Jerri can** 1 - Closed Head 2 - Open Head
2 – Reserved	B – Aluminium	
3 – Jerri can	C – Natural Wood	
4 – Box	D – Plywood	**A or B Boxes** 1 - Ordinary A or B 2 - A or B w/inner lining or coating
5 – Bag	F – Reconstituted wood	
6 – Composite packaging	G – Fibreboard	
	H – Plastics Material	
	L – Textile	**C Boxes** 1 - Ordinary 2 - w/sift proof walls
	M – Paper, multi-wall	

[9] http://www.thecrcenter.com/archives/category/pipeline-and-hazardous-materials-safety-administration/

	N – Metal (other than steel or aluminium)	**H Boxes** 1 - Expanded Plastic 2 - Solid Plastic **L Bags** 2 - Sift proof 3 - Water Resistant **M Bags** 1 - Multi-wall 2 - Multi-wall, Water Resistant
	P – Glass, porcelain or stoneware	

Code system for IBCs			
Type	For solids, filled or discharged		For Liquids
	By gravity	Under pressure of more than 0.1 bar	
Rigid	11	21	31
Flexible	13	-	-
Code system for Large Packaging			
Rigid	50		
Flexible	51		

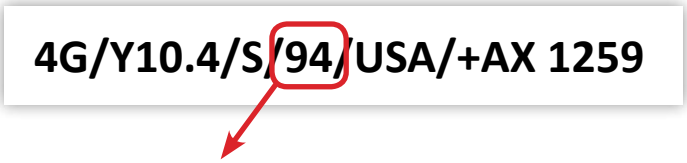


Performance Standard Code: This code identifies the packing group(s) that the package has been tested and approved for:

- X — for packing groups I, II and III
- Y — for packing groups II and III
- Z — for packing group III only

The performance standard code should be followed either by the Relative Density (specific gravity) or maximum Gross Mass in kilograms for which the packaging has been successfully tested (not for IBCs and large packagings).

S or Hydraulic test pressure: Either a letter "S", denoting that the packaging is intended for the transport of solids or inner packagings or the hydraulic test pressure which the packaging was shown to withstand in kilopascals.



Year of Manufacture: This represents the last two digits of the year in which the package was manufactured. For IBCs and large packagings the first two digits indicate the month and the last two digits the year of manufacture.

4G/Y10.4/S/94/USA/+AX 1259

Origin of Manufacture: State authorising the allocation of the marks, indicated by the distinguishing sign for motor vehicles in international traffic.

4G/Y10.4/S/94/USA/+AX 1259

Manufacturer Code: This represents the code for the manufacturing plant or testing facility for the package or other identification of the packaging specified by the competent authority.

Only for IBCs and large packagings:

11A/Y/02 99/NL/...* 007/5500/1500

Stacking test load: This represents the code for the stacking test load in kilograms. For IBCs not designated for stacking, the figure "0" shall be shown.

11A/Y/02 99/NL/...* 007/5500/1500

Maximum permissible gross mass in kilograms.

Examples:

11A/Y/02 99/NL/...* 007/5500/1500

Metal IBC for solids discharged by gravity and made from steel (11A)/for packing groups II and III (Y)/ manufactured in February 1999 (02 99)/authorised by the Netherlands (NL)/manufactured by ...*(name of manufacturer) and of a design type to which the competent authority has allocated the serial number 007(...*007)/ the stacking test load in kilograms: 5500/ and the maximum permissible gross mass in kilograms: 1500.

4G/Y145/S/02/NL/VL823

Fibreboard box(4G)/tested for Packing Group II and III, Maximum gross mass in kilograms: 145(Y145)/ Packing intended to carry solids or inner packing(S)/package was manufactured in 2002(02)/authorised by the Netherlands(NL)/manufactured by … (VL823).

Note: *Empty cargo transport units (CTUs) still containing residues of dangerous goods or loaded with empty uncleaned packages, or empty uncleaned bulk containers, shall comply with the provisions applicable to the goods contained in the unit, packaging or bulk containers.*

4.3 Conditions of Vessels

Diesel and gasoline are transferred by tanker and bunker vessels. The tanker and bunker vessels fly PR China, Lao PDR and Union of Myanmar flags. Thailand has only one registered tanker. Currently the maximum dimensions of these vessels calling at CSCP are length over all (LOA) 50 m, beam 8 m and a maximum draft of 2.5 metres with a maximum gross register tonnage of 500 metric tonnes.

The standards of cargo, tanker and bunker vessels need to be improved on the Upper Mekong, particularly in relation to safety, pollution prevention and waste management. The Mekong Vessel Inspection Scheme (MVIS) will be used over the next 1-2 years to inspect vessels from PR China, Lao PDR, Union of Myanmar and Thailand. Further coordination with PR China, Union of Myanmar and Lao PDR is required through the Joint Committee on Commercial Navigation (JCCN) and MRC to improve the standards of ports and vessels and enhance cooperation between the countries under the Lancang-Mekong Agreement.

The MVIS was completed using international standards; European Barge Inspection Scheme (EBIS), Vessel Particulars Questionnaire (VPQ) and the Chemical Distribution Institute (CDI). It was agreed that the MVIS manual should provide an overview of vessels, the legal framework, and an explanation of the critical items in the MVIS checklist and recommendations for the future.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5 CONSIGNMENT PROCEDURE

5.1 Introduction

In order to ensure that a substance, material or article offered for transport can be readily identified, labels, placards and marks indicating the proper shipping name as well as the UN number of the substance are used. This identification is important in case of an accident involving these goods and to determine what emergency procedures are necessary to deal properly with the situation. Additional markings or symbols indicating precautions to be taken in handling or storing a package (such as a symbol representing an umbrella, indicating that a package shall be kept dry may be displayed on a package if appropriate).

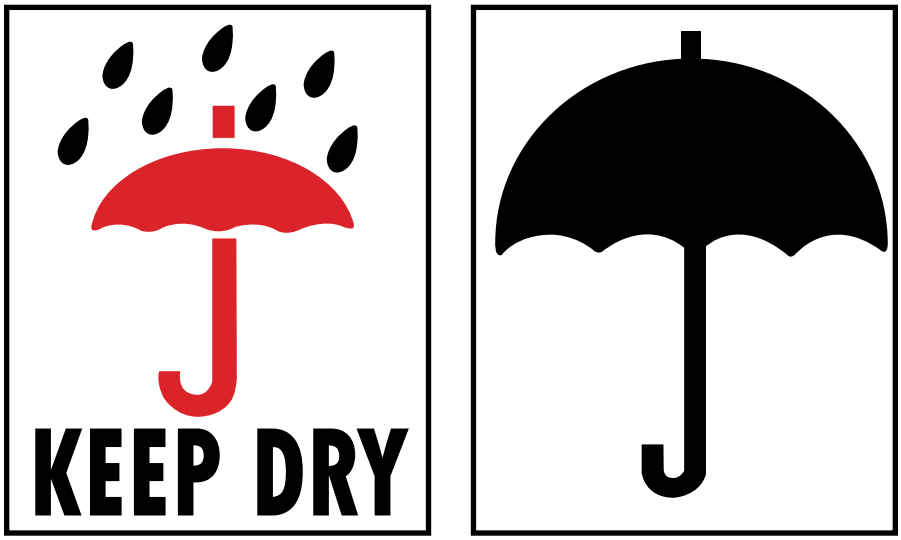


Figure 11:
Optional label – Keep dry

According to the IMDG code labels, placards, marks, signs and symbols shall be readily visible and legible. They shall be of high enough quality that the information will still be identifiable on packages surviving at least three months' immersion in the sea (according to the ADN code they shall be able to withstand open weather exposure without substantial reduction in effectiveness).

5.2 Labels, Placards, Marks, Signs and Symbols

5.2.1 Labels

5.2.1.1 Class Labels

Labels are used on packages including IBCs to indicate the nature of the dangerous goods to be transported. Labels shall have the following dimensions: 100 mm x 100 mm, distance between boundary line and inner line: 5 mm.

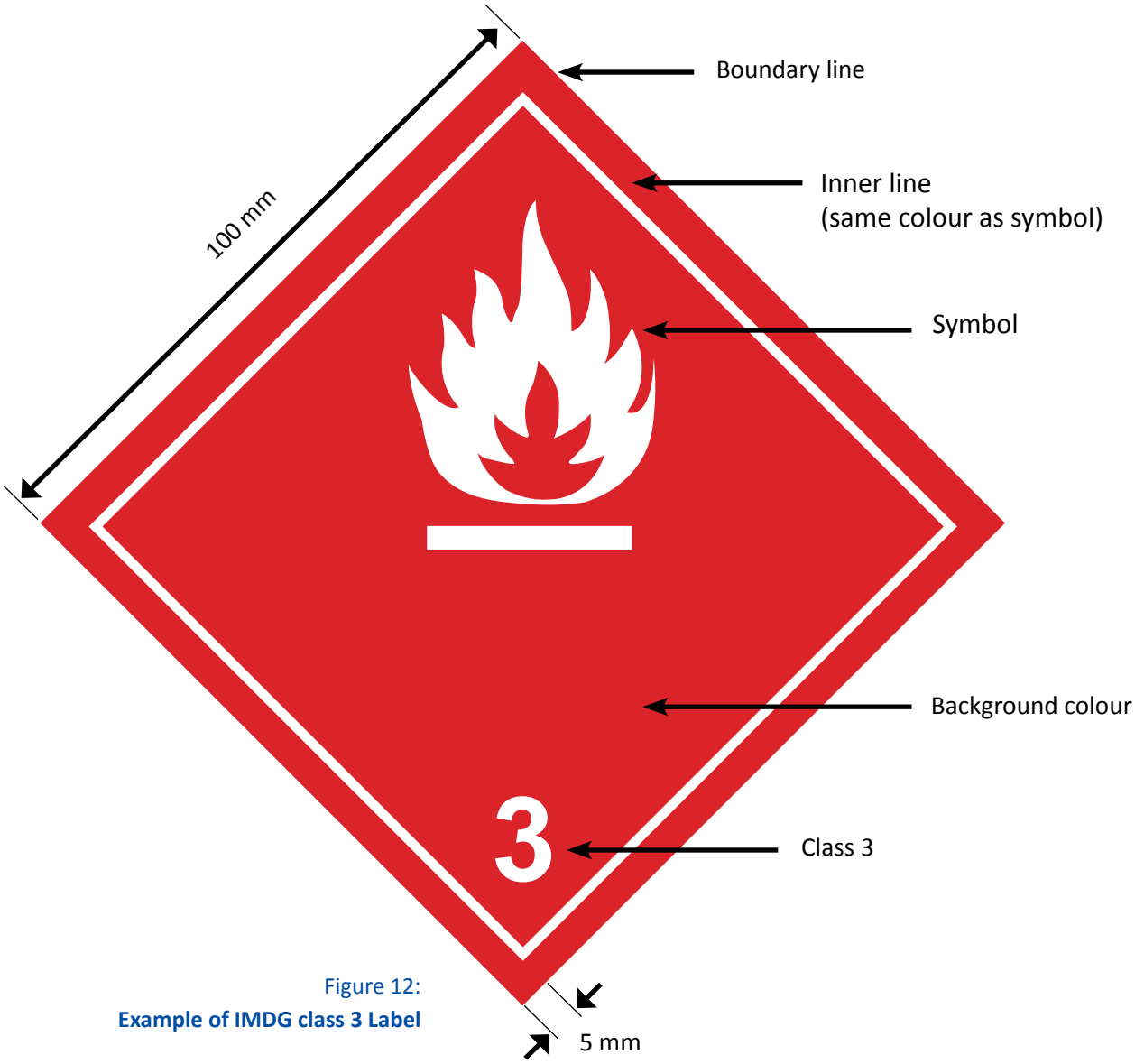


Figure 12:
Example of IMDG class 3 Label

5.2.1.2 Orientation Label

Orientation labels are displayed on combination packages with inner packagings containing liquid dangerous goods, single packages with vents or open cryogenic receptacles for refrigerated liquefied gas. Orientation labels are used to notify personnel how to handle the package. These Arrow Up labels provide an easy-to-see marking, alerting personnel which direction faces up.

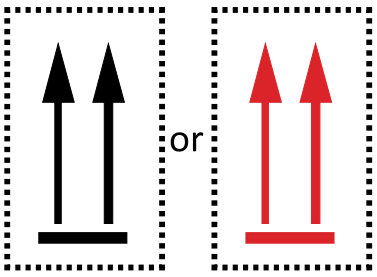


Figure 17: **Orientation Label**

5.2.2 Placards

Placards are enlarged labels placed on the outside of cargo transport units (vehicles, freight containers, portable tanks, etc.) to provide a warning that the contents of the unit are dangerous goods and present risks (minimum 250 mm x 250 mm, distance between boundary line and inner line: 12.5 mm). The following dangerous goods must display the UN number of the goods either in the bottom half of the placard or on an adjacent orange panel; dangerous goods in tanks, packaged dangerous goods loaded in excess of 4,000 kg gross mass to which only one UN number has been consigned and which are the only dangerous goods in the CTU, solid dangerous goods in bulk containers and certain class 7 dangerous goods.

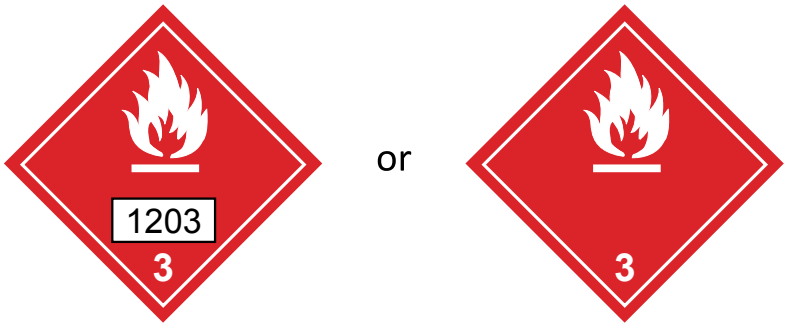


Figure 13:
Placard – display of UN number

5.2.3 Marks

5.2.3.1 Marine Pollutant Mark

Dangerous goods identified as “marine pollutants” that are transported by ship must display a marine pollutant mark. Marine pollutant marks for packagings shall have the dimensions of 100 mm × 100 mm, except in the case of packages of such dimensions that they can only bear smaller marks. For transport units the minimum dimensions shall be 250 mm × 250 mm.

Figure 14:
Marine Pollutant mark (“fish and tree” mark)

5.2.3.2 Elevated Temperature

Cargo transport units containing a substance in a liquid state at a temperature equal to or exceeding 100°C or in a solid state at a temperature equal to or exceeding 240°C shall bear the elevated temperature mark. The triangular shaped mark shall have sides of at least 250 mm and shall be shown in red.

Figure 15:
Mark for transport at elevated temperature

5.2.3.3 Limited quantities

The limited quantities for the dangerous goods can be found in the dangerous goods list in column 7a limited quantities. Packages containing limited quantities of dangerous goods need not be labelled nor marked with the marine pollutant mark, proper shipping name, or UN number. Additionally, if the dangerous goods packed in a cargo transport unit are exclusively in limited quantity, then the limited quantity mark is the only mark allowed on the CTU.

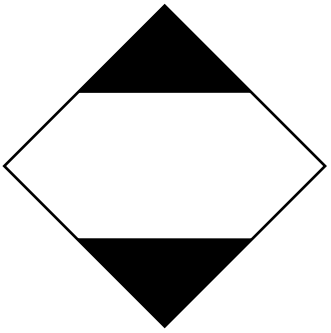


Figure 16:
Mark for transport of limited quantities

5.2.3.4 Excepted quantities

Excepted quantities for the dangerous goods can be found in the dangerous goods list in the column 7b excepted quantities.

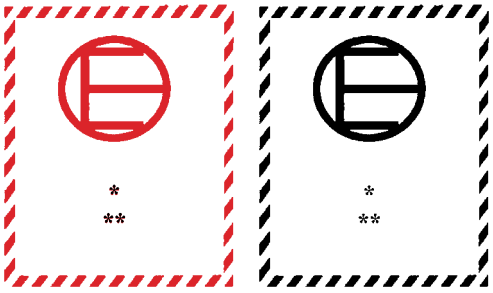


Figure 17: **Excepted quantities Mark**

** The class shall be shown in this location*
*** The name of the consignee shall be shown in this location if not shown elsewhere on the package*

5.2.4 Signs

5.2.4.1 Fumigation warning sign

Many containers carrying non-hazardous cargoes and some carrying dangerous goods cargoes are fumigated in transit for pest control reasons. The fumigant gasses used to carry out the fumigation process are numerous, but the most commonly used currently for the treatment of ship cargoes are phosphine and methyl bromide. Others used are carbon dioxide and more recently sulfuryl fluoride, which is starting to replace the use of methyl bromide. All methods create a hazard when fumigated units are stowed in confined spaces below deck on ships, and a severe hazard for any person who may be required to enter the container for any reason. A container shipped under fumigation becomes a dangerous goods movement, regardless of the cargo[10].

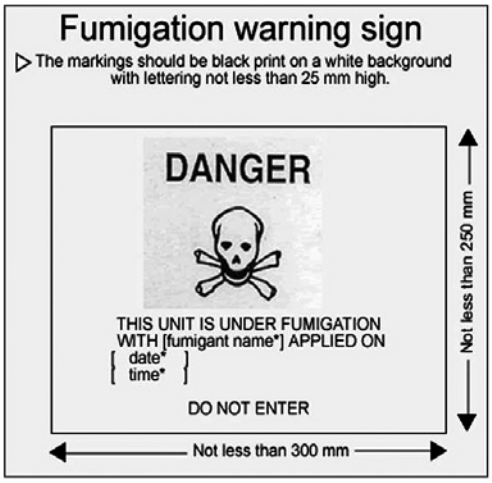


Figure 18: **Fumigation warning sign**

5.2.5 Symbols

5.2.5.1 Maximum permitted stacking load

The maximum permitted stacking load symbol shall be no less than 100 mm x 100 mm, be durable and clearly visible. The letters and numbers indicating the mass shall be at least 12 mm high.

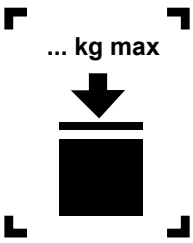


Figure 19: **Symbol - IBCs Capable of being stacked**

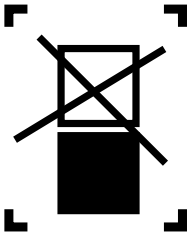


Figure 20: **Symbol IBCs NOT capable of being stacked**

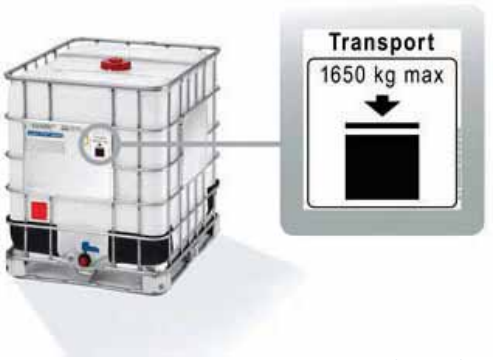


Figure 21: **Symbol indicating maximum permitted stacking load[11]**

[10] Shipping lines and freight sales agencies book 2, Thomas Miller P&I Ltd 2005, p.17

[11] http://www.schuetz.net/schuetz/SCH%DCTZ%20Germany%20%28HQ%29/en/INDUSTRIAL%20PACKAGING/Topics/IBC%20Stacking%20Load/

5.3 Labelling and Marking of Packages Including IBCs

Dangerous goods packages need to be marked with the Proper Shipping Name, UN number and marine pollutant mark (if applicable to the substance) and a UN-certified package approval code. These packages need to be labelled with the hazard class and sub-risk diamond labels. These labels may be stencilled, printed or stuck on the package.

Figure 22: **Marking and labelling of packages**[12]

Marks and labels of palletised unit loads (over packs) should be visible on at least one side of the unit load. Every individual package in the unit load must be correctly marked and labelled with the Proper Shipping Name, UN Number and class(es) and marine pollutant label if applicable. All over packs must additionally display an "OVERPACK" label. This label indicates that each package in the over pack has been properly marked and labelled.

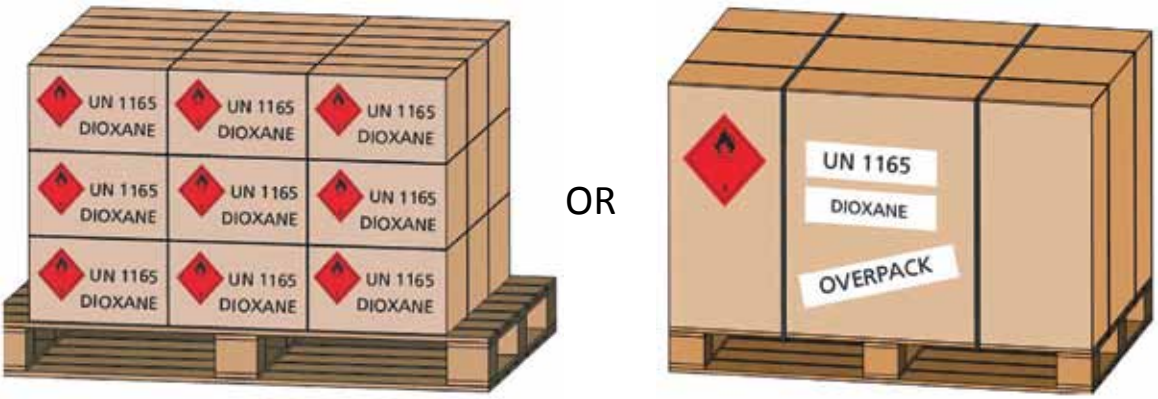


Figure 23: **Marking and labelling of palletised unit loads (over packs)**

IBCs must display the same types of marks and labels as normal packages but on two opposing sides (against just one side for normal packages).

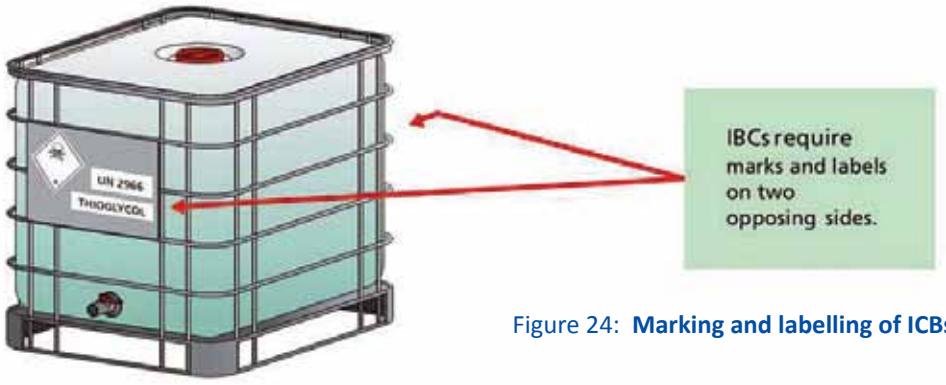


Figure 24: **Marking and labelling of ICBs**

[12] Consolidators and cargo transport unit packers: managers and supervisors: book 3, Thomas Miller P&I Ltd 2005, Part A: p.33

No person may offer dangerous goods for transport, unless these goods are properly marked, labelled, placarded, described and certified on a transport document in accordance with the IMDG code.

5.4 Placarding and Marking of Cargo Transport Units

A cargo transport unit (CTU) means a vehicle, a wagon, a container, a tank container, a portable tank or a MEGC.

Appropriate labels, placards, marks and signs should be affixed to the exterior surfaces of a cargo transport unit to provide a warning that the contents of the unit are dangerous cargoes and present risks. A cargo transport unit containing dangerous goods or residues of dangerous goods shall clearly display labels, placards, marks and signs as follows:

One on each side and one on each end of the unit

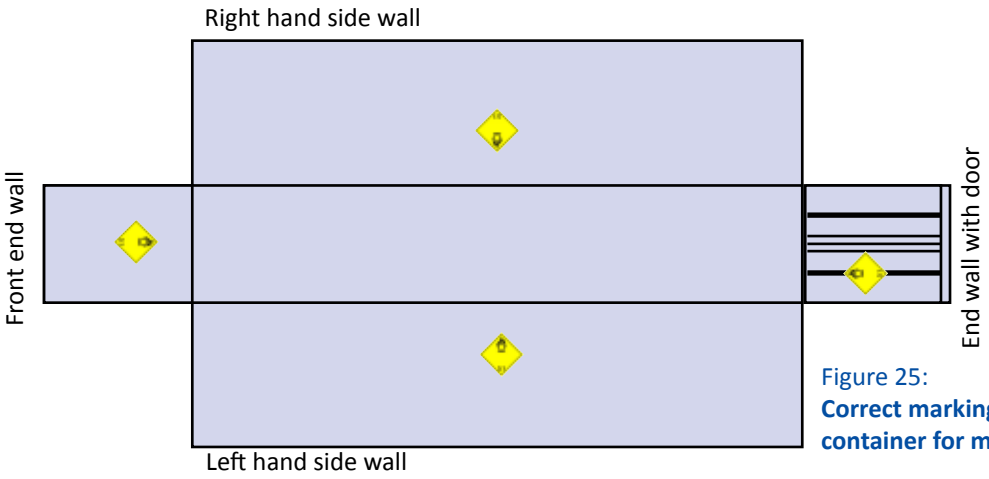


Figure 25:
Correct marking of a freight container for maritime transport[13]

Whenever dangerous cargoes present several risks, subsidiary risk placards (which should also bear the class number) should be displayed in addition to primary risk placards.

If the dangerous goods loaded are in excess of 4,000 kg gross mass, the UN number of the dangerous good should be displayed either in the bottom half of the placard or on an adjacent orange panel.

Note: *It has been proposed to mark the roof of a CTU with a corresponding placard, in order to warn lifting gear or ground conveyor operators when picking up such a container. However, the regulations do not as yet contain any such obligation.*

Placards on the sides of a CTU should be affixed in such a position that they are not obscured when the unit doors are opened.

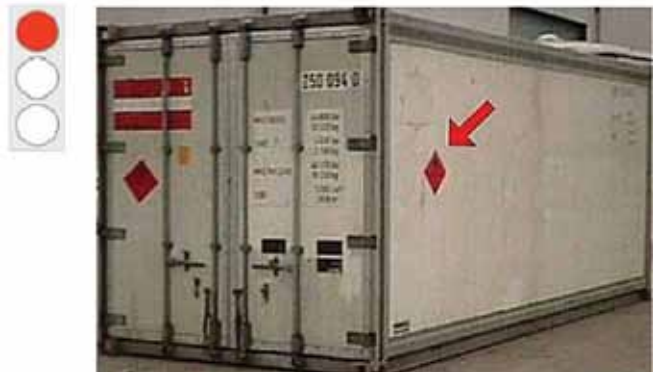


Figure 26:
Placard on freight container obscured with unit doors open[14]

[13] Container Handbook, Cargo Loss prevention Information from German Marine Insurers, GDV, Die Deutschen versicherer, http://www.containerhandbuch.de/chb_e/stra/index.html

[14] Container Handbook, Cargo Loss prevention Information from German Marine Insurers, GDV, Die Deutschen versicherer, http://www.containerhandbuch.de/chb_e/stra/index.html

5.4.1 A multiple-compartment tank containing more than one dangerous substance or their residues

Along each side at the positions of the relevant compartments; and repeating all placards at the rear:

Figure 27: **Marking and labelling of a multiple-compartment tank**

5.5 Documentation

5.5.1 Shipping/Transport documents[15]

The transport of dangerous goods requires a declaration from the consignor (shipper) stating that the goods declared are classified and packed correctly as well as a declaration from the person packing the container that it has been done so correctly. These documents are known as the Dangerous Goods Declaration and the Container Packing Certificate. Often the Dangerous Goods Declaration is combined with the Container Packing Certificate into one document, generally known as the Multimodal Dangerous Goods form (MDGF). These are also known as Dangerous Goods Notes (DGN), and Shippers Declaration and Dangerous Cargo Declarations (DCD). Both the IMDG Code and the ADN code contain the UN designed Multimodal Form. The document illustrated below can be used for sea, inland waterway, and air or road mode. An example of a multimodal dangerous goods form is given in Annex 1.

When setting out the details in the dangerous goods document the first line is usually the number and type of packages followed by the main dangerous goods description details in one of the following permitted sequences:

Table 5: **Multi-Modal Dangerous Goods Form – Sequence of information**

Option 1	Option 2
Number and type of packages	Number and type of packages
UN number	Proper shipping Name
Proper shipping Name	Class (plus sub risk if applicable)
Class (plus sub risk if applicable)	UN number
Packing Group	Packing Group
Other Details e.g. Marine pollutant, Flash Point	Other Details e.g. Marine pollutant, Flash Point

[15] Shipping lines and freight sales agencies book 2, Thomas Miller P&I Ltd 2005, p.17 - 21

Example: Shipment of 20 drums of 200 litres of Gasoline

14 Shipping marks	*Number and kind of packages	Gross mass (kg)	Net mass (kg)	Cube (m^3)
	20 x 200 litres steel drums UN 1203 GASOLINE Class 3 PG II	3,750 kg	3,200 kg	

Figure 28: **Multi-modal Dangerous Goods form – Section 14 (1)**

Example: Shipment of a tank truck of gasoline

14 Shipping marks	*Number and kind of packages	Gross mass (kg)	Net mass (kg)	Cube (m^3)
1 Type 4 Tank	UN 1203, GASOLINE, Class 3, PG II, EMS No. F-E, S-E	15,000 kg		
15 Container identification No./ vehicle registration No. Enter License plate No.	16 Seal number(s) N/A	17 Container/ vehicle size and type N/A	18 Tare mass (kg) 5,000 kg	19 Total gross mass (including tare) (kg) 20,000 kg

Figure 29: **Multimodal Dangerous Goods form – Section 14 (2)**

Alongside the technical details of the dangerous goods the shipper signs the following legal declaration:

"I hereby declare that the contents of this consignment are fully and accurately described below by the Proper Shipping Name, and are classified, packaged, marked, labelled/placarded and are in all respects in proper condition for transport according to the applicable international and national governmental regulations."

The shipper's signature (may be hand written or electronic) against the declaration above ensures that the shipper's declaration becomes a legal document and part of a binding agreement between the shipper and the shipping line that will carry his goods. By signing the legal certification the shipper is certifying that he has accurately stated or described the following:

- the nature of dangerous goods is classified in the IMDG Code dangerous goods list (Proper Shipping Name, class, UN number and other relevant details);
- the quantity of the dangerous goods;
- the number and type of packages;
- that the packages meets the standards required by the IMDG Code; and
- that the packages are marked and labelled with Proper Shipping name, UN Number and class and, if appropriate, with sub-risk and marine pollutant; and if in limited quantities, with the limited quantities label. All according to the IMDG Code.

The data in the shipper's declaration on the dangerous goods document will be used by the shipping line as the source for all operational, security and emergency purposes, so it is essential that the details on it are correct and comprehensive.

Those responsible for the packing of the dangerous goods into a freight container should provide a "Container Packing certificate" certifying that this has been properly carried out and embodying the following main provisions:

- the CTU was clean, dry and fit to receive the goods;
- goods which should be segregated have not been packed together;
- all packages haven been inspected for damage or leakage and only sound packages have been loaded;
- drums have been stowed in an upright position;
- packages have been appropriately packed onto the CTU and have been secured properly;
- when dangerous goods are transported in bulk packaging, the cargo has been evenly distributed;
- the CTU and the packaging therein are properly marked, labelled and placarded; and
- when solid carbon dioxide (CO_2 - Dry ice) is used for cooling purposes, the container/vehicle is marked or labelled in a conspicuous place, such as, at the door entrance, with the words: "DANGEROUS CO_2 (DRY ICE) INSIDE. VENTILATE THOROUGHLY BEFORE ENTERING"

<table>
<tr><td>1 Shipper/Consignor/Sender

Full name + Address</td><td colspan="2">2 Transport document number</td></tr>
<tr><td rowspan="2"></td><td>3 Page 1 of pages</td><td>4 Shipper's reference</td></tr>
<tr><td></td><td>5 Freight Forwarder's reference</td></tr>
<tr><td>6 Consignee</td><td colspan="2">7 Carrier (to be completed by the carrier)</td></tr>
<tr><td>Full name + Address

Packing Certificate
To be completed by packer after the container is packed</td><td colspan="2">SHIPPER'S DECLARATION
I hereby declare that the contents of this consignment are fully and accurately described below by the Proper Shipping Name, and are classified, packaged, marked and labelled/placarded and are in all respects in proper condition for transport according to the applicable international and national governmental regulations.</td></tr>
<tr><td colspan="3">… omitted as example (see Annex for complete document)</td></tr>
<tr><td>CONTAINER/VEHICLE PACKING CERTIFICATE
I hereby declare that the goods described above have been packed/ loaded into the container/ vehicle identified above in accordance with the applicable provisions. †

MUST BE COMPLETED AND SIGNED FOR ALL CONTAINER/VEHICLE LOADS BY PERSON RESPONSIBLE FOR PACKING/LOADING.</td><td colspan="2">21 RECEIVING ORGANISATION RECEIPT

Received the above number of packages/ containers/trailers in apparent good order and condition unless stated hereon:

RECEIVING ORGANISATION REMARKS:

Shipper's Legal declaration</td></tr>
<tr><td>20 Name of company</td><td>Hauler's name

Vehicle reg. no.</td><td rowspan="4">22 Name of company
(OF SHIPPER PREPARING THIS NOTE)

Name/status of declarant

Place and date

Signature of declarant</td></tr>
<tr><td>Name/Status of declarant</td><td rowspan="3">Signature and date

DRIVER'S SIGNATURE</td></tr>
<tr><td>Place and date</td></tr>
<tr><td>Signature of declarant</td></tr>
</table>

Figure 30: **Multimodal Dangerous Goods Form – Shippers declaration**

5.5.2 Dangerous goods Manifest[16]

When emergency services respond to fires and chemical spills in premises that store dangerous goods and combustible liquids, the responders need to know the potential hazards involved at such incidents. For effective and efficient emergency action, they need information about the type, quantity and location of the dangerous goods and combustible liquids stored at the premises. Dangerous goods manifests are a means of providing this information, and should be part of an overall safety management strategy for all premises storing or handling dangerous goods.

A dangerous goods manifest should be prepared observing what dangerous goods are stored at the facility and what is the average quantity of these goods at the facility. The manifest should include the following items:

General information: name of occupier of the site where the dangerous goods are stored, the full address of the site, the date when the manifest was prepared and last revised and the contact details of at least 2 persons who may be contacted in the event of an accident or incident.

For *Dangerous goods and combustible liquids stored in tanks* (other than IBCs) the manifest should include the following information: identification number or code of the tank, the type and capacity of the tank and the details of the content including Proper Shipping Name, the UN number, the class and the packing group (ref. dangerous goods list).

For *Dangerous goods or combustible liquids stored in packages and IBCs* the manifest should include the following information: identification number or code of the storage area, details of the dangerous goods and combustible liquids stored or likely to be stored in the area including Proper Shipping Name, the UN number, the class and the packing group (ref. dangerous goods list).

Site plan: The purpose of the plan of the premises is to identify the places, buildings and structures on the premises where dangerous goods are stored and handled. The plan should be easy for emergency services personnel to read and contain the following information:

- location and identification number or code of storage tanks, storage areas for packaged dangerous goods and areas where dangerous goods in transit may be located;
- main entrance and other entry points to the premises;
- location of essential site services including fire services, isolation points for fuel and electrical power, etc;
- location of manifest for the premises;
- location of all drains on the site;
- location of buildings, structures, and internal roadways on the premises including environmentally sensitive areas and watercourses;
- evacuation routes; and
- location of emergency resources and equipment.

[16] DGSM Information paper No. 2, Manifest for dangerous goods storage under the DGSM act, Chemical Hazard and Emergency Management (CHEM) Services, January 2002, p.1 - 15

The manifest and site plan should be kept in a red weatherproof container or box. The box should be located inside and as close as practicable to, the main entrance of the premises so that it is easily accessible to emergency services personnel. The local emergency services should be informed about the location of the container or box.

Figure 31:
Dangerous Goods Manifest Box

Table 6: **Dangerous Goods Manifest - Example**

Dangerous Goods Manifest							
Occupier							
Address							
Date of preparation							
Site plan number							
EMERGENCY CONTACTS							
Name			Position			Telephone	
1 Bulk Storage							
Tank ID No.	Dangerous goods					Tank	
	Name	Class	Sub risks	UN No.	PG	Type	Capacity
Type: u/g – underground – a/g above ground – n/a not applicable							
2 Package Storage Areas							
2.1 Packaged dangerous goods of packing group I or Class 2.3							
Storage area	Dangerous goods					Tank	
	Name	Class	Sub risks	UN No.	PG	Average	Maximum
2.2 Other Packaged Dangerous Goods							
Storage area	Dangerous goods					Tank	
	Name	Class	Sub risks	UN No.	PG	Average	Maximum

5.5.3 Dangerous Goods Register - MSDS[17]

A dangerous goods register is a list of all stated dangerous goods or combustible liquids stored or handled at the facility including an MSDS for each of the stated dangerous goods. A dangerous goods register is to be made readily accessible to personnel working at the premises and any other person who is likely to be affected by the dangerous goods on the premises. The dangerous goods register should be kept in a central location, or provided to each work area.

Dangerous goods registers may be of limited use to emergency services workers called to a fire or spill as they contain too much information to be assimilated during an emergency. However, there should always be a possibility of retrieving the MSDS from the dangerous goods register if additional information is required by the emergency services.

A dangerous goods register is simply a list of product names of all stated dangerous goods and combustible liquids that are stored and handled on the premises (no matter in what quantity) accompanied by the current MSDS for the stated dangerous goods. The register provides information to assist personnel with the management of dangerous goods on the site. The register must be maintained and kept up to date. The register should be updated when:

- new dangerous goods are introduced on the premises;
- the use of existing dangerous goods is discontinued; and
- the manufacturer, importer or supplier provides a revised MSDS.

Table 7: **Dangerous Goods Register - Example**

Dangerous Goods Register								
Site Name				Person compiling Register				
Address				Date of last revision				
Record all Dangerous Goods here as a master list of chemicals kept on site								
Location	PSN	UN No.	Class	Sub risk	Quantity	MSDS	Risk Assessment	Comment

Signature of person compiling register : _____

Signature of Supervisor : _____

[17] DGSM Information paper No. 2, Manifest for dangerous goods storage under the DGSM act, Chemical Hazard and Emergency Management (CHEM) Services, January 2002, p.1 - 15


玉兴8号
YU XING 8 HAO


วัตถุอันตราย
โซเดียมไฮโปคลอไรท์/ไดคลอร์
(SODIUM HYPOCHLORIDE/DICHLOR)

6 SAFE HANDLING PROCEDURES FOR DANGEROUS GOODS

6.1 Dangerous Goods in Packaged Form

6.1.1 Fireworks (class 1.4G – UN 0336)

Figure 32: **Example of fireworks class 4G boxes**[18]

Fireworks are classified as 1.3G and 1.4G. This is a hazard classification that relates only to transport and packaging. Fireworks classified as 1.3G are considered more hazardous than 1.4G because they may contain certain chemicals or larger amounts of flash powder (a type of gunpowder that is much more powerful than the usual "black powder").

Fireworks can be divided into two categories: display fireworks and consumer fireworks. The display fireworks, such as aerial shells, maroons, and large Roman candles, are meant for professional (usually licensed) pyro technicians to fire during large public display shows. They are devices that are designed to produce certain visual or audio effect at a greater height above the ground than the consumer fireworks. Display fireworks are known as Explosives Class 1.3G. The consumer fireworks belonged to Explosives Class 1.4G. The difference lay mainly in the amount of explosive components contained in the product.

The G stands for the compatibility group. Goods of class 1 are considered to be "compatible" if they can be safely stowed or transported together without significantly increasing either the probability of an accident or, for a given quantity, the magnitude of the effects of such accident. Goods classified as 1.4G are *"pyrotechnic substances, or articles containing a pyrotechnic substance, or articles containing both an explosive substance and an illuminating, incendiary, tear- or smoke-producing substances*

[18] http://www.firework-review.org.uk/firework-classifications/

(other than a water activated article or one containing white phosphorus, phosphides, a pyrotechnic substance, a flammable liquid or gel, or hypergolic liquids)"[19].

Fireworks 1.4G are small fireworks devices containing restricted amounts of pyrotechnic composition designed primarily to produce visible or audible effects by combustion. Such 1.4G fireworks shall include any firework that explodes, produces a report, shoots a projectile into the air, or produces an open flame including rockets, missiles, helicopters, sparklers, reloadable tube devices, comets, mines and shells, fire crackers, and roman candles.

Note: *The fireworks trade has invented some ingenious ways to "make" 1.3G fireworks less hazardous – making them 1.4G – by wrapping them in protective wire mesh cases for example. This type of packaging is often referred to as pyro mesh.*

The fireworks Class 1.4G are imported through a private port a little further downstream from HCCP called Techona. These fireworks are not allowed to be stored in port but are immediately transferred outside the port area. In 2011 a total of 3.7 tonnes was imported from China to Thailand.

6.1.1.1 Properties and main hazards

Fireworks of class 1.4G contain limited amounts of flash powder per item. A fire involving sealed shipping cartons of consumer fireworks will burn for an extended time, as the fire spreads through the unburned cartons. Individual items will ignite and burn, and the fire may get quite intense, but large scale testing has shown that there should not be a mass explosion[20]. As with any fire, avoid breathing the smoke as potentially irritating gasses can be produced. No chemical composition is released or exposed during normal handling, storage and transportation.

6.1.1.2 Precautions measure for safe handling

- Fireworks of class 1.4G, if initiated, give rise to a serious, but localised fire. The normal emergency procedures for fires should be adequate for these type of incidents.
- Strictly prohibit smoking in or near storage areas and display NO SMOKING signs or symbolic prohibition signs.
- Avoid exposure to temperatures above 120°F (49°C); keep shipping cartons cool and dry.
- All practicable precautions should be taken to ensure fireworks or packages of fireworks are not dropped, thrown or mishandled.
- Loading and unloading must not take place during a thunderstorm.
- Facilities/premises where fireworks are handled should be secured in a manner that prevents trespassing, vandalism or handling of materials by untrained personnel.
- If fireworks are spilled as the result of an accident but do not ignite, they can be repackaged with caution. The area should be kept clear of non-essential people when this is done.

The following precautions should be observed in case of fire:

- Stop all cargo operations and traffic on the premises, isolate the immediate area, and deny entry. Keep non-essential people away.
- Fire can be fought with water spray if necessary, although disposal and site clean-up will be simplified if material is allowed to burn if the situation allows.

[19] Recommendations on the transport of dangerous goods, Model regulations Volume I, seventeenth revised edition, UN 2011, p.60

[20] American Pyrotechnics Association Documents: http://www.com.ohio.gov/FIRE/docs/RedBookAPA.pdf

- Do not move fireworks or vehicles carrying fireworks that have been exposed to heat or flames. Directly spray water on the outside of the container to cool it down. Continue spraying until well after fire is out.
- Do not use suffocation methods for extinguishing fires as fireworks are self-oxidising.

6.1.1.3 Incompatible materials

- Keep fireworks away from caustic substances such as drain cleaners, paint strippers and wood preservatives.
- Don't store fireworks near fertilisers and products containing peroxides (such as fibreglass hardeners).
- Don't let fireworks become wet or damp.

6.1.2 Ammonium Nitrate and Ammonium Nitrate Fertilisers

Ammonium nitrate is basically used for two purposes; first as a fertiliser (fertiliser grade), and secondly as an explosive (technical grade). The fertiliser grade is produced to specifications which make it safe from explosions. The technical grade is not explosive in itself, but becomes an explosive when adding organic materials, like diesel fuel. For an explosion to occur there must be a blast initiator such as a detonation from the use of dynamite. The fertiliser grade will be discussed in the sections below.

Ammonium nitrate fertiliser is made by chemically combining ammonia with nitric acid in a water solution. Water formed during the reaction is evaporated, leaving a concentrated ammonium nitrate melt. The hot melt is then processed in one of several ways, depending on plant design, into prills or granules. The finished product is then coated with a conditioning agent, usually a clay, to prevent it from caking. Ammonium nitrate fertiliser is an oxidiser, a substance that oxidises readily to stimulate the combustion of organic matter or other fuels.

Note: *Fertilisers are critical to modern agriculture, but they are chemicals that have other uses. One of these uses is as an explosive. The problem of fertiliser bombs is world-wide. Many groups see fertilisers bombs as a simple means to produce a devastating result. Many countries have already created controls that prevent nitrate fertilisers from falling into the wrong hands. Terrorist groups continue to seek out sources of nitrate fertilisers, and internationally, there have been thefts of significant amounts of ammonium nitrate[21]. Therefore ports handling ammonium nitrate should have appropriate security measures in place to reduce the possibility of misuse.*

6.1.2.1 Properties and main Hazards

Ammonium Nitrate readily absorbs water and is very soluble. Ammonium Nitrate sold as fertiliser is the same substance as Ammonium Nitrate sold for use as an explosive. The explosive grade is a lower density prilled material designed to absorb fuel. Whenever ammonium nitrate passes 32 °C it undergoes a crystal change known as thermal cycling. It results in the prill breaking down, caking and becomes less useful as an explosive as it cannot absorb fuel. Ammonium nitrate and ammonium nitrate fertilisers have three main hazards:

[21] Agrochemicals and security, A training Module for the Safe and Secure Storage of Pesticides and Fertilisers, Florida Cooperative Extension Service, 2005

1 Toxic decomposition: Pure ammonium nitrate melts at 170 °C and decomposes above 210 °C, producing copious clouds of toxic fumes (mainly oxides of nitrogen) that may be yellow or brown. Some fertiliser grades of ammonium nitrate have an increased susceptibility to slow burning (cigar burning) due to chloride in the formulation associated with potassium as an additive.

2 Fire due to oxidising nature: Ammonium nitrate is an oxidising agent so it supplies oxygen to the fuel in a fire and supports burning even when air is excluded.

3 Explosions: In a fire pools of hot molten ammonium nitrate may form and if confined (e.g. in drains or enclosed parts of equipment) may explode. This is because hot and molten ammonium nitrate becomes very sensitive to shock particularly if it contacts incompatible material.

6.1.2.2 Precaution measures for safe handling

- If ammonium nitrate is stored in a building it should be a dedicated, single storage building constructed of material that will not burn such as steel, concrete or brick.
- To prevent spillage and contamination make sure that the bags have been completely sealed on filling, are made of a material that is impermeable to water or oil, and are strong enough to withstand damage during normal storage, handling and conveyance. Store bags and intermediate bulk containers (IBCs) in stable stacks.
- If ammonium nitrate is stored outside it should be protected from the weather. Keep it dry as the risk of explosion increases once the product becomes caked. Loading and unloading of ammonium nitrate during adverse weather conditions such as rain, snow, or hail are not advisable because of the risk of caking.
- Avoid drains, channels and pits where molten ammonium nitrate from a fire could become confined.
- Locate storage away from sources of heat, fire or explosion.
- Electrical equipment and wiring must be kept in good order and be regularly inspected as it can cause fire if faulty. Install main switches and fuses outside the storage area.
- Except when stored in an insulated shipping container, do not store the ammonium nitrate closer than 1 metre to walls and roofs and never within 1 metre of electrical wiring or lighting.
- Store ammonium nitrate away from combustible materials by a distance of at least 8 metres or use a barrier of inert material of at least 1.5 metres width. Outside the storage there should be no combustible material within 8 metres and no standing timber within 15 metres.
- Wooden pallets are a fire risk; do not store unused wooden pallets in the store. Remove empty ammonium nitrate bags from the storage area.
- Strictly prohibit smoking in or near storage areas and display NO SMOKING signs or symbolic prohibition signs.
- Self-confinements of ammonium nitrate can increase the risk of detonation. It is preferable to limit stack sizes to 50 tonnes.
- Personnel need to be trained and practiced in the actions to take in case of fire. This includes using portable firefighting equipment to tackle any fire in its early stages. To enable personnel to deal with such incidents, they need to receive specific training to ensure that they do not put themselves at risk of breathing fumes from decomposing ammonium nitrate.

When ammonium nitrate or ammonium nitrate fertilisers are stored, handled or transported good housekeeping is essential. The following precautions are also essential:

- Keep vehicles, forklift trucks and mechanical shovels clean and well maintained to prevent ammonium nitrate coming into contact with fuel, oil or grease. It is important that vehicles are regularly inspected for oil and fuel leaks. Good maintenance of vehicles is essential to prevent contamination.
- Clean up spillages immediately. Promptly and safely dispose of contaminated products. Small amounts may be spread thinly on open ground or washed away as permissible, but not into water courses or drains.
- Do not use organic matter such as sawdust as a cleaning aid, use inert material such as sand or vermiculate.
- Do not allow pallets, ropes, tarpaulins or other equipment to become impregnated with ammonium nitrate.
- Keep walls, floors and equipment clean.
- Avoid hollow sections in equipment to prevent buildup of ammonium nitrate. If unavoidable they must be regularly washed.
- Ensure any contaminated equipment is thoroughly washed to remove ammonium nitrate before allowing maintenance, particularly if involving heat such as welding or cutting. Apart from the risk of explosion in confined areas there is also a risk of toxic fumes being produced.
- Flood burning ammonium nitrate fertiliser with large volumes of low pressure water. Do not use salt water, carbon dioxide, dry chemicals or foam extinguishers. Never attempt to smother fire such as by sealing off, closing a compartment or building doors when fire occurs. Do not add steam. Ammonium nitrate fertiliser does not have the property of spontaneous combustion. Fire fighters should wear approved self-contained breathing apparatus (SCBA) to protect themselves from the toxic fumes of decomposing ammonium nitrate, and protective clothing to guard against molten nitrate splashes should also be worn.

6.1.2.3 Incompatible materials

Do not store ammonium nitrate in the same building as incompatible materials. The risk of fire or explosion is increased if ammonium nitrate is mixed with combustible or incompatible materials (including when molten in a fire) such as:

- Flammable or combustible liquids such as petrol, diesel, oil, grease, paint and carbonaceous materials;
- Pressure vessels and gas cylinders;
- Oil based pesticides;
- Organic matter such as hay, straw, grain and animal feedstuffs;
- Sulphur;
- Corrosive liquids, acids, alkalis and other reactive substances such as chlorates, hypochlorites, bleaching powder, nitrites, copper or chromium salts, chromates and permanganates;
- Powdered metals, alkali metals, zinc, or galvanised iron, copper or copper alloy;
- Urea;
- Chlorides;
- Products which generate heat in the presence of moisture, such as quick-lime and calcium cyanamide;

- Products, which will generate ammonia gas from the ammonium nitrate, such as cement, basic slag, lime and other alkaline substances; and
- Other agriculture products whose behaviour towards ammonium nitrate is uncertain, for example; branded pesticides, disinfectants or weed killers.

The Health and Safety Executive (HSE) has developed a Self-Help checklist for the storage and handling of Ammonium Nitrate fertiliser. If the checklist is completed and one of the answers to any of the questions is YES, additional advice is to be sought for improving the storage or handling condition. The checklist is included in Annex 2.

6.1.3 LPG Cylinders

The LPG cylinders stored on board vessels that were observed during the completion of the Mekong Vessel Inspection Scheme (MVIS), are principally used for cooking purposes and these cylinders where not part of the cargo transported. Most of the cylinders observed were stored on deck unlashed. The text on some cylinders was unreadable.

Figure 33: **LPG Cylinders – Observed during completion of MVIS**

Liquefied Petroleum Gas (LPG) is derived from two principal sources; it may be extracted from the earth or derived from crude oil during the refining process. LPG refers to hydrocarbon products, sometimes also described as light fractions. Butane and propane are the predominant constituents of LPG with small amounts of lighter and heavier fractions, such as ethane and pentane. LPG is widely used as a domestic fuel because it is convenient, relatively inexpensive and safe when handled correctly.

6.1.3.1 Properties and main hazards

LPG is usually stored as a liquid under pressure. When released into the atmosphere at any temperature above its boiling point, -42 °C for propane and 0 °C for butane, it will change from a liquid to a vapour. Contact with LPG liquid can cause severe frost burns to skin (contact with liquid LPG should not occur in normal cylinder usage). LPG is considered to be nontoxic but may have some anesthetic effect if inhaled in high concentrations. At very high concentrations in air, LPG can decrease the available oxygen causing asphyxiation. In both its liquid and vapour states, LPG is colourless and odourless. An odourising agent (ethylmercaptan) is usually added to LPG to give it a rotten egg-smell to ensure that any leakage can be detected by smell. This distinctive smell can be observed at concentrations well below the lower flammable limit.

When mixed with air, LPG can burn or explode when it meets a source of ignition. Because it is heavier than air, the vapour will travel along the ground and into any exposed drains or openings, sinking to the lowest level of the surrounding. LPG can be ignited at a considerable distance from any leak. When air is still, the vapour will disperse slowly.

Escape of LPG may be noticed by the cooling effect on the surrounding air that appears as frost at the point of escape. Larger leaks can sometimes be seen as having a shimmering effect in some atmospheric conditions.

LPG is supplied in pressurised cylinders to keep it liquefied. The cylinders are strong and not easily damaged, although the valve at the top can be vulnerable to impact. Leaks can occur from valves and pipe connections, most likely as a gas.

6.1.3.2 Precautions for safe handling

- Strictly prohibit smoking in or near storage areas where LPG cylinders are stored and display NO SMOKING signs or symbolic prohibition signs.
- The position for storage should always be levelled and concreted, and paved or compacted to provide a load-bearing surface. Outdoor storage areas should be slightly graded for drainage of surface water.
- Ensure the cylinders are stored in an area that is well ventilated, preferably in open air, and not susceptible to excessive temperature rise (e.g. protect from direct sun). The cylinders should not hinder or endanger the means of escape from the premises or the vessel.
- Make sure the cylinders are properly secured and stored upright (vertical) at all times (even when empty) and there is no risk of tipping over. Never store an LPG cylinder upside down.
- Particular care should be exercised when handling LPG cylinders and they should not be dropped or allowed to come into violent contact with another cylinder or any adjacent object.
- Keep rubbish and any other combustible material well away from the cylinders and make sure they are stored in a readily accessible location.
- Do not allow any electrical equipment or other sources of ignition near the cylinders.
- Make sure that pipes or flexible hoses from the cylinder to the point of use are well protected against accidental damage, and are properly supported.
- If you smell or suspect a gas leak, open all doors and windows to allow the gas to disperse and do not switch any lights or electrical equipment on or off, as this may cause a spark. Immediately extinguish all naked flames in the vicinity.
- Inspect the cylinders on a regular basis to ensure they are in good condition and free from damage and rust.
- Empty LPG cylinders can still contain LPG vapour and are potentially dangerous. Do not pressurise, cut, weld, braze, solder, drill, grind or expose to heat flame, sparks and other sources of ignition. They may explode and cause injury or death.
- On no account should a naked flame be used to search for possible leaks.
- When there is potential exposure to LPG, safety glasses and rubber or leather gloves must be worn to protect the skin from cold related injuries (frost bite). Always wear suitable safety shoes when handling gas cylinders.

- Appliances and equipment for the handling, transportation and use of LPG should be fit-for-purpose, correctly installed and well maintained. Sub-standard appliances, equipment and installations should be excluded.

The following precautions should be observed in case of fire:

- Evacuate all persons from the danger area, except those required to deal with the emergency. Eliminate sources of ignition e.g. non-intrinsically safe communication equipment, matches, etc.
- Where a fire in nearby materials is threatening gas cylinders, they should be removed to a safe place, providing this can be done without exposing anybody to danger.
- Do not extinguish fire; allow the gas to burn out.
- Use water to keep the cylinder(s) cool. If ignition has occurred and water is not available, the metal from the cylinder may weaken from the heat and this may result in an explosion.

6.1.3.3 Incompatible materials

- LPG cylinders should be stored well away from oxidising gasses (ex. Oxygen).
- Can react violently with oxidising agents such as chlorine, pool chlorine or nitric acid.

6.1.4 Pesticides

Pesticides are substances or mixtures of substances intended for preventing, destroying, repelling or mitigating any pest. Pesticides are a special kind of product for crop protection. Crop protection products in general protect plants from damaging influences such as weeds, diseases or insects. A pesticide is generally a chemical or biological agent (such as a virus, bacterium, antimicrobial or disinfectant) that through its effect deters, incapacitates, kills or otherwise discourages pests. Although there are human benefits to the use of pesticides, some also have drawbacks, such as potential toxicity to humans and other animals. Pesticides are categorised into four main substituent chemicals: herbicides; fungicides; insecticides; and bactericides.

According to the Stockholm Convention on Persistent Organic Pollutants, 9 of the 12 most dangerous and persistent organic chemicals are pesticides[22]. These persistent organic pollutants have aroused concern as they pose significant threats to health and the environment. On 22 May 2001, the world's governments met in Sweden and adopted an international treaty aimed at restricting and ultimately eliminating their production, use, release, transport and storage. The convention was ratified by Thailand on the 31st of January 2005. The nine pesticides classified as Persistent Organic Pollutants (POPS) are: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, and toxaphene. These pesticides have four common properties:

- They are highly toxic;
- They are persistent, lasting for years or even decades before degrading into less dangerous forms;
- They evaporate and travel long distances through the air and through water; and
- They accumulate in fatty tissue.

[22] Ridding the world of POPS: A guide to the Stockholm Convention on persistent organic pollutants, United Nation Environment Programme (UNEP) Chemicals, April 2005.

6.1.4.1 Properties and main hazards

Many different types of pesticides are available. In Thailand, over three hundred different active ingredients are registered for use in agriculture pesticides. All these chemicals have different properties and are meant for specific purposes. It is therefore impossible to discuss the specific properties of all registered pesticides in Thailand. The sections below will focus on general aspects concerning pesticides.

The active ingredients of pesticides are toxic, especially in their concentrated form. Most are not flammable, but the solvents used in their formulation are highly flammable. Liquid pesticide emulsions or oil solutions (xylene, kerosene and other organic solvents) present a great fire hazard and should be transported as toxic, flammable liquids. Many liquid pesticides are stored in glass containers or metal cans or drums. Like aerosols, these present a hazard: they may explode. Plastic, paper and cardboard containers may burst upon impact, melt or burn. Their content may poison personnel or fuel a fire. The smoke, fumes, vapours, dusts and liquids produced by pesticides during a spill or fire are toxic and some are extremely toxic.

6.1.4.2 Precautions measures for safe handling

- Store pesticides in the original containers with the labels intact. Keep pesticides in a separate, preferably locked area. Check stored pesticide containers regularly for leaks.
- Cargo areas must be able to securely hold containers or packagings of pesticides and provide proper protection from puncture or impacts that could lead to container or packaging damage. Before loading, clean the cargo area and remove any sharp objects and sharp edges that could cause damage.
- Inspect containers/packagings before loading to be certain they are in good condition. Look for legible and attached labels, tight closure, and pesticide-free outside surfaces. Handle containers/packagings carefully during loading to avoid rips and punctures.
- Only accept pesticides for transport or storage if they are in the original containers/packagings and make certain that the labels are intact.
- Do not store dry materials below shelves containing liquid pesticides. If the liquid leaks they could contaminate the dry products.
- Extremes of temperatures (below 40°F or above 110°F) can affect both the safety and effectiveness of pesticides. Never allow pesticides to become overheated. Some pesticide formulations combust if they are heated above a specific temperature (see MSDS). Protect pesticides, especially liquids, against freezing. Moisture can destroy packagings and containers. Securing a waterproof cover over the load can provide protection from the elements, including the hot sun.
- Separate pesticides from food, livestock feed and seed and plant materials because contamination may render them unusable or result in a poisoning incident.
- Check storage area periodically for leaking containers or damaged packaging.
- Strictly prohibit smoking in or near storage areas where pesticides are stored and display NO SMOKING signs or symbolic prohibition signs.
- The storage area should have a non-permeable floor, such as sealed concrete, that will not let fluids pass through. Shelving should be made of plastic, metal or other non-absorbent material so that cleaning is easier.

- If a spill occurs, control, contain and clean it up immediately. Do not let it spread to any body of water. Keep people upwind and away from the area.
- Be aware of early symptoms of pesticide poising such as headache, dizziness, nausea, sweating or blurred vision. These symptoms may show up immediately or only after several hours.
- Packages or containers which are damaged, severely corroded or show evidence of leakage must not be accepted for transport.

The following precautions should be observed in case of fire:

- Most of the active ingredients in pesticides are not flammable. However, many of the solvents used in liquid formulations are highly flammable. All liquid pesticides and some wettable powders are potential fire hazards. Be aware that some pesticides may explode in a fire.
- Fighting pesticide fires requires extreme caution. Remove all people from the area to a place upwind of smoke and fumes. Be especially careful about using water to fight the fire. Contaminated runoff may create a more serious problem than the fire. It is sometimes better to simply let a fire burn in order to avoid massive problems with contaminated runoff. Whenever possible, use foam or carbon dioxide instead of water to extinguish the fire. If water is used, build dikes to prevent flow of contaminated runoff into the ground, waterways, sewer systems, and the storm draining system or other bodies of water. Runoff water should be treated as hazardous waste.
- Do not try to extinguish a fire involving pesticides without adequate protective clothing (rubber boots, gloves, etc.) and respiratory protection.

6.1.4.3 Incompatible materials

- Never store pesticides with food, feed, seed, planting stock, fertilisers, clothing, respirators or other protective equipment.
- When ammonium nitrate fertiliser is contaminated with some pesticides, it becomes highly flammable and explosive. Ammonium nitrate should not be shipped or stored with pesticides.
- The specific MSDS should be consulted for other specific incompatible materials.

6.1.5 Lignite (coal)

Lignite is a brownish-black fossil fuel that is used primarily for electric power generation. Considered to be a low-ranking type of coal. Lignite coal is burnable and may also be referred to as brown coal, earth coal, or Rosebud coal.

Brown coal has relatively high volatile matter content. Consequently, it can be converted into liquid petroleum and gas products more easily than higher quality kinds of coal, such as bituminous coal or anthracite. Brown coal can be more difficult to use than other types of coal. For instance, it can be susceptible to spontaneous combustion, making transporting and storing it problematic. Due to its transportation limitations, brown coal is often burned in a utility plant that has been set up near a lignite mine. The fuel's high water content also makes disintegration more likely, further reducing its worth. As a result of these limitations, brown coal is usually not traded on the world market as widely as higher grade coals.

According to the Lignite Energy Council, 13.5 percent of lignite coal is gasified into synthetic natural gas, and 7.5 percent goes into production of ammonia-based fertilisers. The balance is used to generate electricity. Because of its high weight relative to its heat content, lignite is typically used in pulverised coal or cyclone-fired electric production power plants close to the mine.

Through a process called coal gasification, lignite can be broken down chemically to create synthetic natural gas that delivers more power and is easier to operate in commercial scale electric generations.

Figure 34: **Lignite**[23]

6.1.5.1 Properties and main hazards

When coal cargo oxidises, it spontaneously generates heat and toxic gases such as carbon monoxide. This can lead to flammable atmospheres in the hold, depletion of oxygen in those spaces and corrosion of metal structures. Lower quality coals such as lignite are more prone to this process than higher quality coals such as anthracite. Understanding the quality of coal being shipped and how to monitor it is fundamental to reducing the risk of self-heating, and possibly the outbreak of fire.

6.1.5.2 Precaution measures for safe handling

- No smoking within 50 metres. Build-up of dust should be avoided as this is prone to spontaneous heating and may cause spontaneous ignition.
- Lignite is susceptible to spontaneous heating, which if uncontrolled could lead to combustion.
- Fog nozzles should be used for outdoor and confined space fires.
- In enclosed storage containers and hoppers, the oxygen level should be measured before entry due to possible depletion of oxygen levels. Alternatively, use self-contained breathing apparatus (SCBA).

[23] http://en.wikipedia.org/wiki/File:Lignite-coal.jpg

- The internal temperature of stockpiles or other bulk storage units should be continuously monitored.

6.1.5.3 Incompatible materials

- Avoid contact with strong oxidisers.
- Avoid contact with heat sources, open flames or other ignition sources.

6.2 Dangerous Goods in Bulk

Both diesel and gasoline are petroleum products, so this section will mainly focus on the storage and handling of petroleum products in general, in case in a later phase of the development of CSCP or HCCP other petroleum products such as kerosene (UN No. 1223), jet fuel (UN No. 1863), etc. are stored or handled at the port.

The main hazards when storing or transferring petroleum products are fire and explosion from either the liquid or the vapour. Fires or explosions are likely to occur when vapour or liquids are released from a controlled environment (e.g. cargo transfer area) to areas where there may be an ignition source, or when an ignition source is introduced in a controlled environment.

Most of the common causes of incidents include[24]:

- Lack of awareness of the specific properties of the flammable liquids;
- Operator error, due to lack of training;
- Extreme heat on or close to flammable liquids;
- Inadequate design of equipment;
- Inadequate installation or maintenance of equipment;
- Failure or malfunction of equipment;
- Exposure to heat from a nearby fire;
- Inadequate control of ignition sources;
- Electrostatic discharges;
- Heating materials above auto ignition temperature; and
- Dismantling or disposing of equipment containing flammable liquids.

Most incidents involving petroleum products commonly arise during transfer operations, including movement from storage, disposal, emptying vehicle fuel tanks and dealing with spillages.

Note: *Although this section will focus on petroleum products stored or handled in bulk, most safe handling procedures can also be applied when the petroleum products are in packaged form.*

Always consult the specific Material Safety Data Sheet (MSDS) of the concerned product for additional information or specific precautions required.

[24] Health and Safety Executive (HSE), The safe use and handling of flammable liquids, p.7

6.2.1 Petroleum products and risk of fire

Vapours of petroleum products provide fuel for fire. Any uncontrolled burning of petroleum vapour is a major threat to life and property.

To produce fires, three things are necessary:

- Fuel ⇨ Combustible Vapours
- Heat ⇨ Source of ignition
- Oxygen ⇨ As present in air

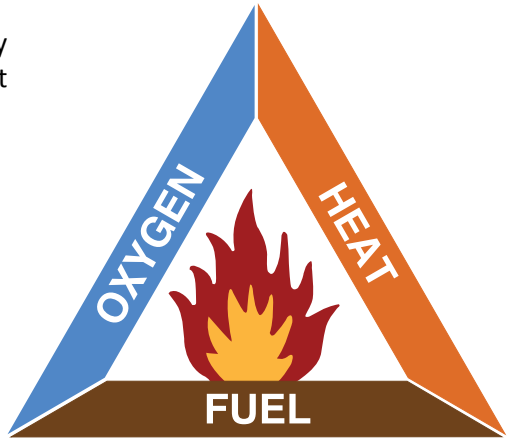


Figure 35: **Fire Triangle**

If any one element is missing fire will not occur. Therefore the following actions should be taken to minimise the risk of fire:

- Contain the fuel properly and if there is a fire, eliminate the source of the fuel if safe to do so.
- Minimise exposure to ignition sources.
- Have fire extinguishers available which can eliminate the oxygen fuelling a fire.

6.2.2 Diesel

Diesel fuel will not ignite at normal storage temperatures unless they are contaminated with a more volatile product. They easily ignite if heated above their flashpoint. Once ignited, they produce a hot fire that maybe hard to put out. These fuels spread quickly on both land and water and burn completely. An open flame can easily ignite a spray of diesel from a leak or a sudden tank overflow.

6.2.3 Gasoline

Gasoline is a greater fire and explosion hazard than diesel. Gasoline forms explosive mixtures above its surface. Gasoline vapours, as all petroleum vapours, are heavier than air, causing them to spread for long distances along the ground and collect in low places. Such vapours ignite easily. The resultant flash and explosion will travel back to the fuel ignition source and ignite it.

6.2.4 Flammable properties of petroleum products

6.2.4.1 Flash point

A fuel's flash point is defined as the lowest temperature at which a liquid gives of vapour in sufficient concentration to form a combustible mixture with air near the surface of the liquid. In other words the lowest temperature at which the fuel's vapour will catch fire momentarily (flash) when exposed to an ignition source. The lower the flashpoint of the fuel, the more dangerous it is. The exact flashpoint can be found in the relevant MSDS of the specific product.

Table 8: **Indicative Flashpoint of petroleum products**

Petroleum product	Flashpoint	
	°C	°F
Diesel	> 52	125
Gasoline	-43	-45
Kerosene	38 – 41	100 – 106
Jet Fuel	38	100

6.2.4.2 Explosive range

Petroleum vapour and air may form a range of mixtures that are flammable, and possibly explosive. A mixture in the explosive range ignites when it come into contact with a spark, flame or other ignition source. In open spaces, this causes intense fire. In enclosed spaces (such as an empty tanker), the mixture explodes. The minimum concentration of a particular combustible gas or vapour necessary to support its combustion in air is defined as the Lower Explosive Limit (LEL) for that gas. Below this level, the mixture is too "lean" to burn. The maximum concentration of a gas or vapour that will burn in air is defined as the Upper Explosive Limit (UEL). Above this level, the mixture is too "rich" to burn. The range between the LEL and the UEL is known as the "flammability range", "explosive range" or "explosive limit". The LEL and UEL can be found in the relevant MSDS of the specific product. Generally the flammable range of petroleum products may be considered as between 1% to 10% by volume.

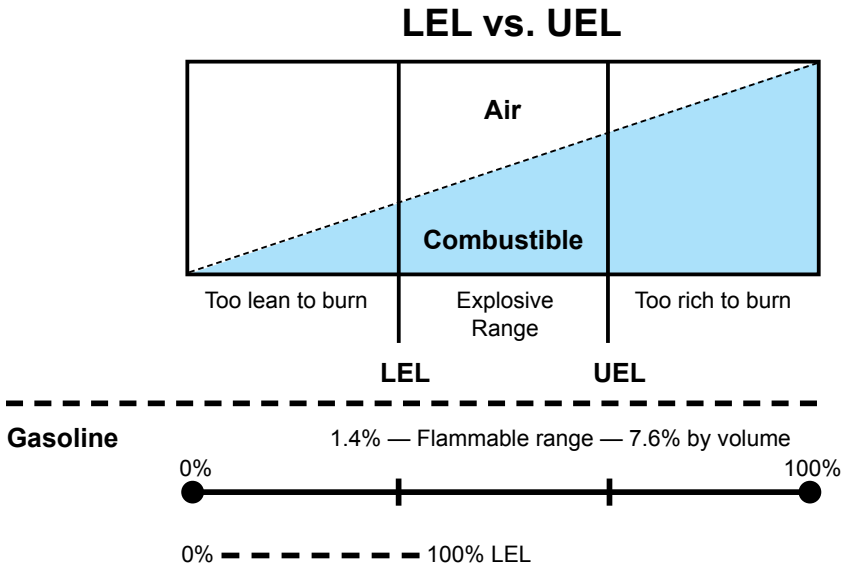


Figure 36:
Explosive range of Gasoline[25]

6.2.4.3 Auto Ignition Point

In the context of a combustible fuel mixture, the auto-ignition point is the lowest temperature at which the fuel will spontaneously ignite in a normal atmosphere without an external source of ignition such as a flame or spark.

[25] http://www.workplacegroup.net/articles/article-flammable-liquids.htm

Table 9: **Indicative Auto Ignition Point of petroleum products**

Petroleum product	Auto ignition point	
	°C	°F
Diesel	210	410
Gasoline	280	536
Kerosene	220	428
Jet Fuel	210	410

6.2.5 Safety precautions for controlling vapour formation

- Fill tanks carefully and avoid overflow
- Place drip trays under hose connections. Repair leaks at once and replace defective hoses and gaskets.
- Inspect tank seams, joints, piping, valves and pumps for leaks.
- Clean up spills and leaks at once.
- Beware of flammable vapours in empty pipelines, hoses and tanks. They are potentially more dangerous than when they are filled.
- Keep fuel tanks as much as possible closed. In case tanks need to be opened take care to prevent sudden release of pressure that can produce a vapour-air mixture in the explosive range.

Figure 37: **(Portable) Driptray**

6.2.6 Safety precautions for controlling ignition sources

- Strictly enforce no smoking rules and post no smoking signs where they can be clearly seen. Collect matches and cigarette lighters at a checkpoint before entering the cargo transfer area.
- Place fire extinguishers and other firefighting equipment within easy reach but where it will be safe from a fire.
- Do not use open flames, heating stoves, electrical tools and other such apparatus in or near areas where diesel or gasoline is transferred.
- Use only authorised tools, equipment and clothing. Use explosion proof or intrinsically safe lights and flashlights.
- Keep tools and equipment in safe and good working condition.
- Bond and ground equipment such as pumps, tank vehicles and transfer hoses.
- Inspect equipment, safety devices, and transfer areas frequently to ensure safety and eradicate hazards immediately.
- Check for other operations in the vicinity that could be sources of ignition.

Figure 38: **No Smoking Sign**

- Put flame and spark arrestors on all equipment in and near petroleum storage areas.
- Never wear nylon clothing because high electrostatic charges build up in nylon fabric.

Figure 39: **Grounding of tank vehicle**[26]

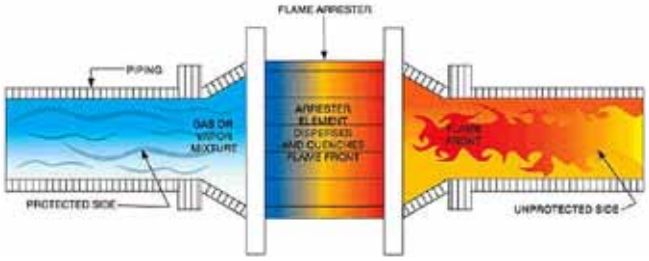


Figure 40: **Flame arrestor**

6.2.7 Personal Safety precautions

- Avoid exposure to fuel vapours for long periods.
- Keep transfer areas free of loose tools, lumber, and other objects that may cause accidents.
- Wear fuel-resistant or rubber gloves and protective clothing to keep fuel off the skin.
- Emergency eye wash capability should be available in close proximity to operations presenting a potential splash exposure.
- Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Figure 41: **Chemical resistant protective gloves**

Figure 42: **Emergency eye wash station**

Figure 43: **Safety goggles**

➡ Always carefully check the Material Safety Data Sheet (MSDS) of the specific product handled or stored at the port for additional or specific safety precautions that are necessary for the safe handling or storing of the product.

[26] http://www.saferack.com.au/truck-grounding-systems.cfm


ROCKET
Pallet No 2
Product No 00914-FD-00302
CAMBODIA
SMF N50L
QTY 80

7 SITE PLAN REQUIREMENTS

7.1 Segregation of Dangerous Goods

7.1.1 Introduction

Many dangerous goods are incompatible with other substances. They may react with other dangerous goods or chemicals, or with apparently harmless substances, such as dust, air or water. Bringing incompatible dangerous goods into contact with each other, whether during transport or storage, or during use where the risks haven't been properly assessed, can have serious consequences. The most common way that dangerous goods come into contact with incompatible substances are spillages or leakages and liberated toxic gases, which cause a fire or explosion.

Examples:

- Carbon black (or other combustible powder or dust) combined with ammonium nitrate may ignite spontaneously; this could even happen in a waste bin.
- Glycol antifreeze liquid may ignite when in contact with many class 5.1 oxidising agents, such as potassium permanganate.
- Water may cause sulfuric acid to boil up explosively, or dangerous goods of class 4.3 to develop flammable or toxic vapours.

An important part of the process in identifying incompatible goods and materials includes a review of storage and handling information provided in the MSDS/SDS of the particular dangerous good.

The factors influencing compatibility are complex and should include consideration of the following[27]:

- Whether a violent reaction (fire or explosion) between one or more highly reactive chemicals may occur.
- A reaction between two or more spilled goods may liberate flammable, toxic, or corrosive vapours or gases. Such reactions may occur rapidly or slowly over time until a buildup of a hazardous material occurs which can then give rise to an emergency situation.
- Released or spilled goods may deteriorate, contaminate or destroy the packaging materials of another incompatible product to worsen a situation.
- Flammable goods stored next to other toxic or corrosive materials may catch fire causing rapid dispersal of the toxic or corrosive materials into the environment.
- Flammable materials may catch fire and cause flame impingement on products stored nearby (e.g. gas cylinders) resulting in rupturing of the gas cylinder.
- Fire suppression methods suitable for one type of dangerous goods may be incompatible with other dangerous goods stored in the same area.
- How the materials used in the construction of spill catchment systems will react with dangerous goods spilled in the catchment (e.g. hydrochloric acid will rapidly corrode concrete walls used as a spill containment system).

[27] http://www.deir.qld.gov.au/workplace/subjects/hazardousmaterials/incompatible/storage/index.htm

7.1.2 Physical and Chemical reaction

Physical reaction: includes dilution, dissolution, abrasion, phase change, leaching and absorption. Hazards resulting from a physical reaction of incompatible substances can be fire, explosion or rapid heat generation.

An example of a hazard arising from dilution is the mixing of acid and water. Adding a small amount of water to a large quantity of concentrated acid may result in rapid boiling of the water as it dilutes the acid. If the heat generated can't dissipate quickly enough, the effect may be explosive. The hazard is the potential for hot acid to be splashed around[28].

Chemical reactions: are reactions that result in a chemical change in one or more of the goods when they come into contact with one another.

An example is the combination of an oxidising agent (ammonium nitrate) and a hydrocarbon (diesel, kerosene) which can result in a very intense fire that is difficult to extinguish.

Reacting dangerously means to react in a manner that directly creates a hazard due to the reaction:

- being violent;
- producing an explosion;
- producing a potentially explosive combination of products;
- producing a fire or rapid evolution of heat; and
- producing toxic vapour or toxic gas.

7.1.3 Segregation of dangerous goods in storage areas

If dangerous goods are not compatible they must not be stored together in a way that allows them to come into contact with each other. In these circumstances, segregation techniques are important for minimising the risk to people, property and the environment. Examples of segregation techniques include but are not limited to:

Distance or inert materials: Isolating the dangerous goods by storing them at a certain distance apart, or separating them from each other by placing inert materials between the incompatible dangerous goods.

Cut-off storage: The use of separate rooms or enclosures to isolate incompatible dangerous goods. Segregation involves storing incompatible goods in separate compartments or rooms within a building. The compartments are separated by fire rated partitions that are impervious to vapours and liquids. This is useful for materials that may react violently or have a high burning rate.

Detached storage: Storing incompatible dangerous goods in separate buildings. This kind of segregation is used for materials that possess severe fire, reactivity or health risk. This may be useful for "dangerous when wet" goods such as aluminium phosphide, which react with water to create a toxic gas and flammable gases (phosphine). Calcium carbide reacts with water to generate acetylene gas. A separate building without a water fire protection system may be required.

Note: *Dangerous goods must also be isolated so they cannot contaminate other non-dangerous goods, including food, food packagings or personal use products.*

[28] Code of practice for the Storage and Handling of Dangerous Goods, Australia, December 2000

The Government of Queensland (Australia) has developed a segregation tool for dangerous goods. The tool consists of a compatibility and segregation chart, segregation guidance notes, compatible goods guidance notes and supplementary notes for use with the segregation tool. The segregation tool must be considered as a guide but is not meant to replace a MSDS/SDS or a risk assessment.

Table 10: **Segregation tool for dangerous goods**[29]

CLASS OF DG	2.1	2.2	2.2 SR 5.1	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	8	9
2.1	A	B	S1	S1	S2	S2	S4	S5	S2	S4	S1	S1	C
2.2	B	A	B	S1	S2	S2	S4	S5	B	S4	B	S1	C
2.2 SR 5.1	S1	B	B	S1	S2	S2	S4	S5	S2	S4	C	S1	C
2.3	S1	S1	S1	I	S2	S2	S4	S5	S2	S4	C	S1	C
3	S2	S2	S2	S2	A	S3	S4	S5	S2	S4	S3	B	B
4.1	S2	S2	S2	S2	S2	A	S4	S5	S2	S4	S3	B	B
4.2	S4	S4	S4	S4	S4	S4	A	S5	S4	S4	S4	B	B
4.3	S5	S5	S5	S5	S5	S5	S5	A	S5	S5	S5	S5	G
5.1	S2	B	S2	S2	S2	S2	S4	S5	D	S4	C	S3	C
5.2	S4	S4	S4	S4	S4	S4	S4	S5	S4	E	CE	S4	CE
6.1	S1	B	C	C	S3	S3	S4	S5	C	CE	A	H	B
8	S1	S1	S1	S1	B	B	B	S5	S3	S4	H	F	C
9	C	C	C	C	B	B	B	G	C	CE	B	C	A

Compatibility Chart Key	
	Goods may be compatible in many cases with exceptions. Follow the supplementary notes for use with segregation tool below.
	Likely to be incompatible. Segregation strongly recommended, follow the segregation guidance notes below.

[29] http://www.deir.qld.gov.au/workplace/subjects/hazardousmaterials/incompatible/isolation/index.htm#segregation

Segregation Guidance Notes for Incompatible Goods	
S1	Segregate these goods by 3 m or more in a well-ventilated area. For liquid dangerous goods the distance is measured from the edge of the spill catchment area. See supplementary notes 6 and 7.
S2	Segregate by 5 m or more. If one of the dangerous goods is a liquid, measure the distance from the edge of the spill catchment area. Liquid dangerous goods should be located within a separate spill catchment area. See supplementary notes 6 and 7.
S3	Segregate by 3 m or more for PG III goods and 5 m or more for PG II and PG I goods or where the goods may react dangerously. If both are solids then a minimum of 1 m separation may be used. Where one of the goods is a liquid the distance is measured from the edge of the spill catchment area. See supplementary notes 6 and 7.
S4	Segregation preferred by the use of fire rated partitioned areas. Consider use of separate detached building for organic peroxides and for highly pyrophoric class 4.2 goods.
S5	Segregation of class 4.3 preferred by use of separate, detached building without water based fire suppression system.
Mappable Goods Guidance Notes	
A	In most cases materials of the same class will be compatible. However, not all materials with different UN numbers will always be compatible. The MSDS/SDS should be checked
B	In many cases the goods will be compatible. Must check for subsidiary risk compatibility. Check the MSDS/SDS.
C	If one of the goods present is also a 'fire risk substance' (one of class 2.1, 3, 4, 5, a combustible liquid or has a subsidiary risk of one of these) or elevated temperature goods, segregation is required by at least 3 m or more. Sub-risk MUST be considered. Other exceptions apply. Check the MSDS/SDS.
D	Not all class 5.1 goods are compatible as follows: Ammonium Nitrate is not compatible with tetranitromethane, dichloroisocyanuric acid, or any organic nitrate; and Calcium hypochlorites (and its mixtures) are incompatible with dichloroisocyanuric acid, ammonium nitrate, or any chloroisocyanurate.
E	Organic peroxides are highly reactive materials. Check MSDS/SDS to ensure compatibility.
F	Where one of the goods to be stored together is a concentrated strong acid and the other a concentrated strong alkali, they should be deemed incompatible.
G	Class 4.3 goods must not be stored next to goods that are in a solution containing water, or where water or foam is the chosen firefighting/spill/leak dispersal or suppression media for the storage area.
H	Except where the class 6.1 is cyanide and the class 8 an acid. Check MSDS/SDS;
I	Toxic gases ammonia and chlorine must be segregated due to risk of explosion. It is important to refer to the MSDS for incompatibilities within this class division. It is strongly recommended that each different toxic gas (class 2.3) be segregated unless information in the MSDS/SDS says otherwise.
Supplementary notes for use with Segregation Tool	
1	Class 2 dangerous goods are generally not recommended to be stored with any other class of dangerous goods particularly flammable dangerous goods due to the risk of flame impingement. Corrosive goods can cause damage to the gas cylinder walls and thus should be kept away from class 2 goods. In a fire gas cylinders need to have copious quantities of water applied to keep them cool. Toxic gases are stored away from other gases to minimise the release of toxic gases in a fire involving other gases.
2	Class 6.1 dangerous goods are not recommended to be stored with fire risk goods or gas cylinders. In the event of a fire, the toxic material will be liberated and may be spread more effectively due to the heat of the fire or explosion of gas cylinders.

3	Two or more goods within the same class with incompatible subsidiary risk should be kept apart.
4	The packing group (PG) of dangerous goods denotes the magnitude of danger the material poses from its hazard... PG I is most dangerous. PG II these are more dangerous than PG III. If one of the incompatible materials is a PG I or II dangerous goods it is recommended that a greater segregation distance or other means of segregation is employed.
5	If class 4.3 dangerous goods are stored or handled care needs to be taken to segregate these away from all containers of aqueous (water containing) solutions even if the solutions are not dangerous goods. The areas these materials are stored in must not be serviced by a water based fire suppression system.
6	If one of the incompatible goods is a liquid OR a solid that is likely to melt from the heat of a fire, separate spill catchment systems or means of separating the incompatible goods must be considered. Solid dangerous goods should not be stored in direct contact with floor surfaces in order to avoid contact with liquids.
7	Fire rated walls constructed of appropriate impervious, chemically resistant materials may be used if provided with an FRL of 240/240/240[30]. Timber structures are not appropriate barriers.
8	In the case of incompatible gases in cylinders intended for use in welding (such as acetylene and oxygen), these gases may be stored together in a purpose built cradle and separated when not in use for extended periods of time.
9	For oxidising agents: although only dangerous goods and combustible liquids feature in the compatibility chart, care must also be taken to segregate oxidisers from those dangerous goods and other materials that are combustible in nature (e.g. polymeric beads, cotton bales, excess packing materials). Chlorine and some other halogens are considered potent oxidisers and are assigned with any oxidising agent subsidiary risk under the dangerous goods classification system.

Buildings for the storage of dangerous goods should be designed and maintained in such a way that the risks associated with the dangerous goods that will be stored in or near the buildings are reduced to an acceptable level. Fire risks are particularly important in building design and suitability. Buildings for the storage of dangerous goods should in general:

- Be constructed of non-combustible materials;
- Not have spaces where dangerous goods could unintentionally accumulate;
- Protect dangerous goods from direct sunlight;
- Have roofs designed so that gases cannot accumulate beneath them or in roof voids if gases are stored; and
- Have adequate ventilation provisions to prevent the build-up of a hazardous atmosphere.

Outside storage areas for dangerous goods should be properly paved and kept free of vegetation.

Shipping containers may not be suitable unless specially adapted for the storage of dangerous goods. Many containers have wooden floors that may absorb substances, create hazards and not retain spills or leaks. Shipping containers need to be adapted to provide the feature of suitable storage areas, including ventilation and spill containment.

7.1.4 Segregation of dangerous goods in container terminal areas

The revised recommendations on the safe transport of dangerous cargoes and related activities in port areas advises the segregation requirements for “on deck” stowage set out in detail in chapter 7.2

[30] Fire Resistance gives a measure of the protection offered by a wall or structure when exposed to fire, in terms of structural adequacy, integrity (the resistance to the passage of flame or gas) and insulation (the resistance to the passage of heat). The numbers indicate the protection offered in minutes.

(segregation) of the IMDG code. The segregation table shows the general provisions for segregation of the various classes of dangerous goods. The dangerous goods list (Vol II of the IMDG code/chapter 3.2) should however always be consulted for particular provisions concerning stowage and segregation. In the case of conflicting provisions, the ones in the dangerous goods list take precedence over the general provisions.

Note: *Dangerous goods of class 1, 6.2 and 7 are not included in the table and should be subject to special rules for each port as the handling facilities vary considerably. These rules should be agreed with the authorities responsible for the safety of the port.*

Table 11: **Segregation advice for dangerous cargoes in port areas**

CLASS OF DG	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	8	9
2.1												
2.2												
2.3												
3												
4.1												
4.2												
4.3												
5.1												
5.2												
6.1												
8												
9												

IBCs/trailers/flat rack or platform containers

	No segregation necessary unless required by the individual schedules
	Away from – minimum 3 m separation required
	Separated from – In open areas, minimum 6 m separation required

For closed containers/portable tanks/closed road vehicles

	No segregation necessary unless required by the individual schedules
	Away from – minimum 3 m separation required
	Separated from – In open areas, minimum 6 m separation required

For open road vehicles/railway freight wagons/open-top containers

	No segregation necessary
	Away from – minimum 3 m separation required
	Separated from – In open areas, longitudinally and laterally, minimum 6 m separation required

The revised recommendation contains an example of how a port has dealt with the problem of segregation of freight containers carrying dangerous goods. This example could also apply for CSCP to ensure they have sufficient space for stacking containers.

Illustrated example:

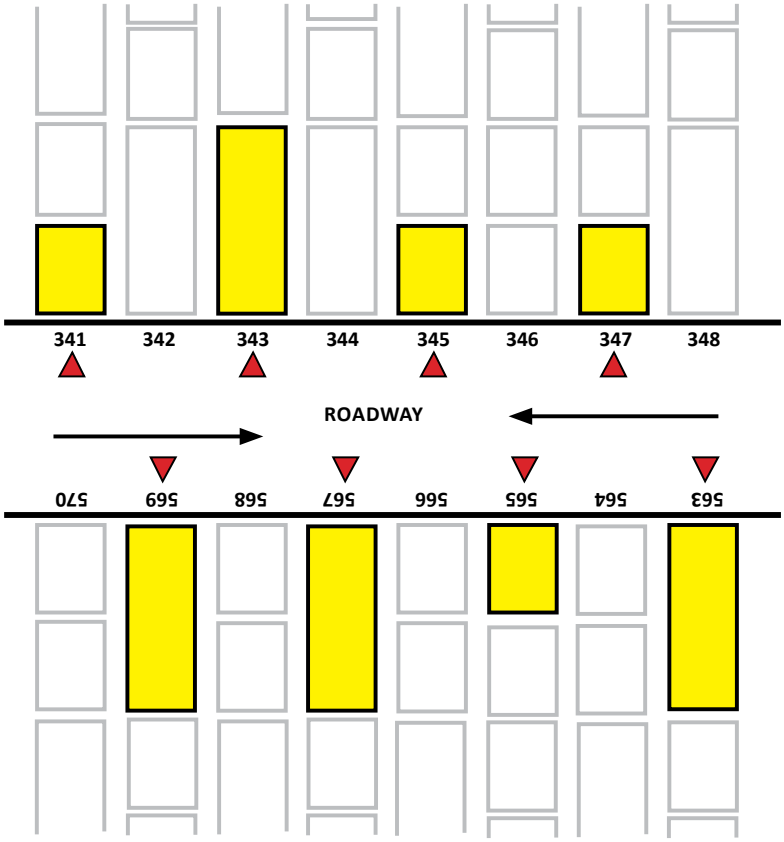


Figure 44:
Container storage area – Segregation of DG containers[31]

In the container storage area illustrated above every first position of the odd-numbered lanes is dedicated for the storage of a container containing dangerous goods (marked in yellow on above figure). The lanes are marked with striking red triangles. The containers are always placed with their doors facing the roadway for easy access in case of emergency. The segregation requirements for the containers are in accordance with the IMDG code requirements for "on deck" stowage. In this case stacking of dangerous goods containers is prohibited.

Note: *For freight containers, portable tanks, lorries, flat racks or platform containers or rail wagons, a distance of 3 m is equal to the width of a standard 20-foot container, or one rail track, one trailer lane or, in the case of successive rail wagons, the longitudinal buffer space.*

[31] Msc.1/Circ. 1216, 26 February 2007, Revised recommendations on the safe transport of dangerous cargoes and related activities in port areas, p. 21

7.2 Dangerous Goods Area

7.2.1 General provisions

Dangerous goods areas should be designed to eliminate the risks associated with the storage and handling of dangerous goods, or if not practicable, reduce the risk so far as is practicable. The following points should be taken in to consideration:

- Dangerous goods packages and CTUs should be sufficiently protected against damage from impact with vehicles. Mechanical equipment used for moving containers of dangerous goods including forklift and overhead lifting grabs can cause damage either directly through mishandling or indirectly by moving containers into other objects, such as protecting pipework, railings or structures.
- Dangerous cargo areas should, where possible, be located so that management and/or security personnel may keep them under continuous observation. Otherwise an alarm system may be provided or the spaces inspected at frequent intervals.
- Dangerous goods cargo areas should have separate areas with all necessary facilities appropriate to the hazards emanating from the cargoes that are stored. Where appropriate these facilities should include separate ventilation, drainage, fire resistant walls and ceilings.
- Dangerous cargo areas should be so constructed that in case of emergency, adequate access is provided for handling equipment, emergency services, etc.
- Adequate emergency facilities should be provided. These facilities should be appropriate to the hazards of the dangerous cargoes to be stored/handled.
- Special areas for damaged dangerous cargoes and waste contaminated with dangerous goods should be provided. These areas should be covered, have a sealed floor or ground, separate drainage systems with shut-off valves, sumps or basins and means to discharge contaminated water to special facilities in order to safeguard the port area and the environment.
- The port operator should ensure that areas where packaged dangerous goods or cargo transport units are kept are properly supervised and all packages and cargo transport units are regularly inspected for leakage or damage. Any leaking package or CTU should only be handled under supervision of a responsible person.
- All cargo handling equipment for dangerous goods should be of an approved type, properly maintained and tested in accordance with national requirements.
- Adequate lighting should be provided to all areas and access ways where dangerous goods are stored or handled.

7.2.2 Fire precautions

For the majority of dangerous goods areas, the handling of bulk dangerous liquids and gases has the greatest potential to cause significant harm or damage. The following should be taken in consideration:

- Keep combustible materials away from ignition sources;
- Protect a flammable substance by sufficient packing;
- Reject damaged or leaking packages;
- Stow packages protected from accidental damage or heating;
- Segregate packages from substances liable to start or spread fire;

- Where appropriate and practicable, stow dangerous goods in an accessible position so that packages in the vicinity of a fire may be protected;
- Enforce prohibition of smoking in dangerous areas and display “NO SMOKING” notices or signs. Notices in a pictogram should be clearly visible at all locations and at a safe distance from places where smoking would constitute a hazard;
- The dangers from short-circuits, earth leakages or sparking will be apparent. Lighting and power cables and fittings should be maintained in good condition. Cables or equipment found to be unsafe should be disconnected;
- The carrying out of hot work, repairs or maintenance work, and the use of any equipment or activity which may lead to a fire or explosion hazard should be prohibited in areas where dangerous goods are handled, unless authorised by the port authority;
- In areas where a flammable or explosive atmosphere may exist or develop, lighting and other electrical equipment should be of a type safe for use in a flammable or explosive atmosphere and used in such a manner that no fire or explosion can be caused; and
- All areas where dangerous goods are stored should be kept clean and tidy.

7.2.3 Firefighting Equipment

- The port operator should ensure that adequate and properly tested firefighting equipment and facilities are provided and readily available.
- All personnel involved in the transport or handling of dangerous goods should be properly trained and practiced in the use of firefighting equipment.
- All firefighting equipment and installations should be clearly marked as such and notices drawing attention to them should be clearly visible at all appropriate locations.

7.2.4 Spill containment system

Spill containment must be provided to eliminate or reduce the risk as far as practicable from any spill or leak of solid or liquid dangerous goods. All spillage or leaks from dangerous goods should be contained within the dangerous goods area. The following should be considered:

- The spill containment system should be impervious and able to hold the spilled dangerous goods until the spill is cleaned up.
- The containment system should be compatible with the dangerous goods and other materials in the vicinity and appropriate to avoid contamination of ground water or soil.
- The capacity of the spill containment system should be sufficient for the volume of liquid to be contained, including a margin for fire water.
- Absorbent materials, barriers and booms should be provided where needed to contain a spill outside areas where physical containment is provided, and to minimise the damage in case of a spillage of dangerous goods.
- Spill containment system should be constructed so that contaminated fire water can be removed during an incident if needed. Means should also be provided for removing any rainwater that may accumulate in the area.

7.2.5 Personal Protective Equipment (PPE)

Personnel working in areas where dangerous goods are handled or stored should be provided with the necessary Personal Protective Equipment (PPE). PPE includes items such as overalls, gloves, dust masks, respirators, safety footwear, goggles or face shields, hard hats, hearing protection etc. PPE may also be necessary as part of emergency procedures. Training should be provided on how to correctly use the equipment. Cleaning and maintaining of PPE should only be done by appropriately trained staff in accordance with the relevant technical standards.

As the use of PPE relies on the users following instructions and procedures correctly, supervisors should make sure that the PPE is worn and instructions and procedures on donning are followed where necessary.

Table 12: **PPE - Pictogram**

	Eye protection must be worn	
	Safety boots must be worn	
	Face protection must be worn	
	Safety helmet (hard hat) must be worn	
	Safety gloves must be worn	
	Safety overalls must be worn	
	Ear protection must be worn	
	Life jacket must be worn	

7.2.6 Safety signs

Dangerous goods areas should be provided with the necessary safety signs that are readily recognisable, understandable and durable. They can be in written or pictorial format. The signs should be easily interpreted in conditions that may prevail, such as low light.

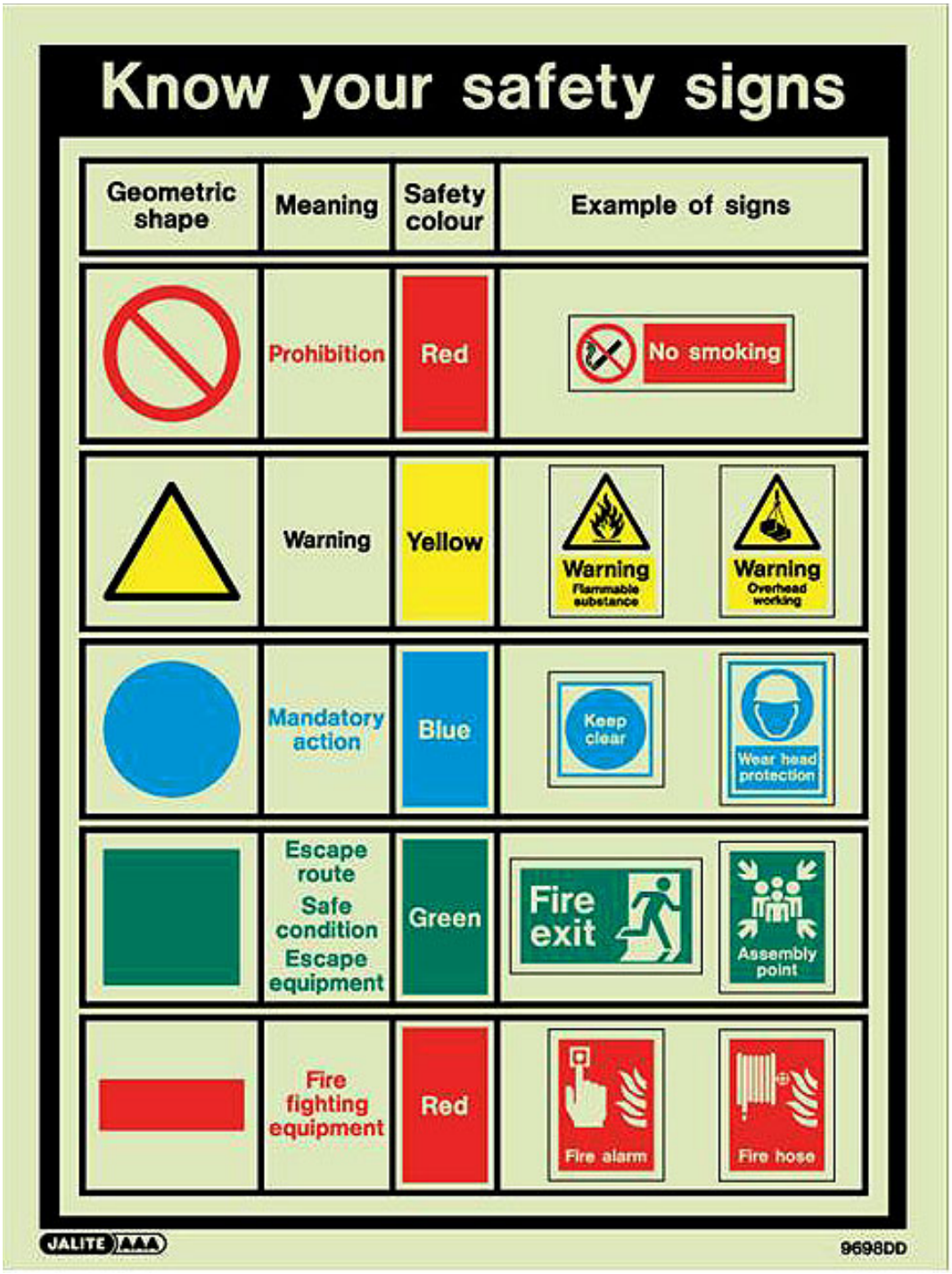


Figure 45: **Know Your Safety Signs**[30]

[30] http://www.photoluminescent-signs.com/uploads/images/img_423.png


79-8197

8 CARGO TRANSFER OPERATIONS

8.1 Packaged Dangerous Goods

The cargo transfer operations or handling of packaged dangerous goods involves the operation of loading or unloading of a ship; transfer to, from, or within the terminal area or ship; or transshipment between ships or other modes of transport (truck, train). This includes the intermediate keeping or the temporary storage of Packaged Dangerous Goods in the port area during their transport from the point of origin, to their destination for the purpose of changing the modes or means of transport.

8.1.1 Procedures

8.1.1.1 Packaging

Probably the most important aspect of the handling of dangerous goods is packaging them in a container. In general, suitable packaging greatly reduces the risk of serious accidents. These packaging standards are included in the safety standards and regulations.

A general requirement of the regulations provides that dangerous goods have to be packaged so that there will be no discharge, emission or escape of dangerous goods that may pose a risk to life, health, property or the environment.

The packages/containers must comply with the following requirements:

- must not be affected by the cargo it contains;
- must be strong enough to endure the rough treatment and risks involved in maritime transport;
- must be able to endure rain, wind and sea water;
- must be practical and adequate for the cargo they carry;
- must be in good condition; and
- must be correctly marked, labelled and signposted.

8.1.1.2 Labels and Placards

Packaged Dangerous Goods require appropriate identification to clearly show, through an international symbol, the latent danger of the product. This information allows shore personnel and crewmembers to adopt the necessary precautions and avoid serious accidents.

The IMDG Code states that all packaging, packages and drums carrying dangerous goods must be labelled. The labels are in the shape of a rhombus in white, orange, blue, green or red, or a combination of these colours. Symbols illustrating the danger of the class are also required. In general, each label is divided into two parts, the bottom half and the top half.

The IMDG Code determines that all “cargo transport units” containing dangerous goods must be placarded. In this context, cargo transport units are containers, containers for liquids, tank vehicles, vehicles transporting goods by land, railway wagons with water tanks, and good tanks destined for intermodal transport.

8.1.1.3 Stowage and Segregation

One of the most important aspects of managing the transport of dangerous goods is the stowage, segregation and separation of these goods. Hazardous substances must not be carried with goods which are liable to interact and cause danger. Incompatible hazardous substances must be adequately separated from each other during transport and storage. Improper stowage or segregation of dangerous goods may result in the release of toxic fumes, fire, spillage and degradation of the product's quality. One of the most important aspects of managing the transport of dangerous goods is the stowage, segregation and separation of these goods. Hazardous substances must not be carried with goods which are liable to interact and cause danger. Incompatible hazardous substances must be adequately separated from each other during transport and storage. Improper stowage or segregation of dangerous goods may result in the release of toxic fumes, fire, spill and degradation of the product's quality.

8.1.1.4 Emergency Response Plan (ERP)

Preventive management is an important element in managing an emergency. It is essential to identify the UN Number of the dangerous good(s) involved in the fire/spillage in order to refer to the specific Emergency Schedule for appropriate action. Column 15 of the IMDG Code Volume 2 contains the Emergency Schedule Guide (EmS). Fire is denoted as "F" and spillage is denoted as "S". "E" and "D" denote the chemical classifications. The Code also provides the guide to manage the fire and spillage incident according to its chemical state.

FIRE SCHEDULE Echo

F-E

NON-WATER REACTIVE FLAMMABLE LIQUIDS

General comments		Cargoes in tanks exposed to heat may explode suddenly during or after a fire situation by a *Boiling Liquid-Expanding Vapour Explosion* (BLEVE). Keep tanks cool with copious quantities of water. Fight fire from a protected position from as far away as possible. Stop leakage or close open valve if practicable. Flames may be invisible.
Cargo on fire on deck	**Package**	Create water spray from as many hoses as possible
	Cargo Transport Units	Cool burning transport units and nearby cargo exposed to the fire with copious quantities of water
Cargo on fire under deck		Stop ventilation and close hatches. Use cargo space fixed fire-extinguishing system. If this is not available, create water spray using copious quantities of water.
Cargo exposed to fire		If practicable, remove or jettison packages which are likely to be involved in the fire. Otherwise, keep cool for several hours using water.
Special cases: **UN 1162, UN 1250,** **UN 1298, UN 1717,** **UN 2985**		Cargoes will create hydrochloric acid in contact with water: stay away from effluent.

Figure 46: **EmS guide–Example Fire Schedule Echo**

8.1.1.5 Administrative Controls

Administrative controls are systems of work or safe work practices that eliminate or reduce risk. They consist of properly designed and implemented work practices and procedures.

Administrative controls rely on people to implement them and follow all the agreed work practices and procedures. To assist implementation, the complexity of such controls should be minimised. Workers are more likely to follow procedures if they have been fully consulted when developing and establishing them.

Administrative controls include:

- safe work procedures that describe the correct methods for performing all work activities, documenting these procedures, and training workers to use them;
- scheduling transfers during 'off-peak' times in terms of people and traffic;
- operating procedures that ensure that the integrity of structures and plant is maintained at all times;
- establishing inspection, maintenance, repair, testing and cleaning procedures to ensure other controls are maintained, and to ensure these procedures do not create risks;
- controlling access to the storage and handling areas (e.g. prohibiting the use of the area as a thoroughfare);
- where there is a fire or explosion risk it is important to prohibit the carriage and use of matches, lighters or spark producing tools. Procedures should be established to ensure that people do not take any substance or article with the potential to be an ignition source into or near a hazardous area;
- "no smoking", "no open fire" and "no naked light" signs should be displayed on obvious places throughout the port including at the entrance, and especially in the vicinity of dangerous cargoes that are stored or handled in bulk;
- regular housekeeping, including cleaning of contamination from walls and surfaces, dust and drip removal from work areas;
- keeping lids on containers when not in immediate use;
- procedures for spill clean-up and decontamination;
- procedures for waste disposal, including disposal of clean-up waste and contaminated waste;
- developing and rehearsing emergency procedures;
- procedures to ensure the provision and use of appropriate PPE, signs to be posted at obvious places throughout the port, including the entrance of the port area; and
- procedures for 'hot work' (e.g. welding or grinding) in or around the storage or handling area, such as using 'permit to work' systems.

8.1.1.6 Storage Requirements

A special storage area or warehouse should be allocated for the storage of packaged dangerous goods. Dangerous goods should be stored for as short a time as possible (with a maximum of 5 days, except packaged dangerous goods of certain classes that shouldn't be stored at all). The maximum quantity of different kinds of dangerous goods stored should be regulated and segregated according the IMDG Code.

There should be limitations on the quantities of Dangerous Goods of Class 1 Explosives and Class 5.1 Oxidising substances that can be handled in or transshipped/transited through the port.

Cargoes of classes 1, 6.2 and 7 should normally be allowed into the port area for direct shipment or delivery only. However, if through unforeseen circumstances these cargoes have to be temporarily kept, it should be in designated areas.

To avoid falls, breakages of containers and resultant spills, packages should not be stacked too high.

Adequate equipment such as forklifts, discharging and loading equipment certified for lifting or carrying a maximum load should be used and operated by trained drivers or port personnel;

The standard of management and housekeeping in the store needs to be consistently high. This is to ensure safe storage and effective management of any emergencies that could arise. It is important that the segregation of goods is maintained at all times;

When evaluating the suitability of a restricted area, the following features should be considered:

- the nature and quantities of PDG kept in the area;
- the type of equipment to be used in handling the cargo;
- the adequacy of the berth's technical, operational, organisational and emergency safeguards operators;
- surrounding land uses, population densities and proximity to other hazardous installations;
- proximity of other dangerous goods and their compatibility; and
- interaction of above mentioned factors.

8.1.2 Safety precautions

8.1.2.1 Training of personnel

Based on risk assessments and the complexity of the handling and storage of Packaged Dangerous Goods in port areas, port users should ensure that all staff involved are provided with a formal training program. The training should aim that each person involved attains the necessary knowledge and competencies to undertake the operation safely. The staff must be provided with adequate supervision until they can demonstrate that they are competent in handling Packaged Dangerous Goods. Responsible parties should select training courses that cover the theoretical aspects of handling and storage of PDG including guidelines and regulations.

8.1.2.2 Handling equipment

Special precautions should be taken, such as the provision of mats, sling nets, boxes and plates with high side boards to prevent breakage or deterioration of containers or packaging of dangerous goods.

8.1.2.3 Personnel protective equipment (PPE)

PPE includes items such as overalls, aprons, gloves, dust masks, respirators, self-contained breathing apparatus (SCBA), footwear, goggles or face shields, hard hats and fully encapsulated suits. PPE should only be used when other control measures are not feasible.

Where the chosen measures to control risks include PPE, the operator must ensure the equipment is kept at the site and is readily accessible. The operator must also provide training on its use and maintenance. Careful supervision and monitoring are needed to ensure that workers use and maintain PPE properly.

Even where not adopted as a regular control measure, PPE may still need to be readily accessible in the event of a failure of containment or an emergency.

Consult MSDSs for advice on appropriate PPE. When choosing PPE, ensure:

- the specification provides the required level of protection for the risks associated with the particular work task;
- it meets an appropriate Standard (look for the Standard on the label or supplier's information);
- it is suitable for the individual's size;
- the wearer's need for mobility, dexterity, clear vision, communication and comfort are considered;
- it is used in accordance with the manufacturer's directions;
- it is readily available, clean and in fully operational condition;
- employees are trained in the use of the PPE, including selection, maintenance and when to discard a disposable PPE;
- the employees wear the PPE as intended;
- any necessary maintenance or cleaning is carried out; and
- the risk of secondary injury (e.g. skin rash, heat stress or dehydration) due to wearing the PPE is addressed.

If in doubt, ask the supplier of the dangerous goods for recommendation on PPE suitable for the intended use and circumstances — preferably obtain this advice in writing.

8.1.3 Checklists

No.	Item	Yes	No
1	All shore-based personnel engaged in the transport of dangerous goods are properly trained?		
2	Do not smoke or introduce any other sources of ignition when flammable or explosive substances are being carried.		
3	For all dangerous goods, check that the consignment agrees with the Dangerous Goods Note and that it shows:		
3a	Proper shipping name		
3b	UN number		
3c	Class label		
3e	Subsidiary risk label (if appropriate)		
3f	Marine pollutant mark (if relevant)		
3g	UN type approval mark		
4	Are all corresponding MSDS/SDS available?		
5	All documents are clear, legible to read and properly signed?		
6	The number and kind of packaging for each UN-number is stated on the dangerous goods documentation?		

7	Check the nature of hazards from the package labels.		
8	Check that the safety approval plate of any freight container is valid.		
9	The container/vehicle identification number is specified on the documents?		
10	Visually check the outside of the CTU for signs of possible damage or leakage. Check the condition of individual packages for damage, leakage, staining etc.		
11	Ensure that the doors of the CTU are properly secured.		
12	Check that the sides and ends of the CTU or packagings are properly placarded. Irrelevant placards, signs and marks have been removed.		
13	For class 3 Flammable liquids, the flashpoint corresponds to the correct hazard group (packing group) and the flashpoint is stated on the dangerous goods documentation?		
14	If dangerous goods are being transported in bulk, they are in an approved bulk container and the appropriate statement is written on the dangerous goods documentation.		
15	All cylinders of propane and butane carried for private use (the gas supply should be shut off at the cylinders) should be adequately secured against the movement of the ship, away from sources of ignition and heat.		

References:

- Department of Planning & Development, Port, Customs and Free Zone Corporation, Government of Dubai, Trakhees, October 2010.
- Government of Western Australia, Department of Mines and Petroleum, Resources Safety, Storage and handling of dangerous goods, Code of practice, 2nd edition 2010.
- Port of Melbourne, Packaged Dangerous Goods Management Guideline, June 2011.
- Australian Government, Information Sheet, Carriage of DG by sea, Mandatory Training Requirements under Chapter 1.3 of IMDG Code (2008 edition).

8.2 Dangerous Goods in Bulk

All fuel transfer operations carry the risk of a spill. Marine environments are particularly sensitive to the impacts of an oil spill. When it is necessary to carry out fuel transfer operations in marine environments, they must be done safely and carefully using proper equipment and procedures.

Before carrying out any transfer of fuel the driver should consider the following:

- Is it absolutely necessary to carry out the fuel transfer operation at that location under the existing conditions?
- Is there any safer way to provide fuel to the vessel?
- Are all necessary precautions taken to prevent a spill or other problem?
- Is a suitable Emergency Response plan in place?

This section will focus on the transfer of petroleum products from truck to marine vessel as this is currently the main activity carried out for the moment. During these operations there are two main parties involved: the tank truck driver and the marine representative.

The driver is ultimately responsible for the decision to carry out the oil transfer operation since he has care and control of the product from loading to delivery. The driver must demonstrate due diligence by

making sure that the equipment and operating procedures meet the highest level required for safety and environmental protection.

The driver has the authority and the responsibility to cease operations if an unsafe condition exists.

The driver's responsibilities include, but are not limited to, the following:

- Ensure the truck and all related fuel transfer equipment is in good condition, meeting all legal requirements.
- Ensure the land-site location of the fuel transfer is suitable and that permission to carry out the transfer operation has been granted by the property owner.
- An acceptable contingency plan exists.
- The vessel's available fuel tank capacity (ullage) has been determined by the marine representative and agreed on by the driver.
- The pre-transfer checklist has been completed with the marine representative.
- The marine representative has given assurance that their responsibilities have been met.
- An effective communication system between the driver and marine representative is in place.
- The driver remains at the truck, maintaining control of the oil discharge throughout the operation.
- Any spillage from the truck system is responded to and reported in accordance with the truck's contingency plan and applicable legislation.
- Any other company-specific requirements, such as taking samples, are carried out.

Note: *The driver is not to carry out the operation unless the marine representative is fully involved, carrying out his or her responsibilities. By carrying out an unattended operation the driver assumes full responsibility for the actions.*

Responsibilities of the marine representative are similar to those of the driver. The representative must attend all deliveries and is responsible for ensuring the following:

- Ensure that the vessel and its tank filling system are in good condition, meeting all legal requirements.
- The vessel is securely moored at an acceptable location, and, if required, the local authority has been notified.
- Where required, an acceptable contingency plan exists.
- The pre-transfer checklist has been completed with the driver.
- An effective communication system is in place.
- In case of spill belt, scuppers are plugged.
- Control is maintained throughout the operation.
- The hose and nozzle are properly secured at the fill connection.
- The tank capacity is constantly monitored to prevent overfilling.
- The vessel's tank vents are monitored to ensure they are not a source of spillage.
- Any spillage on board the vessel or originating from the vessel is reported and responded to in accordance with vessel requirements and regulations.

Figure 47:
Tank Truck at Chiang Khong Port

8.2.1 Procedures

8.2.1.1 Before Transfer

Before carrying out any oil transfer the following items should be checked:

- The tank truck must be safely and securely located to prevent damage from the truck to its surroundings:

  ⇨ Set the parking brake and/or chock the wheels.

Figure 48:
Tank Truck Chock Blocks

  ⇨ The truck engine must be shut off while connecting or disconnecting hoses.

- The vessel must be suitably located, secured and fitted to safely receive the delivery.
- A spill contingency plan must be in place to enable a quick, effective and sustained response to any emergency at that specific location.
- The fuel transfer safety checklist must be completed with a copy retained by the driver and a copy left with the vessel.
- The driver and marine representative must agree on the amount to be transferred, making allowance for:

⇨ Thermal expansion: the tank should not be filled above 95% capacity.

⇨ Sufficient additional tank capacity to accept the hose's line fill after the pumping is complete.

- Oil transfer operations are not to take place until all communications systems have been confirmed for proper operation. Communications should be ensured between the following:

  ⇨ The truck and vessel, to ensure that both parties are in constant, clear communication throughout the oil transfer operation.

  ⇨ The transfer location and the head office or other outside resource to ensure that, in the event of an incident, an appropriate response can be initiated without delay.

- At the first signs of an electrical storm, the operation must be shut down.

8.2.1.2 Starting Transfer

Proper and careful preparation is required for a safe transfer operation. Do not begin the transfer until all of the proper steps have been taken:

- Before opening fill caps, ensure proper bonding is in place.
- The marine representative must be present at the fill opening and signal when ready for flow to begin.
- The driver must be present at the truck controls, starting flow only when signalled by the marine representative.
- Start the flow slowly until the bottom of the filling hose is completely submerged.
- If any significant pressure build-up is noticed the driver shall immediately halt the filling process until it is safe to resume.

8.2.1.3 Finishing Transfer

Most spills during transfer occur when finishing the filling process, for the obvious reason that this is when overfills can occur. Constant vigilance is required:

- Slow down the flow when nearing the top of the tank; throttle the flow rate at the truck for best control.
- Watch the tank level through the fill opening, rather than waiting for product to splash out of the vent.
- If using a large hose, i.e. over 25 mm (1") diameter, take care to avoid shutting the flow down suddenly: line shock can damage the hose and connections.
- When disconnecting from the fill pipe, or removing the nozzle, take care to avoid dripping product; contain all drips.
- After all connections are released and capped, remove bonding cable.

8.2.1.4 Draining hoses

Care must be taken when draining hoses to prevent any spillage or drips from causing pollution or slipping hazards:

- Disconnect at the end nearest the truck and drain into the vessel tank or other suitable container - not plastic! (risk of static electricity).
- If using a portable container, drip tray or similar, ensure solid footing so the container cannot be inadvertently knocked over.
- Plug or cap the hose ends to prevent drips.

8.2.2 Safety Precautions

Prior to conducting an oil transfer operation, the driver must be confident that in the event of an incident, appropriate actions will occur. A contingency plan prescribes specific actions to be taken in the event of accidental discharges and is essential for an efficient and effective response. Such a response is intended to safeguard human health, the environment and property, in that order. A contingency plan is of particular importance during truck to vessel oil transfers because the driver may:

- Not have local knowledge of the environmental, recreational and other resources at risk;
- Not have local knowledge of available help, both manpower and equipment;
- Be entirely reliant upon a third party for provision and deployment of countermeasures equipment;
- Not have an adequate number of staff for assistance and there may be limited alternate personnel available in isolated areas; and
- After a spill, regulators will focus not only on the cause and impacts of the spill but also on the reactions of the responsible party. A functioning contingency plan will effect a good response and, in turn, help establish due diligence.

Emergency oil spill equipment must be present in close proximity of the transfer operations. This includes sawdust in bags, absorbent pads, chemical deck cleaning products, plastic drums for spill waste (200 litres), non-spark brooms, non–spark shovels, waste bags, etc.

Strictly enforce no smoking rules and the use of naked lights. Warning notices should be clearly displayed.

The truck unloading area must meet the following conditions and characteristics:

- The area must be clear of ignition sources.
- If on a wharf, that wharf must have a known adequate load capacity greater than the gross weight of the tank truck. Extra precautions are required if an oil transfer operation is to be carried out on a wooden wharf. Use bonded pails, portable containers or drip trays under the truck fittings to collect any drips and spills. Sudden braking may cause excessive stress and sway on wooden wharves. Wooden wharves can be extremely slippery when wet.
- Adequate lighting must be present.
- The fuel transfer area must have restricted public access.
- Clear of any right of way (placement of safety cones to restrict access to the driver’s work site must be used).

Extra care must be taken when manoeuvring; drivers must adhere to the following:

- Warning notices and/or pylons/safety cones should be displayed to alert bystanders of the potential dangers of the operation.

- Take extra care when backing up. A spotter should assist the driver.

Truck-mounted pumps can yield high pressure resulting in hose ruptures and fittings failure. The truck pump pressure-relief should be set to prevent excessive pressure. The pump system should be tested periodically to ensure the pressure relief is working and is properly limiting the pump discharge pressure.

Static electricity remains one of the greatest dangers in handling petroleum products. Both tank truck and vessel should be properly bonded and grounded. The following procedure should be followed:

- To neutralise the static discharge of both, ground the receiving tank (or the vessel if the tank is bonded to the vessel) and the tank truck to an earthing stud or other ground at the dock.
- If earthing points are not available, then the vessel and truck are to be bonded together to equalise any difference in potential.
- Before the vessel's fill cap is opened, bond the hose to the vessel to ensure there is no difference in the electrical potential between them.
- If a nozzle bonding cable is not available, touch the nozzle to the cap of the vessel structure to discharge any difference.
- When transfer is complete, allow at least two minutes waiting period for any possible static charges which have accumulated in the fuel, to equalise.

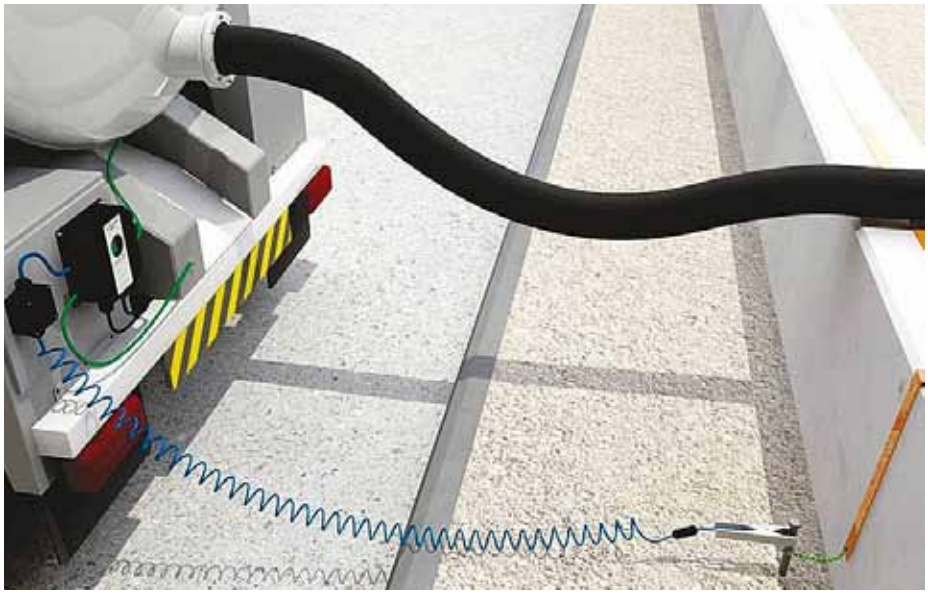


Figure 49:
Tank truck Earthing (bonding, grounding)[31]

Fuel transfer hoses must be visually inspected before each use, checking for signs of wear and fatigue. Do not use hoses that appear to be in poor condition. All pressure hoses must be hydrostatically pressure-tested at least once a year, to at least 1.5 times their maximum working pressure; the hose must bear a test tag showing the date and the test pressure. Hoses should also be tested for electrical continuity when they are pressure tested.

Fuel transfer hoses must be protected from damage. Do not allow hoses to be driven over, dragged over sharp objects, or damaged in any way. Hoses must not lay in the water where they can be damaged by marine traffic, floating logs, or pinched between the vessel and the dock. Hoses must be properly

[31] http://www.newson-gale.com/Industries/PaintsAndCoatings.asp

supported, avoiding stress on the connections. All connections must be liquid-tight and secure; no leakage will be tolerated. Connections must not be made over water and all connections should be contained by drip trays.

Hoses must be of suitable length to allow for tidal variations without being stressed. The time required for cargo transfer, and the estimated tidal action must be accounted for as part of the pre-delivery checklist.

Cargo transfer must not take place if any of the responsible parties are under the influence of drugs or alcohol. No exceptions.

8.2.3 Checklists

The safety checklist must be filled out and kept available during the transfer operation. The purpose of the checklist is to ensure that both parties, the driver and marine representative, have had a "meeting of minds" and understand the particulars of the transfer operation. It also provides a double check that required precautions are in place. On this checklist the driver is considered to be the "shore". By filling out and signing the checklist the driver and marine representative agree that their responsibilities have been met.

Note: *For all other cargo operations the Ship/Shore safety checklist in Annex 4 can be used.*

Location			Date	
Ship			Person in Charge	
Product to be Transferred				
Product	Volume (Litres)	Max. Transfer Rate	Topping Off Rate	Max. Line Pressure
Tanks To be Loaded				
Tank ID	Product	Max. Volume Tank	Available Volume	Volume to be loaded

	Item	Ship	Shore	Remarks
1	Port Authority notified per local requirements. Enter Port Authority Phone number in Remarks.			Phone Number:
2	Is there an Emergency Response Plan?			Emergency Contact:
2a	Is the Plan Available?			
2b	Are you familiar with the plan?			
2c	Are you in compliance with the plan?			
3	The Vessel is securely moored?			
4	Ship red flag or red light must be on.			
5	Is the tank truck parked safely nearest the vessel?			
6	Is the handbrake on and wheel chocks in place to prevent unnecessary vehicle movement?			
7	Tank Truck and or pump truck work area is barricaded with at least 6 safety cones. Access and movement around the vehicle and delivery area controlled.			

8	There is a safe access between the ship and the shore.			
9	Effective communications have been established between responsible persons on ship and shore: (VHF/UHF Ch. ……..) Agree on sign or signal. Emergency Stop Signal: ……..			Primary System: Backup System:
10	There is an effective watch on board the ship and ashore. During transfer operations a competent person will be continuously in attendance of the pump truck manifold and ship manifold. When transfer operation ceases or is temporarily stopped valves will be closed.			
11	Ship agrees that ullage (available volume) & product quantity indicated above is accurate and correct.			
12	Has agreement been reached on responsibility for stopping transfer? Truck or receiving vessel? Document in remarks			
13	Has the emergency shut-down procedure been agreed? Verify that pump engine emergency stop is operational. State procedure in remarks.			
14	Has the procedure for draining delivery hoses on completion of transfer been agreed?			
15	Fire hoses and firefighting equipment on ship are ready for immediate use and 2 extinguishers are in place at the pump truck			
16	All scuppers are effectively plugged. Drip trays are in position on decks under hose connections and tank vents. Static bucket available and in place for drips. No signs of leakage from pump.			
17	Unused connections are blanked and fully bolted.			
18	Transfer hoses have been rated for pump use (tagged and dated) and tested for conductivity.			
19	Static bonding wires attached from vessel to pump and pump to road tanker are in place?			
20	Transfer hoses are in good condition & protected from abrasion, securely bolted to manifold and all cam lock connections are secured in place. No hose joint suspended over water and hose is supported on ship and pump truck.			
21	Product tank content will be monitored at intervals not exceeding …… Minutes & check completed for leaks and or fault.			
22	Ship will ensure that tank valves are not closed against flow & valves are set correctly for tank to receive product and tank valves opened before start of discharge pump.			
23	There is a supply of oil spill clean-up material readily available for immediate use.			
24	Persons in charge are wearing appropriate PPE.			
25	Smoking rooms have been identified on board and smoking restrictions are been observed.			Designated smoking room:
26	Naked light regulations are being observed, hand torches and portable radios are of approved types.			
27	All external doors and ports in the accommodation are closed.			
28	Are required delivery warning notices in position?			

Declaration: We have checked, where appropriate jointly, the items of the checklist in accordance with the instructions and have satisfied ourselves that the entries we have made are correct to the best of our knowledge. If to our knowledge the status of any item changes, we will immediately inform the other party.				
For Ship		For Shore (Min. of 2 for the duration of the delivery)		
Name				
Rank				
Signature				
Date & Time				
Refusal by ship's staff to complete and sign a checklist must be reported and no delivery should be made				

References:

- International Chamber of Shipping, Oil Companies International Marine Forum & The International Association of Ports and Harbours, International Safety Guide for Oil Tankers and Terminals (ISGOTT), Witherbys Publishing & Seamanship International, Fifth Edition 2006.
- Oil Companies International Marine Forum & Central Commission for Navigation on the Rhine, International Safety Guide for Inland Navigation Tank-Barges and Terminals (ISGINTT), First Edition 2010.
- Canadian Petroleum Products Institute (CPPI), Professional Petroleum Driver's Manual, January 2009.
- Canadian Coast Guard, Tank Truck to Marine Vessel Transfer, April 1997 (Date last modified October 2008).
- BP Marine commercial procedures, Pre-delivery Checklist procedures, Elias J. storm, September 2006.
- Shell Marine, Products Delivery Procedures Manual.

8.3 Ship to Ship Bunkering Operations

A Ship to Ship (STS) transfer refers in this case to the delivery of bunkers from the bunker vessel to a commercial vessel positioned alongside one other at anchor or at a designated berth. It requires proper coordination, equipment and approval to perform such an operation. Both the masters of the ships are responsible for the entire operation.

A Risk Assessment (RA) should be carried out before each STS transfer operation and should cover operational hazards and the means by which they are managed. The scope of the RA should include confirmation of the following but not be limited to:

- Adequate training, preparation and qualification of personnel involved in the STS;
- Suitable preparation for operations and sufficient control during operations;
- Proper understanding of signals and commands;
- Adequate personnel assigned to controlling and performing transfer operations;
- Suitability of the agreed STS plan;
- Adequate communications between vessels;
- Condition of the transfer hoses;

- Methods of securely connecting & rigging of hose(s) on both vessels; and
- Recognition of the need to discontinue transfer operations when weather conditions deteriorate.

Spillages and leakages during bunkering operations are a primary source of oil pollution. Experience has shown that many of the bunker overflows and spillages that do occur can be attributed to human error.[32]

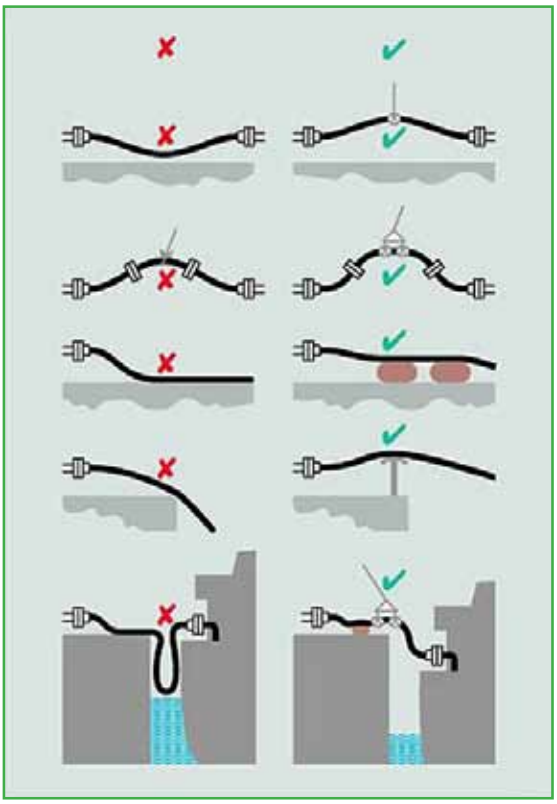


Figure 50: **Rigging of hoses**

8.3.1 Procedures

These procedures should ensure that the risks associated with the operation have been assessed and that controls are in place to mitigate these risks. The procedures should also address contingency arrangements in the event of a spill. Procedures include but are not limited to:

- Determining that there is adequate space for the volume of bunkers to be loaded;
- Establishing maximum loading volume for all tanks;
- Controls for the setting of bunker system valves;
- Determining loading rates for the start of loading, bulk loading and topping-off;
- Arrangements of bunker tank ventilation;
- Overflow arrangements;
- Verification of gauging system operation and accuracy;
- Alarm settings on overfill alarm units;
- Bunker overfill protection (in general, the bunker overfill protection is an emergency topping device only. It should not be used as a standard method of stopping bunkering);
- Communication between the supplier and receiver must be established before bunkering can be undertaken, including communication procedures for the bunkering operation and emergency stopping procedures;
- Manning requirements to execute the operation safely (including e.g. deck watch);
- Monitoring of the bunkering operation and verifying that the operation is carried out according the mutual agreed procedure;
- Changing over tanks during bunkering; and
- Containment arrangements and availability of clean-up equipment.

[32] International Chamber of Shipping, Oil Companies International Marine Forum & The International Association of Ports and Harbours, International Safety Guide for Oil Tankers and Terminals (ISGOTT), Witherbys Publishing & Seamanship International, Fifth Edition 2006, Chapter 25 – Bunkering Operations.

8.3.2 Safety Precautions

The basic safety requirements for a transfer operation are similar to those for normal port cargo operations; however the following safety precautions are emphasised for a bunkering operation:

- All staff involved in bunkering operations should be adequately trained.
- Strictly enforce no smoking rules and the use of naked lights. Warning notices should be clearly displayed.
- Earth indicator lights indicating a faulty circuit should be immediately traced and isolated. This is to void the risk of arcing, especially in deck areas where hazardous accumulations of gas may be present.
- In case of sparking from the funnel, transfer operations should be stopped immediately.
- In order to eliminate the potential for arcing between the two ships when presenting the transfer hose for connection, preference should be given to specially constructed hoses that prevent static build-up or electrical currents transferring between ships.
- The main radio transmitting aerials on both ships should be earthed (grounded) and neither ship should use this equipment while alongside one another.
- Handheld VHF and UHF radios, as used for cargo operations, should be of intrinsically safe manufacture.
- The VHF equipment used for the AIS broadcast should remain in use at all times.
- Portable electronic devices such as portable cellular (mobile) telephones, pagers, cameras using batteries, Portable Data Assistants (PDAs), calculators, etc., may constitute a risk to the ships if used in a hazardous area. Precautions should be taken that all personnel involved are made fully aware of the dangers and any restrictions on the use of such items.
- The use of radar involves the operation of electrical equipment which is not intrinsically safe. Depending on the relative size of the two ships, during cargo transfer operations the radar beam of one ship may at times sweep the cargo deck of the other and be close enough to create potentially hazardous power densities in areas where flammable gas mixtures could be present (radiation from radar operating at frequencies above 9000 MHz (3 cm) may be considered safe at distances of over 10 metres).
- The bunkering operations should be suspended if cargo vapour accumulation around the decks or manifolds of either ship constitutes a risk to the ship personnel, and should not be resumed until it is considered safe to do so.
- When an electrical storm is present or imminent in the transfer area, the transfer should be suspended until such time as it is considered safe to resume operations.
- Oil or gas fired galley stoves or electrical appliances with exposed elements should not be used.
- Pre-planning of the operation should include notifying the amount and type of bunkers involved.
- Proper attention should be paid to the difference in freeboard and the listing of both vessels while bunkering.
- Permission from the relevant port state authority should be obtained.
- A proper communication channel should be set up between the ships.

- The entire crew must be briefed about dangers associated with the cargo such as volatile organic compound (VOC) emissions, chemical reactions etc., involved in the transfer.
- Firefighting and oil spill equipment to be present and ready for immediate use on both ships. Crew to be well trained to use them in case of emergency.
- All access doors to the accommodation should be kept closed during bunker transfer operations. Designated access doors should be used for personnel transit; preferably these should be doors remote from the main deck cargo area.
- No unauthorised crafts should be allowed alongside either ship throughout the cargo transfer.

8.3.3 Checklists

Port/Navigation at (*)		Date			
Time connected		Time start pumping			
Time disconnected		Time stop pumping			
Number bunker tank	1	2	3	4	5
Product	L	L	L	L	L
Tank capacity (@97%)	L	L	L	L	L
Content of tank before bunkering	L	L	L	L	L
Capacity available for bunkering	L	L	L	L	L
Agreed bunker quantity					
Start pumping rate: L/min |m³/h| tonnes/h (*)					
Max. pumping rate in: L/min |m³/h| tonnes/h (*)					
Name of responsible person during receiving operations					
Name of responsible person during delivering operations					
Bunker tank contents are checked during operations at intervals of:					Minute

				< aft ship	fore ship >			

No.	Item	Yes	No
1(*)	Is the receiving ship securely moored and sufficient fendering in place?		
2(*)	Is the delivering ship securely moored and sufficient fendering in place?		
3(*)	If bunkering during navigation has a safe sailing speed being agreed?		
4	Are all of the bunkering hoses in good condition and appropriate for the service intended?		
5	Have effective communications been established between both parties?		
6	Is there an effective watch on both ships?		
7	Is enough lighting in place to monitor the delivery?		
8	Are the smoking and open fire restrictions being observed?		
9	Has an emergency stop procedure been agreed?		
10(**)	Will a bunker overfill protection system be used?		
11(*)	Has the filler pipe been connected properly and checked for tightness?		

12(*)	If using a nozzle that cannot be fully connected, is the nozzle inserted far enough into the filling pipe opening and is the hose securely fastened to the receiving ship?		
13	Are the bunker hoses rigged within their limits of torsion and pulling and is the radius of bending of the hoses above their minimum?		
14(*)	Are spill containment arrangements in place? (driptray, scupper plugs, spillrail, …)		
15	Is clean-up equipment available?		

Ticking or initialling the appropriate boxes and signing this Bunkering Safety check-list for bunker delivery to inland ships confirms the acceptance of obligation.			
Receiving ship		Delivering bunker jetty/station/ ship/truck(*)	
Master's name		Representative name	
Signature		Signature	

(*) = delete where not applicable | (**) = mandatory when available | L = Litres
In general: bunkering may only take place if the questions 4 to 9, 13 and 15 are answered with 'yes'.

References:

- International Chamber of Shipping & Oil Companies International Marine Forum, Ship to Ship Transfer Guide (Petroleum), Witherbys Publishing, Fourth Edition 2005.
- International Chamber of Shipping, Oil Companies International Marine Forum & The International Association of Ports and Harbours, International Safety Guide for Oil Tankers and Terminals (ISGOTT), Witherbys Publishing & Seamanship International, Fifth Edition 2006.
- Oil Companies International Marine Forum & Central Commission for Navigation on the Rhine, International Safety Guide for Inland Navigation Tank-Barges and Terminals (ISGINTT), First Edition 2010.
- Bunkering Procedures, Loss Prevention Bulletin (LPB 002), West of England, July 2010.

9 EMERGENCY PREPAREDNESS AND RESPONSE

9.1 Emergency Preparedness

9.1.1 Emergency Response Plan

However much improvement is made in preventative measures, there will never be a guarantee that a (major) incident will not occur. It is essential, therefore, to have in place effective emergency arrangements in the event of an accident occurring. The main objective of an emergency response plan is to protect people, minimise damage to property and the environment and reduce disruption to business operations in the event of an emergency.

All ports should have an emergency response plan ready for immediate implementation in the event of an emergency. In general the emergency response plan should address:

- All possible types of emergencies that can occur, e.g. major oil spill, toxic gas leak, fire, explosion and injured persons.
- The use of emergency equipment such as firefighting equipment, breathing apparatus, resuscitation equipment, stretchers and means of escape.
- Manpower necessary to initiate and sustain the response plan at all times.
- Training and emergency response exercises.

9.1.2 Components and procedures

9.1.2.1 Preparation

The emergency response plan should cover all aspects of the actions to be taken in the event of an emergency. The plan should be developed in close cooperation with the port authority, fire brigade, police and other emergency services. The plan should include:

- Action to be taken by those at the location of the emergency to raise the alarm;
- Initial action to contain and overcome the incident;
- Procedures to be followed in mobilising the resources of the terminal;
- Evacuation procedures;
- Assembly point;
- Emergency organisation, including roles and responsibilities;
- Communication systems;

- Emergency control centres; and
- Inventory and location of emergency equipment.

Once the emergency plan is formulated it should be properly documented in an emergency procedure manual and be made available to all personnel working at the port.

9.1.2.2 Control

- The plan should contain a list of the people who have the overall responsibility for dealing with an emergency, listed in order of priority.
- The plan should outline roles and responsibilities of all personnel within the terminal to contain and control the emergency.
- The location of the designated emergency control centre that will be used by key personnel to coordinate the emergency response activities must be included in the plan. The control centre should be located at a central point, not adjacent to likely hazardous areas and be fitted with appropriate emergency and communications equipment.

9.1.2.3 Communication and alarms

- The plan must include a description of the alarm system and how it will be operated.
- The emergency plan should include full contact details, both during and outside office hours, for those inside and outside (fire brigade, police and emergency services) the organisation that must be called in case of emergency.
- A reliable communication system is essential for dealing successfully with an emergency situation. A suitable communication system should be provided linking with all necessary contacts both inside and outside the terminal.
- The emergency response team should be kept free from communication requirements with other parties not involved in handling the emergency. A dedicated person should be appointed to handle central communications, press and public relations.

9.1.2.4 Site plan and maps

- Detailed map of the facility and surrounding area; and
- Plans showing firefighting equipment, emergency equipment, major facilities and road access. These should be up to date and readily available.

9.1.2.5 Access to equipment

All emergency equipment should be readily accessible and kept free of obstructions at all times.

9.1.2.6 Road traffic movement and control

- Roadways in the terminal approaches and areas in the way of jetty heads should be kept free of obstructions at all times.

- During an emergency, traffic into the terminal or onto the berth should be strictly restricted to those vehicles and people required to deal with the emergency. Limitations on vehicle weights should be taken into account before emergency vehicles access jetty areas.

9.1.2.7 Outside services

The terminal emergency plan should make the best possible use of external services. The success in responding to an emergency may depend on the cooperation received from third parties.

This includes:

- Harbour authorities, Vessel Traffic control Centres, Police and Fire Service;
- Pilots;
- Rescue launches; and
- Medical facilities.

9.1.2.8 Training for emergencies

All personnel should be trained to understand the emergency plan and how to respond to an emergency.

References:

- International Chamber of Shipping, Oil Companies International Marine Forum & The International Association of Ports and Harbours, International Safety Guide for Oil Tankers and Terminals (ISGOTT), Witherbys Publishing & Seamanship International, Fifth Edition 2006.
- Recommendations on the emergency preparedness for, response to, and recovery from incidents, Buncefield Major Incident Investigation Board, July 2007.
- Dangerous goods sites, Emergency planning code, second edition, Government of Western Australia, Department of Mines and Petroleum, Resource Safety, 2011.

9.1.3 Oil spill Response plan

The main objective of the *Notification of the Marine Department No. 412/2543 Guidelines for the Action Plan for Combating Marine Pollution at Ports Where dangerous goods are Loaded/Discharged* was to ensure uniformity and consistency of the action plans for combating marine pollution caused by the spillage of oil or chemicals at ports. The notification clearly states that it is the duty of the port owner or operator to develop an action plan. The primary purpose of the action plan is to set in motion the necessary actions to stop or minimise the marine pollution incident and to mitigate its effects on human lives, properties and the environment.

9.1.4 Components of the Action Plan

The notification describes the different components that should be included in the Action Plan:

9.1.4.1 Introduction

a. Background:
   - Information of the operator of the port (name, address, contact information, etc.);
   - Type and characteristics of dangerous goods handled;
   - Cargo handling equipment; and
   - Other relevant information.

b. Objectives of the action plan.

c. Areas of responsibility:
   - A clear description of the area that falls under the responsibility of the operator; and
   - Relevant environmental information such as water depth, river bottom, tide, current and wind direction and force, specially protected coastal resources.

d. Risk Analysis:
   - Quantity, frequency and type of dangerous goods handled; and
   - Possible damage to human life, property and the environment in case of a spill.

9.1.4.2 Organisation and Duties/Responsibilities

a. Responsible persons appointed:
   - Description of duties and responsibilities; and
   - Displayed in an organisational chart.

b. Alternatives for:
   - Combating Marine Pollution;
   - Controlling the situation;
   - Assistance to injured persons;
   - Control of areas;
   - Evacuation of people in the vicinity (if necessary);
   - Medical treatment for injured staff; and
   - Compilation of all relevant expenses.

c. Logistics plan:
   - Request for assistance from other authorities/organisations and the joint work plan.

d. Training and exercise plan:
   - Regular training programme or regular joint exercises at least once a year.

9.1.4.3 Operations

a. Follow-up and evaluation of pollution movement.

b. Guidelines coordination with local and central authorities.

c. Contact details of relevant local and central authorities.

d. Method and equipment for combating the spill.

9.1.4.4 Report and communication

a. Preliminary notification of emergency incidents:

- Contact details of parties to be notified; and
- Emergency or situation report system to responsible authorities.

b. Report format.

c. Summary report of the incident.

This report should be submitted to the Marine Department whenever such an incident occurs.

9.1.4.5 Administrative and supporting work

a. Expenditure indicating a budget reserved for the operation.

b. Compilation of evidence for expenditure and damage.

c. A person or group of people appointed to collect evidence of expenditure and damages which will be used as a claim for compensation.

d. Revision of the action plan.

e. A person or group of people appointed to collect and analyse the information relating to the incident in order to prepare lessons learned and subsequent revision of the plan.

9.1.4.6 Annexes

a. Map illustrating areas of responsibility (see 9.1.4.1 section c).

b. Map illustrating high risk areas and protected areas.

c. Communication Chart.

d. Information on environment, hydrography, hydrology and other relevant information.

e. List of parties concerned.

f. List of relevant authorities and experts/specialists.

g. List of providers of necessary services such as rental cars, motor boats, labour, materials, foods, etc.

9.1.5 Drills/exercises

The running of drills is an important tool for an oil spill preparedness program. Drills and exercises test the effectiveness of the oil spill contingency plan. All personnel involved must be familiar with the response procedures, should be adequately trained and should clearly understand the action they would be required to take in responding to an oil spill. This should include the sounding of alarms, the setting up of a control centre and the organisation of personnel to deal with an oil spill. Lessons learned during the drills should be incorporated into the plan to continuously improve capability to respond.

Annual drills should be organised. The following items should be included in the drill:

- Internal spill response team was notified as per plan procedures.
- Notifications to authorities were made in a timely manner.
- Initial Site Safety was addressed as per plan procedures.
- Emergency shutdown procedures identified in the contingency plan were conducted (may be a walk-through).
- Field-tested plan holder's initial response communication equipment and systems.
- Performed initial assessment of the spill including; spill volume, product type, status of discharge, status of the slick including consideration of environmental conditions.
- Water Intake Protection: Demonstrated the ability to identify water intakes and followed the proper protection procedures from the contingency plan.
- Population Protection: demonstrated the ability to identify health hazards associated with the discharged product and the population at risk.
- Local internal team members performed task assignments as described in the contingency plan.
- The initial response team ensured a smooth transition to the spill management team through completion of an Initial Incident Briefing.

The complete Emergency plans should be tested at least every 3 years. If not practicable to test all parts of the plan simultaneously, several tests may be conducted during the 3 year period, with at least one being a major exercise involving emergency services, adjacent facilities and nearby residents.

9.1.6 Communication with external Emergency Services

Management of an emergency is vital to the potential success of any response. Clear lines of communication between the various parties and the ability to share accurate, up-to-date information as rapidly as possible are keys to good management in emergency situations.

Emergency response plans should contain a full list of contact details of all Emergency Services. This list should be kept up to date and communication procedures should be incorporated into the drills.

References:

- Notification of the Marine Department No. 412/2543 Guidelines for the Action Plan for Combating Marine Pollution at Ports Where dangerous goods are Loaded/Discharged.
- Planning and conducting drills in Washington State, Department of Ecology – State of Washington, March 2012.
- Recommendations on the Emergency Preparedness for, Response to and Recovery from Incidents, Buncefield Major incident investigation board, July 2007.

9.2 Emergency Response

9.2.1 Fire Fighting Equipment

9.2.1.1 Introduction

Fire safety at ports and terminals is provided through overlapping levels of protection as follows:

Figure 51: **Fire Safety: Overlapping Levels of Protection**

Fire safety at ports and terminals requires an appropriate balance between good design features, safe operational procedures and good emergency planning. Fire protection measures are not effective in limiting the frequency and size of spills or in minimising sources of ignition. Automatic detection of fire, and the subsequent rapid response of emergency personnel and fire protection equipment, will limit the spread of fire and the hazard to life and property at unmanned locations or at locations with limited numbers of personnel. Fire protection facilities should be designed to contain and control fires that may occur in defined areas and to provide time for an emergency exit.

Emergency exit facilities are needed to ensure the safe evacuation of all personnel from the affected area in the event that fire protection facilities do not successfully control a fire.

9.2.1.2 Fire prevention and isolation

Safety at terminals begins with fire prevention features inherently designed into the overall facility. Terminal firefighting equipment is usually dispersed around the site and much of it is exposed to the

weather. To ensure that it is fit for use, it is essential that all firefighting equipment is regularly inspected, maintained in a constant state of readiness and tested periodically to ensure reliable operation. Ports and terminals should ensure that all firefighting equipment is maintained under the control of a planned maintenance system. Careful design of a terminal is no guarantee that a safe operation will be achieved. The training and competence of personnel are of critical importance. Periodic simulated emergency drills, both announced and unannounced, are recommended to ensure operability of the equipment, operator proficiency in the use of equipment and familiarity with emergency procedures.

9.2.1.3 Fire detection and Alarm Facilities

The following general detection and alarm facilities are suggested for all control rooms or buildings:

- Manual fire alarm stations should be provided at all exits. The operation of a manual fire station should sound a local alarm and activate an alarm at the main fire control panel, if provided.
- A fire detection system should be installed in any area of a control building that is normally unattended. Each detector should raise a local alarm in the areas of the control room that are normally occupied and should activate an alarm at the main fire control panel located in a continuously attended area.

The general alarm system should, as a minimum, consist of one or more air horns, electric horns or steam whistles which are strategically located to ensure maximum coverage throughout the terminal. The alarm should be clear, audible and distinctive from signals used for other purposes, and should be capable of being heard in all areas of the terminal regardless of background noise.

9.2.1.4 Portable Fire Protection Equipment

Portable and wheeled fire extinguishers should be provided at every terminal berth on a scale relative to the size, location and frequency of use of the berth. Portable fire extinguishers should be located so that a fire extinguisher can be reached without travelling more than 15 metres. Wheeled extinguishers should normally be located in accessible positions at each end of loading arm gantries or at the berth approach access point.

Figure 52:
Wheeled dry powder extinguisher – 50 kg

Fire extinguisher locations should be permanent and conspicuously identified by luminous background paint or suitably coloured protective boxes or cabinets. The top or lifting handle of a fire extinguisher should normally not be at a height of more than one metre. Dry chemical extinguishers are recognised as the most appropriate type of extinguisher for the quick knock-down of small (hydrocarbon) fires.

Figure 53:
Weatherproof fire extinguisher cabinet

Foam extinguishers, portable or wheeled, with a capacity in the order of 100 litres of pre-mix foam solution are suitable for use at berths. They are capable of producing approximately 1,000 litres of foam and provide a typical jet length of about 12 metres. They should have a discharge capacity of at

least 115 m^3/h of foam and water in solution. At least two portable foam/water monitors should be provided for each wharf or jetty, together with adequate lengths of foam induction hose and fire hose.

9.2.1.5 Fixed Fire Protection Equipment

Fire pumps: Water for extinguishing fires at ports and terminals is mainly taken from the unlimited supply available from the river. The fire pumps are to be located at a safe and protected location on the wharf or jetty, in order to ensure that the fire pumps do not become immobilised during a fire at the terminal, or do not in themselves present a potential ignition source. Taking into account the reliability of the fire pumps, diesel pumps are preferred to electric pumps.

Hydrants: Hydrants should be spaced at intervals of not more than 45 metres in the berth or loading arm areas, and not more than 90 metres along the approach or access routes. Hose connections should be of a design compatible with those of the local or national fire authorities. Hydrants should be readily accessible from roadways or approach routes, and located or protected in such a way that they will not be prone to physical damage.

Monitors: Monitors may be situated at berth or wharf deck level (normally only suitable at small terminals) or may be mounted on fixed towers. Typically, monitors will provide a jet length of 30 metres and a jet height of 15 metres in still air. The water monitors should be mounted at berth or wharf deck level and be fitted with variable nozzles capable of discharging either a spray or a jet. They should be located so as to be capable of cooling the berth structure, as well as the adjacent hull of a tanker.

9.2.1.6 Protective Clothing

All fire protective clothing gives some protection against radiant heat and burns. Conventional, heavy firefighting jackets are very good in this respect. However, modern practice is to provide fire protective clothing that is manufactured from a lightweight, fire resistant fabric incorporating an aluminium covering, sometimes referred to as a fire proximity suit. This type of suit is not suitable for direct fire exposure. Heavier suits, termed fire entry suits, will allow personnel wearing breathing apparatus with suitable rescue and backup provisions to withstand direct flame exposure for a limited period.

Figure 54:
Fire entry suits[33]

Depending on local firefighting arrangements, a minimum of one or two complete sets of fire proximity and fire entry suits, including helmets, gloves and boots, should be provided. All protective clothing should be kept serviceable and dry.

Figure 55:
Fire Proximity Suit[34]

[33] http://www.asiprotectiveclothing.com/entry-suits

[34] http://mehtasanghvi.tradeindia.com/fire-proximity-suit-375132.html

Table 13: **Fire Protection guidelines for terminals handling crude oil and petroleum products**[35]

Installation	Minimum Provisions
Tanker berth or wharf or jetty handling flammable liquids including materials in drums, and any product heated above its flashpoint.	Fire-Main incorporating isolation valves and fire hydrants with a water supply of 100 m^3/h and/or guaranteed intervention by the local fire brigade. Firefighting equipment consisting of hand-held and wheeled fire extinguishers; fire hose Portable equipment: • 2 x 9 kg portable dry chemical extinguishers. • 2 x 50 kg wheeled dry chemical extinguishers.
Tanker berth or wharf or jetty handling liquids with a flashpoint at or below 60°C including materials in drums, and any product heated above its flashpoint. Tanker berth at a wharf or jetty handling tankers of less than 20,000 tonnes deadweight, and less than one tanker per week.	Fire-Main incorporating isolation valves and fire hydrants with a water supply of 100 m^3/h. Firefighting equipment consisting of: hand-held and wheeled fire extinguishers; fire hose; foam branch pipes; and portable or wheeled foam/water monitors designed for a minimum solution rate of 115 m^3/h. Static trailer borne 3 m^3 bulk supply of foam concentrate. Portable equipment: • 2 x 9 kg portable dry chemical extinguishers. • 2 x 50 kg wheeled dry chemical extinguishers.
Tanker berth at a wharf or jetty handling more than one tanker per week of less than 20,000 tonnes deadweight.	Fire-Main incorporating isolation valves and fire hydrants with a water supply of 350 m^3/h. Portable and wheeled firefighting equipment. Fixed foam/water monitors and appropriate bulk concentrate supplies. Jetty support structure protection (optional). Portable equipment: • 4 x 9 kg portable dry chemical extinguishers. • 2 x 75 kg wheeled dry chemical extinguishers.

9.2.2 Oil Spill Equipment

9.2.2.1 Introduction

River ports and inland waterways are often relatively poorly equipped to respond to small spills which may occur on land or on jetties or piers and pollute their channels and basins. Most spills are caused by the following; bunkering, deliberate or accidental discharge of bilge water, pollution due to shipping accidents, failure of installations or port infrastructures (storage facilities, pipes etc.), road or rail accidents, solid waste due to activities near water bodies and run-off from sewer systems or drainpipes into water basins.

In the event of a spill, the execution of various activities in a port or harbour requires a quick and predetermined response. The port authorities should therefore possess a contingency plan or at least a series of procedures to respond to pollution. These plans or procedures should aim above all to ensure the safety and protection of personnel, the environment and equipment in terms of risks of fire, explosion or pollution and the toxicity of the hydrocarbons or chemicals spilled or present in the vapours.

[35] International Safety Guide for Inland Navigation Tank-Barges and Terminals (ISGINTT), CCNR/OCIMF, June 2010, p.292

9.2.2.2 Contingency planning

The contingency plan or response procedures should outline at least the following:

1. Response organisation:
    - scale of seriousness;
    - emergency procedures and alert system;
    - identification of pollutants and associated risks (toxicity, flammability, persistence…);
    - mobilisation of responders; and
    - mobilisation of means and possibility of increasing the resources available.

2. Response strategies:
    - reflex measures (safety, reduction of spreading, etc.);
    - report and sampling (for technical and/or legal requirements);
    - protection, containment or trawling using booms;
    - recovery using sorbent or by skimming and pumping;
    - clean-up of infrastructures and polluted vessels;
    - management of waste recovered; and
    - main pollution response equipment.

Preventative examination can simplify and facilitate first response actions, thanks to improved prior knowledge of the risks involved:

- Mapping (for the "catchment area" of the port in question) of the sites where hydrocarbons and/or chemicals are handled or transferred (bunkering facilities, industrial sites, etc.).
- Mapping of existing storage sites (for example all storage sites with a storage volume greater than 10 or even 5 m^3), including buried storage facilities for domestic/heating fuel.
- Up-to-date map showing the course of any pipelines (aerial, buried or underwater) in the port area.
- Detailed map of the sewer system and rainwater drainage systems (drainage ditches, streams, etc.) in the port area.
- All other information (maps or documentation) which may be used to list potential sources of pollution or the routes taken by liquid pollution:
    - in the waterways flowing into the port basin; and
    - underground, and amongst other things the contact details of local hydro geologists.

This information and all other similar elements relating to possible sources of pollution can be added to the port's contingency planning database. In this way, in the event of a pollution incident, even if the origin of the spill cannot be immediately identified, the search for the source is greatly facilitated.

Finally, it is important to note that liquid pollution on the surface of a waterway or water body will be likely to strand in natural areas of accumulation where solid waste regularly washes up, and such well-known places should be regularly checked for the presence of liquid pollution. When pollution

is detected, it is often advisable to visit these generally well-known sites to check for the presence of liquid pollution, and begin clean-up where necessary.

9.2.2.3 Pollutants

The pollutants most commonly spilled in ports and harbours belong to the following families of products:

Diesel and similar products: light marine diesel, marine diesel oil (MDO), domestic fuel oil and fuel residue.

Heavy products: heavy fuel oil (HFO) for boilers or bunker fuel, Intermediate Fuel Oil (IFO) with a maximum dynamic viscosity of 180 or 380 centistokes at 50°C; heavy, medium or light crude oil; lubricating oil and vegetable oil.

Petrol and similar products: motor vehicle petrol, premium petrol, super unleaded, super unleaded 95, super unleaded 98, kerosene, JET A1 and jet fuel.

Potentially hazardous chemicals or petrochemical substances: in particular acids (sulphuric, hydrochloric, phosphoric, nitric or acetic acid), bases (ammonia, soda), fertilisers, phytosanitary products (pesticides, insecticides and weed killers) and petrochemical products.

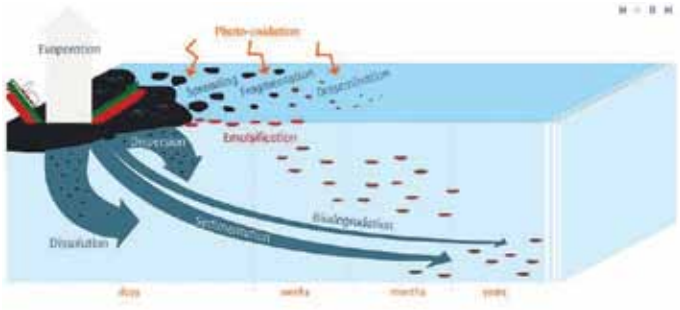


Figure 56:
Evolution/weathering of a pollutant spilled in water[36]

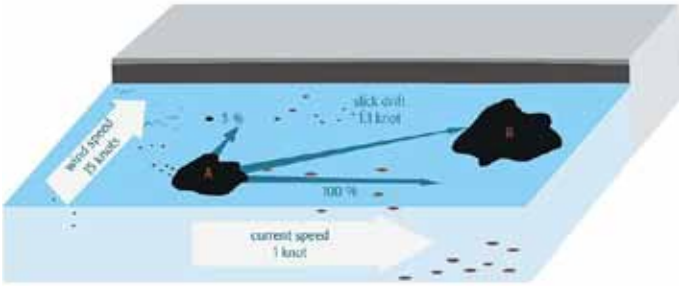


Figure 57:
Drift of a pollutant on a water surface, influenced by wind and current[37]

In the above figure a pollutant on a water surface will drift under influence of the current and wind from A to B. The slick of pollutant will drift at 3 % of the wind speed and 100 % of the speed of the current.

9.2.2.4 Pollution by Diesel and similar products

The behaviour of diesel or a similar product spilled in water depends on the exact nature of the product. Diesel always floats, as it is far lighter than water (its density is most often between 0.82 and 0.87 kg/l at 15.6°C, this variation has to do with the amount of kerosene (jet-fuel) blended into diesel). Its behaviour depends to a great extent on the wind force, the agitation of the water surface and the air and water temperature. In ports and harbours which are mainly calm and relatively sheltered from the wind, natural dispersion is limited, even in quite strong winds. Diesel therefore mainly evolves by spreading and evaporating. This evaporation usually, other than in exceptional meteorological conditions, affects 20 to 30% of the spill in the first 6 to 12 hours, 30 to 40% after 24 hours, 40 to 50% between 2 and 4 days after the spill and less than 60% after 7 days (according to weathering tests carried out in seawater by Cedre with average water temperature: 14°C and average air temperature: 17°C).

If diesel spilled in a waterway or water body is subjected to considerable agitation (due for example to wind or waves), it can emulsify by mixing with water which it retains, giving it an appearance resembling

[36] http://www.black-tides.com/uk/impact/evolution-oil/evolution-oil-spilled-in-water.php

[37] Response to Small Scale Pollution in Ports and Harbours / Operational Guide, Cedre, Xavier Cremer, 2007, p. 15

a mousse. This phenomenon is highly problematic when it comes to response operations, as it makes absorption of the diesel by sorbents very difficult. Whether the sorbents are oleophilic or hydrophobic they will absorb a diesel/ water mixture less easily than pure diesel.

At ambient temperatures the risks of fire and explosion for response personnel are relatively limited, due to the product's low volatility (flashpoint higher than 50°C). However, this risk should not be completely ignored in high temperatures or if the spill is in an unconfined area. It is advisable to wear Personal Protective Equipment (PPE) suited for hydrocarbons to prevent contact with the skin and possibly inhalation of vapours.

The risks for the environment are mainly related to certain toxic compounds dissolving in the water column and droplets of hydrocarbon being dispersed by wave action.

9.2.2.5 Pollution by Heavy Products

Heavy products (crude oils, lubricating oils, vegetable oils, heavy fuel oils, bitumen) are characterised by a high viscosity and density in relation to petrol or diesel. These properties affect their behaviour when spilled in water. All these floating substances spread and can form slicks which can sometimes reach several tens of centimetres in thickness in the case of a large spill. This compact state slows down and reduces natural elimination processes such as dispersion or evaporation.

Experience shows that chemical treatments (such as dispersion) very often prove useless in the case of heavy fuel oils or bitumen. Their viscosity is generally high and thus sorbents and pumping operations are of limited efficiency. If the water surface is agitated, these products will tend to form an emulsion with water and even air, thus creating a mousse which cannot easily be absorbed by sorbents and complicates pumping operations.

Furthermore, these heavy products stick to rocks and concrete structures and can prove resistant to even the most energetic attempts to clean-up. Their density is close to that of seawater, therefore reducing their buoyancy. In ports and harbours, where the presence of matters in suspension is high, it is not uncommon to observe slicks of heavy substances being submersed, facilitated by the adsorption by particles in suspension.

The toxicity of a product is directly linked to its chemical composition and more specifically to its proportion of light aromatic compounds. Thus, amongst heavy products, the most toxic pollutants for the environment are light crude oils. Furthermore, in the event of a spill of these products which can give off hazardous vapours, it is of vital importance to wear masks and personal protective equipment.

Certain crude oils which have a low flash point can present serious risks of fire or even explosion. Fuel oils and heavy bitumen are slightly toxic for the environment, as light compounds are present in small proportions. However, due to their high viscosity, they have a significant impact on flora and fauna by smothering. The risks of these products for humans are mainly linked to toxicity by contact. During clean-up operations, the main means of exposure is contact with the skin and mucous membranes. It is therefore essential to avoid all contact by wearing PPE suitable for hydrocarbons. It is advisable to wear breathing apparatus when cleaning using high pressure or hot water because of the production of spray and vapours.

9.2.2.6 Pollution by Petrol and similar Products

Petrol spilled on the water surface floats, spreads and evaporates quickly. Petrols are light products (density of around 0.75 kg/l, the density depends on a whole range of factors including purity and temperature) with a low viscosity, which evaporate almost entirely in the first six hours after they are spilled. Around 75 to 85% of a petrol slick will evaporate from the first hour after the spill. In ports and harbours which are mainly calm and relatively sheltered from the wind, natural dispersion is limited,

even in quite strong winds. However, as petrols are naturally rich in aromatic compounds, molecules which are recognised for their solubility and toxicity, the hydrocarbon content in the water column will be significant. The less the water in which the product is spilled is renewed, the more significant this phenomenon will be.

It is important that the risks generated by a significant petrol spill are understood by response personnel. They are linked to the production, by the petrol slick, of toxic and above all extremely flammable vapours. The flash point of this type of product is lower than ambient temperature and the risks of fire and explosion are therefore high. If the vapours form a persistent cloud, it may come into contact with a source of ignition or heat (vehicle with engine running, electric appliance or machine switched on, cigarette …) and catch fire, or even explode. Due to these risks, the possibility of containment and recovery should be put aside and evaporation and natural dispersion of the slick should be promoted, for example by mixing the pollutant on the surface using a fire hose with a solid jet. Nevertheless, if the slick is liable to drift towards sources of heat or an urban area, its deflection and containment remain response options which should be taken into consideration. In this case use flameproof materials, containing where possible a fireproof boom and covering the slick with a carpet of foaming agent (low to medium expansion) to reduce the formation of inflammable vapours. The product can then be recovered using a floating suction head, suitable for recovering the pollutant from under the carpet of foam (lightweight flat suction head). The storage tank for the recovered pollutant will also present risks of release of flammable or explosive vapours. It is therefore important to restrict this release of vapours and ensure the absence of sources of heat in the area.

It is advisable to wear PPE suitable for hydrocarbons to prevent contact with the skin and possibly inhalation of vapours. From an environmental point of view, a spillage of such a product generates the presence of toxic molecules in large quantities in the water column. In turbid waters these molecules will become combined with matter in suspension and will then settle. Furthermore, most additives present in petrols, and in particular in unleaded petrol, are also toxic.

9.2.3 Clean-up and Recovery

9.2.3.1 Containment and Protection techniques

Containing pollution means stopping a slick from spreading further and concentrating the pollutant in a specific area to facilitate recovery by pumping or using sorbents. It may also be necessary to protect the most sensitive or strategic parts of ports and harbours from the arrival of a pollutant (inner basin, water intakes, slipways). In this case, protection and deflection aim to stop the pollution upstream of the site, by channelling the pollutant towards an area where it will be easier to recover. For safety reasons, highly flammable volatile pollutants, such as petrol or certain chemicals, should not be contained. On a water surface, the evaporation and dispersion of such products should be promoted.

Figure 58:
Fence boom (grey), curtain boom with foam filled floats (orange), self-inflating curtain boom (yellow), sorbent boom (white)[38]

[38] Response to Small Scale Pollution in Ports and Harbours / Operational Guide, Cedre, Xavier Cremer, 2007, p. 23

Accumulations in naturally formed containment areas can be dispersed using a fire hose. Containment techniques should thus be set aside for less volatile products such as diesel, heavy fuel oil and other similar products.

Containment of a small volume of liquid pollutant on the surface of a harbour basin can be carried out using floating or sorbent booms. These two types of booms are often used simultaneously, with sorbent booms being deployed to ensure that the areas sealed off by floating booms are more watertight. If a slick has already spread over the water surface, booms can be deployed to trawl the slick before drawing it against a solid quay or in the corner of a basin.

In ports and harbours, fence booms should be favoured over curtain booms as they are lighter and quicker to deploy. Although fence booms have poorer roll response (resistance to wind, waves and current), this is not a handicap on calm water bodies. Fence booms are also easier to store on reels etc., to clean and to transport.

Figure 59:
Containing a slick using a fence boom with absorption by bulk sorbents[39]

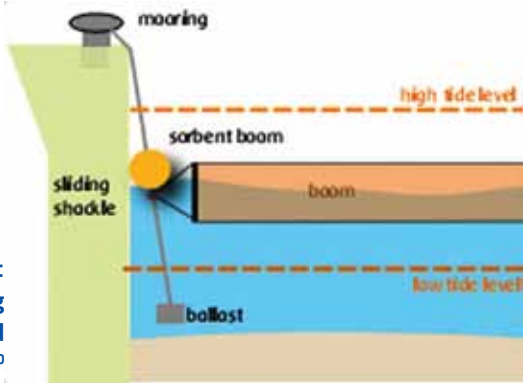


Figure 60:
Boom mooring arrangements and tidal compensators[40]

9.2.3.2 Recovery by absorption

Recovery on the water surface of volatile substances by absorption, like petrol, should be avoided for safety reasons. Recovery of small volumes of diesel and heavy fuel or similar products on the water surface should mainly be carried out using sorbent in the form of mats, sheets, rolls or booms with or without a short ballasted skirt. The rapid implementation of this technique is advantageous for a few litres to a few hundred litres of pollutant. A minimum of 2 volumes of sorbent for 1 volume of pollutant spilled will be required.

Figure 61:
Sorbents in sheets (blue squares), rolls (white strips) and booms (white boom)[41]

[39] Response to Small Scale Pollution in Ports and Harbours / Operational Guide, Cedre, Xavier Cremer, 2007, p. 23

[40] Response to Small Scale Pollution in Ports and Harbours / Operational Guide, Cedre, Xavier Cremer, 2007, p. 31

[41] Response to Small Scale Pollution in Ports and Harbours / Operational Guide, Cedre, Xavier Cremer, 2007, p. 25

9.2.3.3 Recovery by pumping

Pumping by sanitation trucks

When the volume of pollutant needing to be recovered exceeds 1 to 2 m^3, the use of a vacuum truck equipped with a suction nozzle or surface skimming head is advantageous. Sorbent can be used to finish off the work. Sanitation trucks are widely available and can simultaneously ensure pumping and storage, and where necessary settling and transportation, following regulations for road transportation of hazardous materials.

Pumping using a pump and skimmer

This technique requires a skimmer, pump and storage unit and is only used in ports and harbours in the exceptional situation whereby no sanitation truck is available. In the case of pumping a liquid pollutant by a sanitation truck, the pollutant is stored in the truck which can then transport its contents to the appropriate treatment facility. In other cases, it is necessary to store the pollutant in a storage tank or at an intermediate storage site. The container must be watertight.

Figure 62:
Recovery using pump and skimmer[42]

9.2.3.4 Recommended Oil Spill Equipment

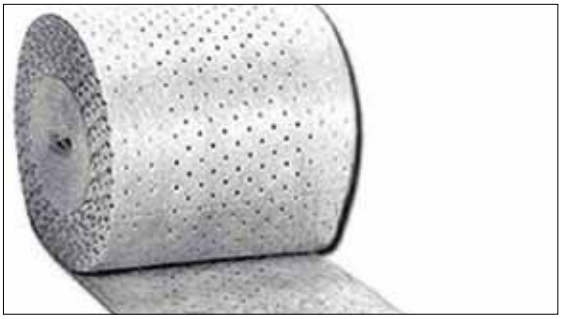
To respond to accidental pollution in a port or harbour, responders must have a stockpile of equipment at their disposal. The table below presents typical stockpiles according to the type and volume of pollutant spilled. These recommended stockpiles do not take into account the layout of the harbour which can vary greatly from one site to another, or the complexity of an incident which can in certain cases require further response measures. It is the responsibility of each port or terminal to estimate the risk and choose the equipment that is deemed necessary to respond to these risks.

Table 14: **Typical Oil Spill Equipment**

Typical Oil Spill Equipment	
	
Floating Fence Boom	Sorbent Boom

[42] Response to Small Scale Pollution in Ports and Harbours / Operational Guide, Cedre, Xavier Cremer, 2007, p. 26

Absorbent Sheets



Roll of Sorbent

Bulk Sorbent

Work Boat

Table 15: **Recommended Oil Spill Equipment**[43]

Spill Volume (Litres)	Recommended Equipment
Pollutant: Diesel	
1,000	• Floating fence boom: 100 m in sections of 10 to 15 m x 0.60 m. • Sorbent Boom: 20 sections of 3 m. • Mooring and anchoring arrangements. • Sheet Sorbent: 2 to 4 m^3 (2 to 4 times the volume spilled). • Rolls of sorbent to trawl a slick over a large surface: 2 rolls of 25 to 30 m, fitted on one side with a propylene rope. • Two motor craft to work on the water surface, to deploy booms and possibly to trawl diesel slicks. • Watertight skips, tanks, barrels or bins and landing nets or boat hooks to recover and store used sorbent. ***Note:*** *Possibility of using a vacuum truck + skimmer*
10,000	• Floating fence boom: 100 m more (i.e. 200 m in all). • Sorbent Boom: 40 more 3 m sections. • Vacuum truck equipped with a self-adjusting mechanical surface weir skimmer with suction hoses fitted with floaters.

[43] Response to Small Scale Pollution in Ports and Harbours / Operational Guide, Cedre, Xavier Cremer, 2007, p. 48

Pollutant: Heavy Oils	
If the pollutant is crude oil with a low flash point, there may be a risk of fire or explosion	
1,000	• Fire service must be called upon. • Floating fence boom: 100 m in sections of 10 to 15 m x 0.60 m. • Sorbent Boom: 10 sections of 3 m. • Mooring and anchoring arrangements.
	• Vacuum truck fitted with a skimmer head with a large opening. • Bulk sorbent: 1 to 2 m^3. • One motor craft to work on the water surface to deploy booms and possibly to recover heavy fuel oil using bulk sorbent and landing nets. • Watertight skips, tanks, barrels or bins and landing nets or boat hooks to recover and store used sorbents.
Pollutant: Petrol	
If risk of toxicity, tire, explosion, corrosion or reactivity the fire service must be called upon	
500	• Floating fence boom: 50 m in sections of 10 to 15 m x 0.60 m. • Sorbent Boom: 10 sections of 3 m. • Mooring and anchoring arrangements. • Sheet Sorbent: 1 to 2 m^3 (2 to 4 times the volume spilled). • Watertight skips, tanks, barrels or bins and landing nets or boat hooks to recover and store used sorbents. • Possibly vacuum truck. • Fire hose(s): movement of the pollutant slick on the surface and destruction of vapours in the atmosphere.
Pollutant: Chemicals	
Risk of toxicity, fire, explosion, corrosion or reactivity the fire service must be called upon	
100	• Floating fence boom: 50 m in sections of 10 to 15 m x 0.60 m. • Sorbent Boom for chemicals: 10 sections of 3 m. • Mooring and anchoring arrangements. • Specific Sheet Sorbent for chemicals: 1 m^3. • Watertight skips, tanks, barrels or bins and landing nets or boat hooks to recover and store used sorbents. • Fire hose(s): movement of the pollutant slick on the surface and destruction of vapours in the atmosphere.


NO PHONE AND PAGER
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10 TRAINING OF PERSONNEL

10.1 Nature of Training

According to the IMDG code Amendment 35, from the first day of 2012, dangerous goods training has become mandatory for all shore-side personnel dealing with dangerous goods that are transported by sea, in this case international transport by inland waterways.

10.1.1 General Awareness Training

Training designed to provide familiarity with the general hazards and provisions of relevant dangerous cargoes and the legal requirements. Such training should include a description of the types and classes of dangerous goods, marking, labelling and placarding, packing, segregation and compatibility requirements, as well as a description of the purpose and content of the transport documents and a description of available emergency documents.

10.1.2 Function-specific Training

Detailed training concerning specific requirements for the storage and handling of dangerous goods which are applicable to the function of the trainee.

The following training topics should be considered as a minimum, where relevant to the job:

- types and quantities of dangerous goods and combustible liquids at the site, work location, and the correct manner in which they are stored and used;
- safe work methods to be used on the job, including matters described in this code of practice;
- safe use (such as fire protection measures and eliminating ignition sources) of any tools, plant and associated equipment, and dangerous goods or hazardous substances to be used on the job;
- administrative procedures for controlling risks, such as ensuring that permits to work systems are followed;
- correct use, care and storage of Personnel Protective Equipment (PPE);
- dust, gas and fire risks that may be present and the controls adopted, including procedures to follow if equipment such as dust extraction fails;
- hazardous areas and restrictions on ignition sources, especially for vehicles and portable items;
- recognition of plant failures or other system failures that could lead to an escape of dangerous goods;
- emergency and evacuation procedures (including recognising the fire alarm, firefighting measures, the location of firefighting equipment and other emergency equipment), confined spaces entry procedures and rescue of entrapped persons;
- how to observe any administrative controls, such as restrictions on entry into areas, and warning signs including signs attached to containers, controls or valves;
- dangerous goods classification of substances used, stored or handled, and any other relevant

safety or health risks (e.g. dusts, emissions) arising from work, handling or storage;

- security measures, signs and procedures;
- dangers of storing containers of dangerous goods in confined spaces, and the confined spaces entry procedures (if entry is planned, or could be required for emergency rescue); and
- how to access health and safety information, such as the register or manifest, reading labels, signs, placards and MSDSs.

The desired outcomes of training include the ability of workers to demonstrate, where relevant to the particular job, an understanding of:

- the dangerous goods classification system;
- safe work practices relating to the storage and handling of dangerous goods at the site;
- how to interpret information provided on labels, signs and placards;
- how to locate an MSDS and use this information, and where to obtain any other relevant information;
- the nature of the hazards and risks associated with the duties being performed;
- measures used to control the risks and how to apply these;
- proper use, cleaning and replacement of PPE;
- emergency procedures; and
- first aid and incident reporting procedures to be followed in the case of illness, injury, incident or serious incident.

10.1.3 Safety Training

Training focusing on dealing with risks in the event of a release of dangerous cargoes, including:

- Methods and procedures for accident avoidance, such as proper use of package handling equipment and appropriate methods of stowage and segregation of dangerous goods.
- Necessary emergency response information and how to use it.
- General dangers of the various types and classes of dangerous cargoes and how to prevent exposure to their hazards including the use of Personal Protective Equipment (PPE).
- Immediate procedures to be followed in the event of an unintentional release of dangerous cargoes, including any emergency procedure for which the person is responsible and the personal protection procedures to be followed.

10.2 Function Specific Training Requirements

Chapter 1.3 of the IMDG code contains detailed recommendations concerning function specific training needs for shore-side personnel involved in the transport of dangerous goods under the IMDG code. The indicative table below describes per function the specific training requirements.

Table 16: **Function Specific training requirements**

Function		Specific training requirements
1	Classify DG	**Classification requirements, in particular** • The structure of the description of substances. • The classes of DG and the principles of their classification. • The nature of the dangerous substances and articles transported (physical, chemical and toxicological properties). • Identification by PSN. • Use of dangerous goods list.
2	Pack DG	**Classes** Packing requirements: • Type of packages. • UN marking for approved packaging. • Segregation requirements. • Limited and excepted quantities. • Marking and labelling. • First aid measures. • Emergency response procedures. • Safe handling procedures.
3	Mark, Label or placard DG	**Classes** Marking, labelling and placarding requirements: • Primary and subsidiary risk labels. • Marine pollutants. • Limited quantities and excepted quantities.
4	Load/unload CTUs	**Documentation** • Classes. • Marking, labelling and placarding. • Stowage requirements. • Segregation requirements. • Cargo securing requirements. • Emergency response procedures. • CSC requirements. • Safe handling procedures.

5	Prepare transport documents for DG	**Documentation requirements** • Transport document. • Container/vehicle packing certificate. • Competent authorities' approval. • Waste transport documentation. • Special documentation.
6	Offer DG for transport	**Thorough knowledge of the IMDG code** Local requirements at loading and discharging ports: • Port bylaws. • National transport regulations.
7	Accept DG for transport	**Thorough knowledge of the IMDG code** Local requirements at loading, transiting and discharging ports: • Port bylaws. • National transport regulations.
8	Handle DG in transport	**Classes and their hazards** • Marking, labelling and placarding. • Emergency response procedures. • First aid measures. Safe handling procedures such as: - Use of equipment; - Appropriate tools; and - Safe working loads. • CSC requirements, local requirements at loading, transit and discharge ports. • Port bylaws, in particular, quantity limitations. • National transport regulations.
9	Prepare dangerous goods loading/ stowage plans	**Documentation** • Classes. • Stowage requirements. • Segregation requirements. • Document of compliance. • Relevant IMDG code parts, local requirements at loading, transit and discharge ports.. • Port bylaws, in particular, quantity limitations.

10	Load/unload DG into /from ships	**Classes and their hazards** • Marking, labelling and placarding. • Emergency response procedures. • First aid measures. Safe handling procedures such as: - Use of equipment; - Appropriate tools; and - Safe working loads. • Cargo securing requirements. • CSC requirements, local requirements at loading, transit and discharge ports. • Port bylaws, in particular, quantity limitations. • National transport regulations.
11	Carry DG	**Documentation** • Classes. • Marking, labelling and placarding. • Stowage requirements. • Segregation requirements. Local requirements at loading, transit and discharging ports: - Port bylaws, in particular, quantity limitations; and - National transport regulations. • Cargo securing requirements. • Emergency response procedures. • First aid measures. • CSC requirements. • Safe handling procedures.
12	Enforce/survey or inspect for compliance	Knowledge of IMDG Code and relevant guidelines and safety procedures
13	Are those involved in the transport of DG determined by the competent authority?	As required by the competent authority commensurate with the task assigned

The following related Codes and publications may be appropriate for function specific training:

1. International Maritime Dangerous Goods (IMDG) Code, as amended.
2. The EmS Guide: Emergency Response Procedures for Ships Carrying Dangerous Goods (EmS), as amended.
3. Medical First Aid Guide for Use in Accidents involving Dangerous Goods (MFAG), as amended.

4. United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations, as amended.
5. United Nations Recommendations on the Transport of Dangerous Goods – Manual of Tests and Criteria, as amended.
6. IMO/ILO/UNECE Guidelines for Packing of Cargo Transport Units (CTUs).
7. Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas.
8. International Convention for Safe Containers (CSC), 1972 as amended.
9. Code of Safe Practice for Cargo Stowage and Securing (CSS code), as amended.
10. MSC.1/Circ.1361 Recommendations on the safe use of pesticides in ships applicable to the fumigation of cargo transport units.
11. International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended.
12. International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended.
13. International Convention for the Prevention of Pollution from Ships 1973 as modified by the Protocol of 1978 (MARPOL 73/78), as amended.

Table 17: **Related Codes and Publications for Function Specific Training**

Function		Number of related Code and publication as listed above												
		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Classify DG	x			x	x							x	
2	Pack DG	x			x									
3	Mark, Label or placard DG	x												
4	Load/unload CTUs	x					x	x	x					
5	Prepare transport documents for DG	x												
6	Offer DG for transport	x	x	x	x	x	x	x	x	x	x			x
7	Accept DG for transport	x	x	x	x	x	x	x	x	x	x	x	x	x
8	Handle DG in transport	x	x	x			x	x	x		x			
9	Prepare dangerous goods loading/stowage plans	x									x	x	x	
10	Load/unload DG into/from ships	x	x	x				x		x	x		x	
11	Carry DG	x	x	x			x	x			x	x	x	
12	Enforce/survey or inspect for compliance	x	x	x	x	x	x	x	x	x	x	x	x	x
13	Are involved in the transport of DG determined by the competent authority	As appropriate												

The table below describes the sections of the IMDG code and other relevant instruments that may be appropriate to be considered in any training for the transport of dangerous goods.

Table 18: **IMDG Code sections and other instruments for training for the transport of dangerous goods**

	Function	IMDG Code part/section																SOLAS chapter II-2/19	Port Bylaws	National transport regulations	CSC	Guidelines for Packing of Cargo Transport Unites	Emergency Response Procedures	First aid measures	Safe handing procedures
		1	2	2.0	3	4	5	6	6*	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9								
1	Classify	x	x		x		x										x	x								
2	Pack in packages	x		x	x	x	x	x			x					x	x	x						x	x	x
3	Mark, label, placard			x	x		x																			
4	Load/unload cargo transport units	x		x	x	x	x		x	x	x		x	x	x	x						x	x	x	x	x
5	Prepare transport documents	x		x	x	x	x																	x	x	
6	Offer for transport	x	x		x		x	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	
7	Accept for transport	x	x		x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
8	Handle in transport	x		x	x	x	x		x																	
9	Prepare loading/ stowage plans	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x				x		
10	Load/unload from ships	x	x		x		x											x		x		x	x	x	x	x
11	Carry	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

**Only sections 6.1.2, 6.1.3, 6.5.2, 6.6.3, 6.7.2.20, 6.7.3.19 and 6.7.4.15 apply*

10.3 Training Records

Records of training received according to the IMDG code shall be kept by the employer and made available to the employee or competent authority, upon request. Records shall be kept by the employer for a period of time established by the competent authority.

10.4 IMDG E-Learning Course

IMDG Code e-learning is a Computer Based Training (CBT) package in the application of the provisions of the IMDG Code primarily for shore-side personnel, including shipping line staff processing dangerous goods shipments.

To meet the challenge of efficiently and economically training very large numbers of shore side staff to the requirements of IMDG Code Chapter 1.3, Exis Technologies, with the support of industry bodies, developed IMDG Code e-learning. The system has been implemented by major shipping lines, shippers and transport operations worldwide.

The course was developed by a dedicated team with teaching, dangerous goods, chemical, project management and programming skills and with the support of industry bodies and the IMO. Content and examination questions are continually reviewed by an expert panel.

The course has been assessed and certified against DNV (Det Norske Veritas) Standard for Certification of Learning Programs. This certifies that the course has met the DNV requirements in terms of the quality of development, content and delivery of learning programs, is properly designed, contains clear objectives for results, is designed by qualified trainers and is assessed and improved in line with market demands and experience.

11 PROCEDURES FOR NEW DANGEROUS GOODS

11.1 Risk Management Process

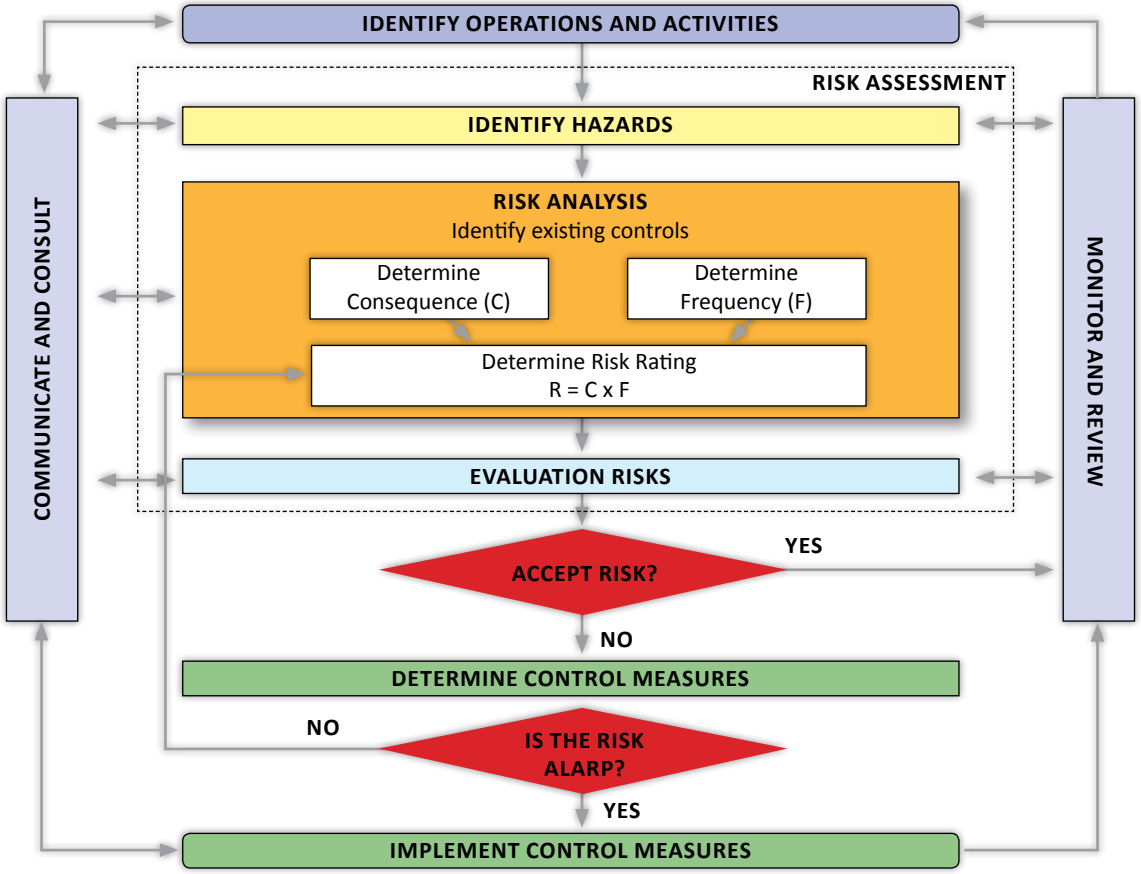

Figure 63: **Risk Management Process**

Risk Management (RM) incorporates all the processes by which port or terminal operators, managers, and owners make safety decisions and regulatory changes, and choose system configurations based on the data generated in the Risk Assessment (RA). RM involves using information from the RA stage to make decisions about control measures to be implemented. The main aim is to maintain or increase the safety of the system and to control the risks involved in operating the port or terminal.

The main purpose of RM and RA is to minimise risk to personnel, property and the environment. In this respect, all activities that could adversely affect a port or terminal's operations and performance need to be evaluated and appropriate measures taken to ensure that risks are either reduced or maintained at an acceptable level.

A RA is a careful examination of what, in the range of operations, could cause harm to people, property or the environment. Following the RA, decisions can be made as to whether enough precautions have been taken, or whether more are necessary to prevent harm to personnel, the environment or property.

11.1.1 Basic Terminology

Hazard: the potential of a substance, activity or process to cause harm to personnel, property or the environment.

Accident/incident: an unintended event involving harm to personnel, property or the environment.

Consequence: the outcome of an incident/accident (quantified by some measure of severity).

Likelihood or frequency: What are the chances of an incident/accident happening, a measure of the number of occurrences per unit of time (e.g. once per year, once per operation).

Risk: The chance of a substance or activity causing harm. The combination of the likelihood and the severity of the consequence (Risk = Likelihood x Consequence).

11.1.2 Risk Management

Risk is managed by identifying hazards and existing control measures, assessing consequence and likelihood and evaluating and implementing prevention and mitigation measures. Risk management basically consists of 6 steps:

Table 19: **IMDG Code sections and other instruments for training for the transport of dangerous goods**

Steps of Risk Management Process	
STEP 1	Identification of operations, systems or tasks
STEP 2	Identification of hazards
STEP 3	Identification of existing control measures
STEP 4	Risk evaluation
STEP 5	Determination of additional control measures
STEP 6	Review of the risk assessment

11.1.3 Step 1: Identification of operations, systems or tasks

A risk assessment should be carried out for routine and non-routine operations and whenever any temporary or permanent changes to procedures, equipment or goods handled for any reason are to be applied. Such changes could be but are not limited to:

- Introduction of new equipment or instruments;
- Introduction of new operations or tasks;
- Introductions of new dangerous goods to be handled/stored;
- Changes to work procedures or equipment;
- Temporary repairs; and
- Changes in routine jobs.

11.1.4 Step 2: Identification of hazards

All hazards and their associated risks to people, property and the environment arising from the physical, chemical and toxicological properties of the dangerous goods need to be identified and subsequently assessed by conducting an estimation of their likelihood and consequence.

The identification of hazards is the most important step because all that follows depends on correct identification. Hazard identification must be complete and accurate, and should be based, as far as possible, on observation of all activities/operations.

A hazard is simply a situation or condition which has the capability of causing damage, harm or other loss. Hazards are the cause of an incident/accident. Following are some examples of hazards:

Mechanical (related to working equipment): misuse/defective equipment, power tools and lifting equipment.

Electrical (electrocution, fire): high voltage, exposed/worn cables and equipment that has not been grounded.

Physical (related to work environment conditions): weather, cargo stowage lashing, working aloft, slippery surfaces and poor lighting.

Radiation (energy emission): heat radiation and extreme light.

Substances: flammable dangerous goods, combustible materials and hot work.

Psychological: fatigue.

11.1.5 Step 3: Identification of existing control measures

Before the harmful effects of a hazard can be determined, existing controls/measures that may mitigate the effects of that hazard have to be taken into account. For any operation, these control measures can be for example:

- procedures;
- control systems;
- human resources;
- training;
- control systems;
- maintenance;
- communication; and
- use of proper equipment.

11.1.6 Step 4: Risk evaluation

Risk is normally evaluated as a function of the severity of the possible consequence (C) for a hazard and the likelihood/frequency (F) of occurrence of that particular hazard:

Table 20: **Risk Evaluation**

FREQUENCY (F)		
Very Unlikely 1	Practically impossible. Once every 30 years or more.	
Unlikely 2	Not likely to occur. Once every 10 years. The scenario is considered unlikely. It could happen, but would be surprising.	
Likely 3	Possibility of isolated incidents. Once every 5 years. The scenario has occurred in the past and/or is expected to occur in the future.	
Very Likely 4	Possibility of repeated incidents. More often than every six months	
CONSEQUENCE (C)		
Catastrophic 4	Multiple fatalities. Total loss – Extensive costs. Major pollution with difficult control of the situation and/or difficult cleaning affected.	
Severe 3	Single fatality or multiple severe injuries. Sever damage/high costs. Significant pollution demanding urgent measures for the control of the situation/or cleaning of affected areas	
Significant 2	Multiple severe injuries. Non-severe damage/Little cost. Little pollution, few tonnes/Limited response of short duration	
Minor 1	Single or minor injuries. Local equipment, minor structural damage, minimal cost. Non-significant spill, minor pollution, little response needed.	
RISK (R) = CONSEQUENCE (C) x FREQUENCY (F)		
HIGH *10 ≤ R ≤ 16*	NOT TOLERABLE	Operations should not continue until the risk level has been reduced. Additional measures should be cost-effective but reduce the risk. If the control measures will not reduce the risk, then the operations must not be started.
MEDIUM-HIGH *8 ≤ R ≤ 9*		Risk level should be reduced. Additional measures should be cost-effective but reduce the risk. If the control measures will not reduce the risk, then the operations should not be repeated in the future.
MEDIUM *4 ≤ R ≤ 6*	TOLERABLE	Efforts should be made to reduce the risks, but the costs of prevention should be carefully measured and limited. Risk reduction measures should normally be implemented within a defined period of time.
LOW *1 ≤ R ≤ 3*	ACCEPTABLE	No further additional controls/preventative actions are necessary, but considerations should be given to cost effective solutions or improvements.

The level of risk is evaluated based on the severity and frequency as estimated by the RA process and categorised into possible combinations such as High, Medium-High, Medium or Low. Knowing this, an estimated risk of hazards can be used to make reliable decisions to improve safety. Risks can be lowered by reducing the severity of the consequences, reducing the frequency/likelihood of an accident/incident or a combination of both.

11.1.7 Step 5: Determination of additional control measures

Here the decision needs to be taken on what new/additional control measures, systems, or procedures are required to minimise the risk to an acceptable level. To decide whether risk has been minimised as far as reasonably practicable, the likelihood of harm to personnel, property or the environment and the severity of the harm must be considered. In circumstances where it is not practicable to calculate or estimate the level of risk, the assessment of risk must take account of good industry practice and comply with recognised standards.

The following are examples of possible control measures:

Elimination: modify a design to eliminate the hazard, e.g. introduce mechanical lifting devices to eliminate the manual handling hazard.

Substitution: substitute a less hazardous material or reduce the system energy, e.g. lower the force, pressure or temperature.

Engineering controls: install ventilation systems, machine guarding, and interlocks.

Signage, warnings, and/or administrative controls: safety signs, hazardous areas marking, photo luminescent signs, warning sirens/lights and alarms.

Procedures, equipment inspection, access controls: safety systems of working and the use of work permits.

Personal Protective Equipment: safety glasses, face shields, safety harnesses, respirators and gloves.

In applying risk control measures consideration should be given to the relative costs, risk reduction benefits, and reliability of the available options. Following the selection of the appropriate new control measures, the risk ranking process should be repeated in order to evaluate if the risk is reduced to a lower level, e.g. from intolerable to tolerable when implementing the selected new control measures. The process should be repeated in order to reach the lowest possible level.

11.1.8 Step 6: Review of the risk assessment

In this step, implementation of the new control measures is followed up and recorded and evaluation of the controls are made to ensure they remain in place and have their desired effect.

A RA may no longer adequately assesses the risks associated with the storage and handling of dangerous goods. In this case, the RA must be reviewed and, if necessary, revised. The assessment needs to be revised if:

- A new dangerous good is introduced in the port/terminal;
- New information on the dangerous goods hazard becomes available;
- Monitoring indicates inadequate risk controls;
- Accidents/incidents or near misses have occurred; and
- New or improved control measures become available or practicable.

11.2 Dangerous Goods Risk Assessment

During several audits at sites where dangerous goods are stored and handled in Australia the following significant issues consistently arose[44]:

- A lack of formal procedures in relation to the storage and handling of dangerous goods;
- Out-dated or non-existent MSDS/SDS;
- Incomplete or non-existent DG registers;
- Lack of documented risk assessments;

[44] Dangerous Goods, How are You managing Your Risk?, Risk Review, December 2010, Noel Arnold & associates (Risk Management consultants)

- Inadequate training for those required to handle dangerous goods;
- Lack of knowledge of placarding;
- Inappropriate containers used for the storage of dangerous goods;
- Inadequately labelled containers for dangerous goods;
- A lack of safety showers and eye wash facilities;
- Inappropriate storage facilities, or inadequately ventilated structures for the storage of class 3 flammable liquids;
- Lack of appropriate spill containment;
- Lack of provisions for the clean-up of spills; and
- Lack of appropriate firefighting equipment.

During the completion of the Terminal Audit Checklist (TAC) at several Thai Ports and Terminals where dangerous goods are stored and handled or planning to be stored or handled, it was noted that similar significant issues consistently arose. Proper risk management/assessment would however deal with most of these issues, and eventually by implementing the correct control measures they would not consistently arise.

This section will provide additional information to guide people carrying out a hazard identification and RA for new dangerous goods handled or stored at ports or terminals. This additional information will identify the type of issues that need to be addressed in a thorough RA for dangerous goods.

11.2.1 Product identification and information

The new dangerous good(s) needs to clearly identified. MSDS/SDS and markings on packages should be carefully reviewed. This will be important for the hazard identification. Describe the physical state of the product using the following guide:

- Compressed gas (such as compressed nitrogen);
- Gas dissolved under pressure (such as acetylene);
- Liquefied Gas (such as LP Gas);
- Cryogenic liquid (such as liquid nitrogen);
- Volatile liquid (evaporates quickly);
- Mobile liquid (viscosity like water);
- Viscous liquid (viscosity like oil or paint);
- Liquids with solids in solution/suspension;
- Finely divided solids (a powder);
- Granular/flaked solid; and
- Caked or undivided solid.

Also note the classification information of the dangerous goods, the package markings and the package labels.

11.2.2 Storage and handling systems

To identify hazards effectively, you must look at how the dangerous goods are stored and handled. A storage or handling system means any system used in connection with the storage or handling of the dangerous goods. It includes but is not limited to the following:

- Containers (including a tank or package);
- Spill containment systems;
- Pipework, hoses and associated valves and hoses; and
- Firefighting or fire protection system.

It is important to consider the hazards associated with the storage and handling system. The type and capacity of these systems can contribute to the resultant risk from leaks, spills, fire or other scenarios.

11.2.3 Hazards arising from properties of the DG

In order to determine these properties the MSDS/SDS needs to be reviewed. The MSDS/SDS must be the most recent version. If not the supplier, manufacturer or importer should be contacted to obtain the most recent MSDS/SDS. Consideration should be given to the inherent hazards of the dangerous goods, for example:

- Fire;
- Explosion; and
- Toxic effects from inhalation, ingestion, absorption through the skin or eyes and corrosive effect.

Examine the chemical and physical properties such as specific gravity, vapour density, melting point, boiling point, flash point, fire point, auto-ignition temperature, flammable range (LEL, UEL), solubility in water, electrical conductivity and pH.

The following checklist can assist in determining hazards arising from the chemical and physical properties of dangerous goods:

Table 21: **Checklist for hazards arising from properties of DG**

Chemical and Physical Properties		
	Yes	No
Physico-chemical hazards (consider the class and sub-risk)		
Explosive or flammable?		
An oxidising agent?		
Toxic?		
Corrosive (to skin, metal or other)?		
Health effects		
Occupational exposure limit		
Odour threshold value		
Toxicity		
LD_{50} dermal/oral		
LC_{50} inhalation		
Irritant/Sensitiser		
Carcinogen/Mutagen		

Note: *The odour threshold value is the lowest concentration of a certain odour compound that is perceivable by the human sense of smell.*

The LD_{50} is a standardised measure for expressing and comparing the toxicity of chemicals. The LD_{50} is the dose that kills half (50%) of the animals tested (LD = "lethal dose").

The LC_{50} value is tested in inhalation experiments, the concentration of the chemical in air that kills 50% of the test animals in a given time (LC = "lethal concentration").

11.2.4 Hazards relating to storage and handling practices

Once you have identified the dangerous goods and reviewed the available information you need to consider if the way the goods are stored or handled creates hazards. The following issues should be considered (MSDS/SDS may assist in completing the checklist):

Table 22: **Checklist for hazards arising from storage and handling practices**

Safe Handling Information		
	Yes	No
Reactivity/Stability hazards		
Are there decomposition conditions?		
Shock, friction, heat or sunlight sensitivity?		
Self-reactive?		
Storage temperature required? (if yes state temperature)		
Incompatible with other goods? (if yes state goods)		
Are there segregation requirements?		
Sensitive for exposure to air, moisture or other?		
Inhibitor required?		
Environmental Hazards		
Marine pollutant?		
Ground water pollutant?		
Atmospheric pollutant?		
Soil Pollutant?		
Flammable / expressivity hazards		
Produces hazardous combustion products?		
Explosion potential?		
Ignition source a hazard?		
Static electricity a hazard?		
Fire / explosion hazard?		
Special firefighting measures required?		

11.2.5 Hazards arising from the work environment

There are several hazards that can arise from the work environment. Here it is important to observe and consult personnel to find out how the job is actually done. Some personnel may not always "work by the book", and may devise their own methods of work. The following checklist can help to determine hazards arising from the work environment:

Table 23: **Checklist for hazards arising from the work environment**

Possible Hazards arising from the work environment		
	Yes	No
Are there structures, systems or procedures of work activities that are not used in the dangerous goods storage/handling area that could interact with the dangerous goods?		
Are there any fire hazards, including concentrations of combustible material or uncontrolled vegetation near the dangerous goods area?		
Is there any risk from unauthorised persons accessing the dangerous goods storage/handling area?		
Are there any hazards from movement of vehicles or machinery?		
Can hot work, maintenance work or construction work effect the DG area?		
Are packages stored and never opened?		
Are entrances/exists from dangerous goods areas free from obstruction?		
Are the dangerous goods areas clearly marked?		
Are dangerous goods properly handled by personnel?		
Is the dangerous goods area properly supervised?		
Are there any activities or installations on neighbouring premises that could create a hazard?		

Also, consideration should be given to the known history of incidents involving the new dangerous goods at other facilities. Is there information available about how these incidents where caused, how effective are the risk controls and how can they be avoided.

11.2.6 Risk Evaluation

The next step in the risk management process is to assess the risks associated with the hazards identified above. The main questions in this stage are:

- What are the consequences of an incident accident?
- What is the likelihood that the hazard will result in an incident/accident?

Once these questions have been answered, the risk level can be determined. The evaluation will help in determining the need for control measures to be implemented and assist in making decisions about how certain risks need to be controlled.

11.2.7 Determination of control measures

The following list contains control measures that may need to be considered:

- Provision of training and information;
- Marking of packages;
- Safety Management systems;
- Placarding;
- Warning signs;
- Restrictions of unauthorised access;
- Eliminating ignition sources in areas where flammable atmosphere may exist;
- Spill clean-up procedures and equipment;

- Spill containment measures (e.g. bunding);
- Management of dangerous goods transfer risks from overfilling, static electricity and release of vapour;
- Management and control of temperatures, humidity and other stability factors;
- Detection systems for leaks;
- Mechanical ventilation;
- Impact protection;
- Separation of protected works;
- Segregation of incompatible materials;
- Emergency plans as required;
- Ongoing inspection and maintenance;
- Provisions of firefighting equipment;
- Provisions of Personal Protective Equipment; and
- Provisions of safety equipment.

When selecting control measures to be implemented, the aim should be to achieve an acceptable level of risk, i.e. to minimise the risk as far as reasonably practicable. Once the control measures to be implemented have been selected a target date for the implementation should be determined. Once the measures are implemented and the assessors are satisfied that the risk is now at an acceptable level, the document may be signed off and retained at the premises.

Note: *Annex 3 contains a list of generic controls for the storage and handling of dangerous goods.*

11.3 Risk Assessment Template

A RA template has been developed for the member countries. The template workbook (RA Template. xlsx) consists of several worksheets that will be discussed in this section.

11.3.1 Template worksheets

Figure 53: **RA template worksheets**

The template consists of several worksheets:

Explanation: this worksheet contains the necessary information on consequence, frequency, the risk matrix and risk levels as discussed in *chapter 11.1 Risk Management Process.*

Example: This worksheet contains a fully worked out example of a risk assessment (see 11.3.2 Example of a RA).

RA Template Blank, RA, RA(2), …: these worksheets are blank templates to perform a risk assessment.

11.3.2 Example of a RA

Risk Assessment			
Reference Number	001	Date	14/05/2012
Site Location	Chiang Saen Port	Assessed by	MRC
Activity	Transfer of flammable dangerous goods from truck to vessel		
Hazards	Truck is not earthed		

Figure 64: **RA Example – RA Step 1**

Step 1 of the RA: Identification of operations systems or tasks: *Transfer of flammable dangerous goods from truck to vessel*.

Risk Assessment										
Reference Number	001			Date			14/05/2012			
Site Location	Chiang Saen Port			Assessed by			MRC			
Activity	Transfer of flammable dangerous goods from truck to vessel									
Hazards	Truck is not earthed									
Risks	Fire	x	Explosion	x	Environment	x	Injury	x	Danger to Property	
	Static electricity can ignite flammable vapours and cause a fire/explosion									

Figure 65: **RA Example – RA Step 2**

Step 2 of the RA: Identification of hazards: *Tank truck is not earthed* (or grounded). Grounding provides a path for static charges to rapidly flow to earth, reducing the voltage of the object to zero and thereby eliminating the presence of an ignition source.

Current Situation - Existing Control Measures
Complete pre unloading checklist for tank trucks

Figure 66: **RA Example – RA Step 3**

Step 3 of the RA: Identification of existing control measures. In this case the existing control measure is the *completion of a pre-unloading checklist* for tank trucks. This checklist contains an item that indicates if the tank truck is earthed.

Risk Assessment							
Severity of possible Consequence (C)			Frequency of Incident Occurring (F)			Risk Level (R) [R] = [C] x [F]	MEDIUM HIGH - NOT TOLERABLE
Catastrophic	4		Very Likely	4		9	Risk level should be reduced. Additional measures should be cost-effective but reduce the risk. If control measures are not possible to reduce the risk, then the work should not be repeated in the future
Severe	3	x	Likely	3	x		
Significant	2		Unlikely	2			
Minor	1		Very Unlikely	1			

Figure 67: **RA Example – RA Step 4**

Step 4 of the RA: Risk evaluation. Here we need to determine the severity of the possible consequence and the frequency of the incident occurring. Without grounding, static electricity can ignite flammable vapours and can cause a fire or explosion resulting in personnel being injured (or in the worst case scenarios killed) and damage to property. So if the severity of the consequence is 3, insert an x after the 3. If the likelihood can be estimated at 3, insert an x after the 3. The risk level is calculated automatically and the explanation on the side is also displayed automatically.

Proposed Control Measures	
Install truck grounding system with alarm / safety interlock.	
Target Date for Implementation of control measures	

Figure 68: **RA Example – RA Step 5**

Step 5 of the RA: determination of the control measures. Here the proposed control measure is to install a truck grounding system with alarm and safety interlock (no transfer can be started if the grounding is not sufficient). Insert a target date for implementing the proposed control measures.

Re - Assessment - After implementation of proposed Control Measures							
Severity of possible Consequence (C)			Frequency of Incident Occurring (F)			Risk Level (R) [R] = [C] x [F]	LOW - ACCEPTABLE
Catastrophic	4		Very Likely	4		3	No further additional controls/ preventive actions are necessary, but consideration should be given to cost effective solutions or improvements.
Severe	3	x	Likely	3			
Significant	2		Unlikely	2			
Minor	1		Very Unlikely	1	x		

Figure 69: **RA Example – RA Step 6**

Step 6 of the RA: Review of the risk assessment. Once the proposed control measures are implemented a re-assessment is done. Once the grounding system is installed, the frequency of the incident occurring becomes very unlikely and the risk level is reduced to an acceptable level.


ระวังไฟฟ้าแรงสูง
BEWARE
HIGH VOLTAGE


วัตถุไวไฟ
ใบอนุญาตเลขที่
ลพ.3/2552
CT
PETROLEUM
1202
1203
3
c.t. petro & tran
ฮับรถไม่สุภาพโปรดแจ้ง 053-567056
รถพ่วง
วง-075

12 SECURITY PROVISIONS

12.1 General Provisions

12.1.1 Introduction

The aim of port security measures is to maintain an acceptable level of risk at all security levels. Security measures should be devised to reduce risks, and should, in the main, revolve around procedures to establish and control access to restricted areas and other vulnerable or sensitive key points, locations, functions or operations in the port. The eventual outcome of security measures should:

- Prevent access to the port by people without a legitimate reason to be there and prevent those with legitimate reasons to be in the port from gaining illegal access to ships or other restricted port areas for the purpose of committing unlawful acts.
- Prevent introduction of unauthorised weapons, dangerous or hazardous substances and devices into the port or vessels using the port.
- Prevent personal injury or death, or damage to the port, port facility, and ship or port infrastructure by explosives or other devices.
- Prevent tampering with cargo, essential equipment, containers, utilities, protection systems, procedures and communications systems affecting the port.
- Prevent smuggling of contraband, drugs, narcotics, other illegal substances and prohibited material.
- Prevent other criminal activities, such as theft.
- Protect against the unauthorised disclosure of classified material, commercially proprietary information or security-sensitive information.

12.1.2 Physical Security of the port

Physical security of the port includes:

Restricted Areas: such as office rooms, electrical rooms, pump rooms and warehouses where dangerous goods are stored. These areas are restricted and should be locked at all times.

Access gate: with security guard and security office for identification procedures, delivery of access badges and surveillance of vehicles and trucks.

Figure 70:
HCCP – Security guard with logbook and registering equipment

Figure 71:
CSCP – Checking Point

Fence: firm construction of at least 2.5 m high.

Figure 72:
CSCP – Surrounding wall and fence (2,5 m high)

Figure 73:
HCCP – Surrounding fence

Lighting: sufficient lighting to cover the entire Port Area.

Alarm: Port should have an Emergency Siren alarm that is used for emergencies and a public address system to inform personnel and visitors.

Video Surveillance (CCTV): to be operated remotely from the security office and monitored continuously by a security officer.

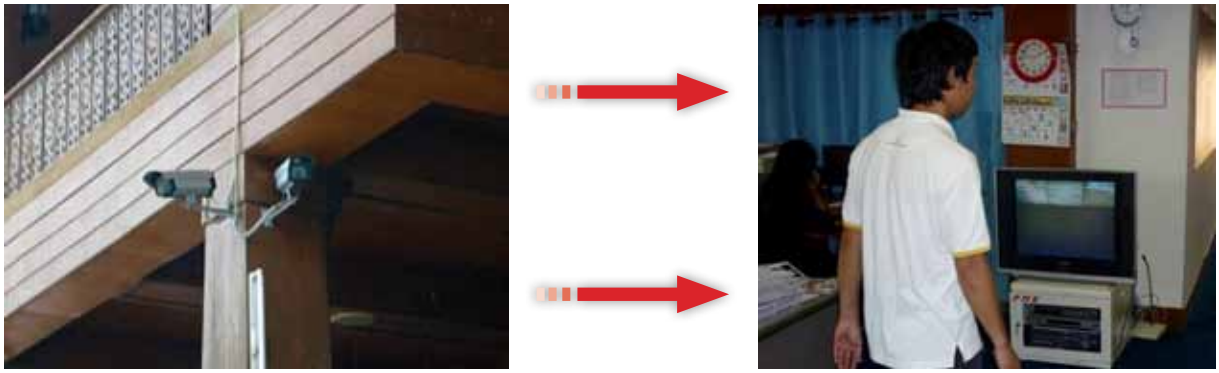

Figure 74:
HCCP – CCTV and central observation point

Communication system: security communication equipment to contact police or other emergency services.

Hand-held VHF radios: to be used by security officers when conducting security patrols.

Figure 75:
Security Guard – Hand-Held VHF

12.1.3 Port Security Officer (PSO)

Tasks of the PSO should include:

- Conduct an initial security survey of the port;
- Develop and implement a Port Security Plan (PSP);
- Nominate the people responsible for port security operations such as security guards at the different access points and patrols for regular inspection of the port area;
- Undertake regular security inspections of the port to ensure execution of appropriate measures;
- Enhancing security awareness and vigilance of the port's personnel;
- Ensuring adequate training for personnel responsible for the security;
- Reporting security incidents to Harbour Authority and recording of these incidents;
- Coordinating and contact with other security services such as police, fire brigade; and
- Ensuring that security equipment is properly operated, tested and maintained.

When making a Port Security Assessment (PSA) and following the PSP, it should be taken into account that: unlawful acts may occur at any time and protection of human life, health and security are paramount. It is important that port operations go smoothly, and that all members of the port community voluntarily support and participate in measures to secure the port and its functions.

12.1.4 Port Security Assessment (PSA)

The Port Security Assessment should include:

- Identification and evaluation of critical assets and infrastructure that it is important to protect;
- Identification of threats to infrastructure in order to establish and prioritise security measures;
- Identification, selection and prioritisation of measures and procedural changes;

- Identification of weaknesses, including human factors, in infrastructure and procedures;
- Identification of perimeter protection, access control and personnel clearance requirements for access to restricted areas of the port;
- Identification of measures to control access to the port at different security levels;
- Identification of the nature of the expected traffic into or out of the port; and
- A risk assessment tool to prepare a port security assessment.

12.1.5 Port Security Plan (PSP)

The Port Security Plan should be based on the PSA and include:

- Details of the security personnel of the port, including their specific duties: PSO (including 24-hour contact details), security guards, patrols;
- Details of all personnel working at the port including duties and working hours;
- Details of the port's links with relevant authorities including police department, fire brigade and hospital;
- Procedures for entering and leaving the port for personnel, crew, visitors, and other people related to the port or operation, including control of identification documents, registration and the use of special entry badges;
- Measures and controls designed to limit access to the port area and restricted areas within the port stores such as warehouses for storage of fireworks or other dangerous goods. These include a reduction of entry points, use of entry badges, monitoring of port facilities including berths, adequate illumination for detection of unauthorised people and visible signs and placards indicating that unauthorised people are prohibited from entering as well as regular security patrols;
- Procedures to check in and out going cargo including cargo documents and the integrity of container seals;
- Regular security patrols to check and inspect: pontoons/ docks, mooring of vessels, suspicious activities, access doors of sheds and warehouses, fuel points, repair stores, restroom facilities;
- Measures designed to prevent unauthorised weapons or other dangerous substances and devices from being brought into the port area;
- Procedures for evacuation in the event of a security incident including activation of a security alarm, and guidelines provided to port residents;
- Measures to prevent theft of port property and equipment, stores and cargo, including adequate illumination, entry checks, vehicle and truck checks, security patrols;
- Detailed map of the port area and surroundings, including approach channel, including places where security equipment is stored; and

Figure 76:
Security Notice - Example

- Measures to control movement of ship's cargo and the content of the cargo (visual, physical or dogs).

References:

- ILO and IMO, Code of Practice on Security in Ports.
- Guide to maritime security and the ISPS Code, IMO 2012.

12.2 Security Awareness and Training

12.2.1 Introduction

Security awareness is vital to the safety, security and health of port personnel and others having a place of work in the port. All personnel should be made aware of their responsibilities to fellow workers, the port community and the environment. Appropriate training of personnel working in the port should maximise personal awareness of suspicious behaviour, incidents, events or objects when going about daily tasks, and the invaluable contribution to be made to the security of the port and its personnel by each individual. Clear lines for reporting such matters to supervisors, managers or appropriate authorities should be included. Additional or special training may be required for people in particular roles.

Training may be focused on particular roles and tasks in the port or at external facilities serving the port such as:

- Security and law enforcement personnel.
- Stevedores and all those handling, storing and transporting, or coming into contact with, passengers, freight, cargo, material and stores or ships.
- Other associated roles and tasks where personnel do not come into direct contact with freight, cargo, material and stores or ships as a matter of course, but who are in administrative and support roles in the port or at associated facilities.
- Consideration should also be given to circumstances where it would be ineffective or contrary to good security practice to train or give additional information to those without a direct need to know.

12.2.2 Training and security awareness

All security officers must complete Security Awareness Training. In addition, security officers must complete a training programme designed by the PSO specific to the security requirements of the Port. The PSO will maintain files on these training records.

The Port Security Training Programme includes the following elements:

- Law enforcement and security guidelines.
- Applicable security related legislation.
- Minimum Information Security Standards.
- Company policies including the security plan and response procedures.

- Prevention, detection and investigation of criminal activities.
- Reporting of threats or actual criminal and terrorist activity.
- Operations of communications systems.
- Procedures for notifying all Port personnel when higher security levels are imposed.

Security officers will be given an annual security awareness training refresher to ensure that they have an up-to-date working knowledge of the following:

- Port Security Plan;
- Port Emergency Response Plan;
- Procedures for notifying police agencies; and
- Bomb Threat and other Emergency and Security Response Procedures.

The security officers training programme is reviewed annually by the PSO and security officers are re-certified annually.

In addition to the above, all Port personnel must also complete a Security Awareness Training Programme. The programme will be designed and implemented by the PSO. The essential elements of the Security Awareness Programme for employees are:

- Port Security Plan;
- Port Emergency Response Plan;
- Procedures for notifying police agencies;
- Bomb threat and other Emergency and Security Response Procedures; and
- Minimum Information Security Standards.

The aim of the Security Awareness Programme for employees is to ensure that all employees have an up-to-date working knowledge of the above as well as knowledge of their overall security responsibilities. The programme must also be repeated annually.

12.2.3 Drills and exercises

The PSO is responsible for the scheduling and conduct of security drills and exercises, keeping management informed of when such events have been scheduled. Wherever possible, drills and exercises should include the participation of any ships alongside, unless they decline. Drills shall be conducted at least quarterly. Exercises shall be conducted annually and if at all possible, in conjunction with those scheduled by the Port Authority.

References:

- Guide to preparing section 5 of a Maritime Security Plan (Port and Port Facilities), National Intelligence Agency Republic of South Africa.
- ILO and IMO, Code of Practice on Security in Ports.
- Maritime Security Guidance Tidal River Thames Passenger Services – (Vessels & Piers), Department for Transport, November 2011.

12.3 Access Control

12.3.1 Introduction

How easy is it for people external to the port or terminal to gain access to areas where dangerous goods are stored? Does the port or terminal have surrounding fences? Is there a security guard at the entrance? Is the terminal equipped with closed-circuit television (CCTV)?

Uncontrolled access means there is a risk that members of the public could damage equipment, steal liquid bulk products, and damage packaged dangerous goods or cause fires or explosions either deliberately or unintentionally.

12.3.2 Port Area Access Control

Gates: The main gate shall be locked during silent hours and monitored at all times. Other gates shall be locked at all times and monitored by video surveillance at the Main Gate/Security Office.

Deliveries (of supplies and services): All packages entering or leaving the Port are subject to search by security officers, PSO, or Duty Managers. Signs are posted advising of this requirement at principal Port entry gates.

Deliveries: Deliveries shall be scheduled in advance. Where not scheduled in advance, deliveries are prohibited until approved by the Duty Managers. The Duty Manager will provide a list to the Main Gate/Security Office of regularly authorised delivery companies having permission to bring vehicles onto the Port premises.

Hazardous materials: Hazardous materials shall not be permitted to enter the terminal area without verification by the PSO or Duty Manager that the materials are expected for delivery and that safety and security precautions are in place prior to their acceptance. Precautions include transportation in properly marked vehicles and proper secure storage, availability of first aid firefighting equipment and appropriate clean-up equipment.

Figure 77:
CSCP – Barrier at main entrance

Vessel Arrival and Security Procedures while Moored: Unscheduled tugs, barges or other vessels are not permitted to berth alongside the port without prior notification from the Harbour Master's office and notification of arrival to the PSO, who will clear the arrival. Vessel crew may not exit or enter the Port without showing photo ID to the on watch Security guard, who shall verify their ID.

12.3.3 Identification Procedures

Identification of Personnel Entering Terminal: All personnel entering the Port area must present their Access Control Card at the Main Gate/Security Office to gain access. Individuals arriving by motorcycle shall remove helmets to assist in identification. Security guards shall verify that ID matches the person presenting it. While in the Port Area, all personnel must carry their Access Control Cards visibly displayed. These must also be presented upon request of security officers the Duty Manager, or PSO.

While conducting patrols, security officers or other competent authority shall challenge unknown or suspicious personnel to identify themselves with a valid issued access card. If the security officer does not know that the person has valid business at the Port, he shall contact the PSO for authorisation prior to allowing the person to enter.

Vendors/Contractors/Vessel Pilots/Agents: Vendors, contractors, vessel pilots and agents must show valid photo ID prior to entry. Vendors, contractors, pilots, and agents should be scheduled in advance. The Duty Manager will provide the schedule to security staff. The Duty Manager will provide a list to the guard of pre-authorised, regularly scheduled vendors. Non-scheduled visits must be cleared with Port Management prior to entry. Vehicle Control Procedures (see below) apply if private vehicles are driven into the Port.

Port Authority Staff: Port Authority employees entering the main gate with private vehicles or Port Authority vehicles must show valid photo ID prior to entry. Vehicle Control Procedures (see below) apply if private vehicles are driven into the Port.

Truck Drivers: All truck drivers must show valid photo ID prior to entry. The Main Gate security officer will verify that drivers have valid business at the Port (for example, checking booking or bill of loading number). Passengers are not permitted in trucks unless authorised by Port Management.

Visitors: All visitors must show valid photo ID prior to entry. Vehicle Control Procedures (see below) apply if private vehicles must be driven into the Port. Whenever possible, visitors shall be scheduled in advance. If not, entry is not permitted until authorised by Port Management. This will ensure that visitors have valid business at the Port. Only visitors with official business at the Port will be allowed.

Government Employees: All government employees may enter the Port to conduct official business and must show valid government organisation photo ID prior to entry. Security will direct government employees where to park vehicles.

Vessel Crew and Passengers: Crew and passengers who exit the gate cannot re-enter unless they show a photo ID to the security officer. Crew and passenger vehicles are not permitted to enter the Terminal unless authorised by Port Management.

Figure 78:
CSCP – Truck Driver at checking point

Vehicle and Personnel Searches: All people, packages and vehicles entering or leaving the Port are subject to search by security, Port Management or government authority. Random inspections must be conducted on at least 5% of vehicles entering the Port. This excludes freight containers.

Acceptable Identification in lieu of Port Access Control Card: ID cards shall be tamper-resistant and laminated with a photograph. ID cards shall show the relevant details of the holder, e.g., name, description or other pertinent data and are to be issued by a Government Institution.

Acceptable identification includes: valid driver's license, photo ID card issued by a governmental institution, passport or employee photo ID.

12.3.4 Vehicle Control and Security

Control of all motor and supplier/contractor vehicles is as specified below in "Vehicle Control Procedures". All vehicles entering or leaving the main gate are subject to search. Signs are posted at the main gate advising of this requirement.

Parking for vehicles authorised to enter the Port Area is restricted to specific areas.

12.3.5 Vehicle Control Procedure

Private vehicles that must enter the Port must be registered at the main gate. A Permanent Vehicle Pass will be issued for Management, Port Authority, approved government vehicles and identified Supplier/ Contractors' vehicles (on approval of the PSO).

A Temporary Vehicle Pass (which must be displayed prominently in the vehicle front window) will be issued for all other vehicles authorised temporary access. The main gate security officer will instruct drivers where to park and the safest traffic pattern to follow depending on the type of operation in progress (container yard operation, container vessel, break-bulk vessel, etc.). Once the person has completed his or her visit, they will turn in their Temporary Vehicle Pass and the security officer will record the exit time. Government vehicles that have regular business at the terminal and clearly marked Port Authority vehicles are not required to be issued a Temporary Vehicle Pass.

12.3.6 Cargo Security

All cargo/ships' stores awaiting a vessel's arrival shall be stored in Terminal Sheds and kept under lock and key until embarkation. Security patrols shall also be regularly conducted in cargo storage areas.

12.3.7 Water Side Security

All personnel are to be vigilant when working in the docks area and report any suspicious activity or security threats on the water or shorelines adjacent to the Terminal Area to the Main Gate/Security Office. Security officers should report to the PSO for action.

References:

- Guide to preparing section 5 of a Maritime Security Plan (Port and Port Facilities), National Intelligence Agency Republic of South Africa.
- ILO and IMO, Code of Practice on Security in Ports.
- Maritime Security Guidance Tidal River Thames Passenger Services – (Vessels & Piers), Department for Transport, November 2011.

Annex 1: **Multimodal Dangerous Goods Form**

<table>
<tr><td colspan="2" rowspan="3">1 Shipper/Consignor/Sender</td><td colspan="3">2 Transport document number</td></tr>
<tr><td colspan="2">3 Page 1 of pages</td><td>4 Shipper's reference</td></tr>
<tr><td colspan="2"></td><td>5 Freight Forwarder's reference</td></tr>
<tr><td colspan="2">6 Consignee</td><td colspan="3">7 Carrier (to be completed by the carrier)</td></tr>
<tr><td colspan="2"></td><td colspan="3">SHIPPER'S DECLARATION
I hereby declare that the contents of this consignment are fully and accurately described below by the Proper Shipping Name, and are classified, packaged, marked and labelled/ placarded and are in all respects in proper condition for transport according to the applicable international and national governmental regulations.</td></tr>
<tr><td colspan="2" rowspan="3">8 This shipment is within the limitations prescribed for:
(Delete non-applicable)
PASSENGER AND CARGO AIRCRAFT / CARGO AIRCRAFT ONLY</td><td colspan="3" rowspan="3">9 Additional handling information</td></tr>
<tr><td>10 Vessel/flight no. and date</td><td>11 Port/place of loading</td></tr>
<tr><td>12 Port/place of discharge</td><td>13 Destination</td></tr>
<tr><td colspan="5">14 Shipping marks *Number and kind of packages Gross mass (kg) Net mass (kg) Cube (m^3)</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>15 Container identification No./ vehicle registration No.</td><td>16 Seal number(s)</td><td>17 Container/vehicle size & type</td><td>18 Tare mass (kg)</td><td>19 Total gross mass (including tare) (kg)</td></tr>
<tr><td colspan="2">CONTAINER/VEHICLE PACKING</td><td colspan="3">21 RECEIVING ORGANISATION RECEIPT</td></tr>
<tr><td colspan="2">CERTIFICATE

I hereby declare that the goods described above have been packed/ loaded into the container/vehicle identified above in accordance with the applicable provisions. †

MUST BE COMPLETED AND SIGNED FOR ALL CONTAINER/VEHICLE LOADS BY PERSON RESPONSIBLE FOR PACKING/LOADING.</td><td colspan="3">Received the above number of packages/containers/trailers in apparent good order and condition unless stated hereon:

RECEIVING ORGANISATION REMARKS:</td></tr>
<tr><td colspan="2">20 Name of company</td><td>Haulier's name

Vehicle reg. no.</td><td colspan="2">22 Name of company (OF SHIPPER PREPARING THIS NOTE)</td></tr>
<tr><td colspan="2">Name/Status of declarant</td><td rowspan="2">Signature and date</td><td colspan="2">Name/status of declarant</td></tr>
<tr><td colspan="2">Place and date</td><td colspan="2">Place and date</td></tr>
<tr><td colspan="2">Signature of declarant</td><td>DRIVER'S SIGNATURE</td><td colspan="2">Signature of declarant</td></tr>
</table>

Annex 2: Self-Help Checklist for the Storage and Handling of Ammonium Nitrate Fertiliser[44]

	Questions	Yes	No
1	Is the building or floor constructed from combustible materials?		
2	Is the floor in poor condition i.e. large cracks or holes?		
3	Are there any open or uncovered drains or channels in the floor?		
4	Is there evidence of significant oil/diesel spillage on the floor? Significant means there are a number of stained areas on the floor as opposed to a few isolated stained areas.		
5	Is the building used for mixed storage of any of the incompatible substances listed below? Urea, flammable liquids, chlorates, oil, grease, gas cylinders, acids, zinc or copper including their salts, nitrites, powdered metals, sulphur, alkalis, reducing agents, organic (carbonaceous) materials.		
6	Is the building used for mixed storage of combustible materials (such as stacks of pallets, packaging materials, straw, hay, etc.)?		
7	Where the ammonium nitrate is stored in bags, are the housekeeping standards poor? Poor means there are several bags of ammonium nitrate which are spilled/split or there are piles of loose ammonium nitrate in one or several areas in the warehouse.		
8	For manufacturing, blending and bagging sites, is the ammonium nitrate stored as loose bulk? If so, are the prills/granules stuck together in lumps? (Note: they should be free flowing) Are there any signs of organic contamination?		
9	For manufacturing, blending and bagging sites, does the company carry out any oil/organic coating of the ammonium nitrate prills/granules?		
10	Are there any waste/off-spec materials held in the store? Are there any signs of oil/organic contamination?		
11.	Are there any sources of ignition in the building? This includes: Not having a 'no smoking policy' or 'hot work policy or permit'(for welding, etc.), open or broken electrical fittings; including open or broken lights or electric junction boxes, vehicles or equipment other than as required for handling the ammonium nitrate.		
12.	Where the ammonium nitrate is stored outside, are there any combustible materials stored in the vicinity (i.e. within 30 m); such as stacks of pallets or packaging materials, storage of timber or wooden products, tires or vehicles, gas cylinder.		
13.	Where the ammonium nitrate is stored outside, are there storage tanks in the vicinity (i.e. within 50 m) used for extremely flammable, highly flammable, flammable, organic or carbonaceous liquids? e.g. diesel, fuel oil or other substances.		
14.	Are there any bags of ammonium nitrate not labelled with an UN number or marked as 5.1 Oxidising Substance? Appropriate UN numbers are 1942, 2067, 2071,		

[44] Storing and handling ammonium nitrate, Health and Safety Executive (HSE), December 2002, Annex

Annex 3: **Generic Controls for the storage and handling of dangerous goods**[45]

Ventilation
Adequate ventilation shall be provided for package storage and dangerous goods areas.
Adequate ventilation depends on the nature of the substance and the circumstances of its use.
First Aid
The port or terminal shall provide an adequate first aid kit and appropriate personal protective equipment. Reference should be made to the MSDS/SDS for the dangerous goods being kept.
Security and Access
All dangerous goods areas must be secured against unauthorised access.
The means of entry into and exit from dangerous goods areas shall be kept clear at all times.
At all times, access shall be available to: • Firefighting equipment; • Personal Protective Equipment; • Clean-up materials and equipment; and • Place where the dangerous goods manifest is kept.
Communications
Each port/terminal must have a phone and contact details for emergency response.
Lighting
There must be adequate lighting in any area where dangerous goods are stored or handled.
Emergency requirements
An adequate supply of water for emergency use shall be available at a nearby location.
Fire extinguishers of a suitable type shall be installed. These should be located so that they are immediately accessible in an emergency.
Dangerous goods can present the following hazards in a fire: • They may give of vapours, fumes or smoke, which may be flammable, toxic or corrosive, or may form flammable mixtures in air; • Flammable or oxidising dangerous goods may intensify or spread the fire; • Spilled substances and contaminated debris may be toxic to the environment; • Containers may rupture violently, or become projectiles, when heated; • Some substances may react violently with water or other chemicals, causing the substance to be sprayed over a wide area; • The mixing of spilled or fire-affected substances may have unknown properties and consequences; and • Contaminated water run-off from fires may present a hazard to personnel and the environment.
Containers
The contents of a container shall not be transferred to any other container for storage unless the later is suitable for the storage of this particular dangerous good and is clearly marked with the appropriate hazard diamond to indicate the identity and hazard potential of that substance.

[45] DGSM Information Paper No. 6, Carrying out a Risk Assessment for Dangerous Goods (under the Dangerous Goods Safety Management Act 2001), Queensland Government / Department of Emergency Services, CHEM services, October 2003, p.16 - 18

Containers shall: • Be kept on non-combustible surfaces which are not liable to attack or damage the content if spilled; • Be kept at least 3 m away from sources of heat; • Be opened only in appropriate ventilated areas; • Be kept securely closed when not in use; and • Not be kept next to reactive materials.
Containers shall be kept closed when not in use.
Containers with flammable dangerous goods should be kept away from any potential ignition source.
Appropriate spillage retention measures shall be provided where containers are opened for the transfer of their contents.
The transfer of dangerous goods from the storage area to the point of use shall be carried out in a manner that minimises the possibility of spillage.
Storage and segregation
Any materials that are incompatible, or might react dangerously if mixed, shall be segregated so that the possibility of reaction is minimised.
Spills
All spills and leaks shall be attended to promptly. Spilled or leaked dangerous goods shall not be returned to its original point of storage.
Every endeavour shall be made to prevent leaks or spills, and to control them if they occur; clean-up action shall be initiated immediately. Leaked or spilled materials shall be segregated from other waste and disposed of properly. For dealing with spills, the following are essential: • Appropriate clean-up materials and equipment; • An adequate supply of water (if the dangerous goods are compatible with water); and • Appropriate personal protective equipment shall be used.
Personal Protective Equipment
Supervisors of areas where dangerous goods are stored/handled must ensure that all personnel handling dangerous goods are provided with appropriate personal protective equipment.
Personal protective equipment should be kept in designated, well-identified locations and ready for use.
Personal protective equipment should be properly maintained and in a fit state of repair at all times.

Annex 4: **Ship/Shore Safety Checklist**

Ship/Shore Safety Check List

Ship Name _____ Port / Berth _____

Date of Arrival _____ Time of Arrival _____

The safety of operations requires that all questions be answered affirmatively in the appropriate box. If an affirmative answer is not possible, the reason should be given and agreement reached upon appropriate precautions to be taken between the ship and the terminal. Where any question is considered to be not applicable, a note to that effect should be inserted in the remark column.

เพื่อความปลอดภัยในการทำงานกำหนดให้มีการตอบยืนยันในแบบสอบถามทุกคำถาม ในกรณีที่ไม่สามารถตอบได้ ต้องระบุเหตุผลและข้อตกลงถึงการป้องกันที่เหมาะสมระหว่างเรือและท่าเรือ คำถามใดที่พิจารณาแล้วว่าไม่สามารถปรับไปใช้ได้ ให้ระบุผลกระทบในช่องข้อสังเกต

- A box in the column “Ship” and “Shore” indicates that checks should be carried out by the party concerned.

  ช่องที่ระบุ “Ship” and “Shore” ให้ตอบโดยหน่วยงานที่รับผิดชอบ

The presentation of the letters A, P or R in the column “Code” indicates the following:

- A) All procedures and agreements should be in writing in the remarks column of this check list or other mutually acceptable form. In either case, the signature of both parties should be required.

  ขั้นตอนและข้อตกลงควรจะเขียนในช่องข้อสังเกตในแบบฟอร์มนี้หรือแบบฟอร์มที่สัมพันธ์กันอย่างใดอย่างหนึ่ง และลงลายมือชื่อทั้งสองฝ่าย

- P) In the case of a negative answer the operation shall not be carried out without the permission of the Port Authority.

  ในกรณีที่ตอบปฏิเสธ การปฏิบัติงานควรหยุดดำเนินการหากปราศจากการอนุญาตจากเจ้าหน้าที่ทางท่าเรือ

- R) Indicates items to be re-checked at intervals not exceeding that agreed in the declaration.

  รายการที่กำหนดให้มีการตรวจซ้ำระหว่างการทำงาน เวลาต้องไม่เกินที่กำหนดไว้ในแถลงการณ์

No	General	Ship	Shore	Code	Remarks
1	There is safety access between the ship and shore. มีทางขึ้น-ลงระหว่างเรือ และท่า ที่ปลอดภัย				
2	The ship is securely moored. เรือได้เทียบท่าและผูกอย่างมั่นคงเรียบร้อยแล้ว			R	
3	The agreed ship/shore communication system is operative. ระบบการติดต่อสื่อสารระหว่างเรือกับท่าได้ถูกกำหนดเรียบร้อย			A R	System: Backup System:
4	Emergency towing-off pennants are correctly rigged and positioned. ธงแสดงตำแหน่งจุดลากจูงฉุกเฉินถูกแสดง ณ. ตำแหน่งที่ถูกต้อง			R	
5	The ship's fire hoses and firefighting equipment are positioned and ready for immediate use. สายดับเพลิงและอุปกรณ์ดับเพลิงบนเรืออยู่ในตำแหน่งที่พร้อมใช้งานได้			R	
6	The terminal's firefighting equipment is positioned and ready for immediate use. สายดับเพลิงและอุปกรณ์ดับเพลิงบนท่าเรืออยู่ในตำแหน่งที่พร้อมใช้งานได้			R	
7	The ship's cargo and bunker hoses, pipelines and manifold are in good condition, property rigged and appropriate for the service intended. ท่อสินค้าและท่อน้ำมันเชื้อเพลิงและท่อรับส่งของเรืออยู่ ในภาพดี ถูกต่อติดไว้อย่างถูกต้องและเหมาะสมที่จะใช้กับงาน				
8	The terminal's cargo and bunker hoses or arms are in good condition, property rigged and appropriate for the service intended. ท่อสินค้าและท่อน้ำมันเชื้อเพลิงและท่อรับส่งของท่าอยู่ ในสภาพดี ถูกต่อติดไว้อย่างถูกต้องและเหมาะสมที่จะใช้กับงาน				
9	The cargo transfer system is sufficiently isolated and drained to allow safe removal of blank flanges prior to connection. ระบบขนถ่ายสินค้า มีทางแยกและทางปล่อยทิ้ง ที่ได้ทำการปิดหน้าแปลนก่อนที่จะทำการต่อ				
10	Scuppers and save-alls on board are effectively plugged and drip trays are in position and empty. ช่องระบายน้ำและรูเดรนต่าง ๆ มีการอุดปลั๊กที่แน่นหนา, ถาดรองอยู่ในตำแหน่งและว่างเปล่า			R	
11	Temporarily removed scupper plugs will be constantly monitored. ปลั๊กอุดรูระบายน้ำเมื่อมีการถอดออกจะต้องใส่กลับเข้าไปให้แน่นหนา			R	
12	Shore spill containment and sumps are correctly managed. การควบคุมการหกล้นและที่รวบรวมของท่าได้มีการจัดการอย่างถูกต้อง			R	

13	The ship's unused cargo and bunker connections are properly secured with blank flanges fully bolted. หน้าแปลนของเรือที่ไม่ได้ต่อท่อรับสินค้าและน้ำมันมีการปิดแน่นเรียบร้อยและใส่น็อตหน้าแปลนครบทุกตัว				
14	The terminal's unused cargo and bunker connections are properly secured with blank flanges fully bolted. หน้าแปลนของทางท่าเรือที่ไม่ได้ต่อรับสินค้าและน้ำมันมีการปิดแน่นเรียบร้อยและใส่น็อตหน้าแปลนครบทุกตัว				
15	All cargo, ballast and bunker tank lids are closed. ฝาปิดถังสินค้า, น้ำถ่วงเรือ, ถังน้ำมัน ทุกถังได้รับการปิดเรียบร้อย				
16	Sea and overboard discharge valves, when not in use, are closed and visibly secured. วาล์วน้ำทะเลและวาล์วส่งออกนอกเรือ เมื่อไม่ใช้งานได้ถูกปิด และตรวจสอบว่าปลอดภัย				
17	All external door, ports and windows in the accommodation, stores and machinery spaces are closed. Engine room vents may be open. ประตู, ช่องระบายอากาศและหน้าต่างของส่วนที่พักอาศัย, ห้องเก็บของและพื้นที่ห้องเครื่องได้ทำการปิดระบบระบายอากาศในห้องเครื่องอาจจะเปิดไว้ก็ได้			R	
18	The ship's emergency fire control plans are located externally. แผนผังอุปกรณ์ดับเพลิงฉุกเฉินจัดเตรียมไว้ภายนอก				Location:
19	The ship is ready to move under its own power. เรือพร้อมที่จะเคลื่อนย้ายออกจากท่าได้โดยตัวเอง			R P	
20	There is an effective deck watch in attendance on board and there is adequate supervision of operations on the ship and in the terminal. มีพนักงานเข้ายามปากระวางและพนักงานควบคุมดูแลการทำงานอย่างเพียงพอ ทั้งบนเรือ และทางท่า			R	
21	There are sufficient personnel on board and ashore to deal with an emergency. มีเจ้าหน้าที่บนเรือและทางท่าเพียงพอ ในการติดต่อเมื่อมีเหตุฉุกเฉิน			R	
22	The procedures for cargo, bunker and ballast handling have been agreed. การขั้นตอนการปฏิบัติงานสินค้า, การรับน้ำมัน, การสูบถ่ายน้ำถ่วงเรือได้มีการตกลง			A R	
23	The emergency signal and shutdown procedure to be used by the ship and shore have been explained and understood. สัญญาณฉุกเฉินและขั้นตอนการหยุด ที่ใช้โดยเรือและทางท่า ได้มีการอธิบายและทำความเข้าใจแล้ว			A	

24	Material safety data sheets (MSDS) for the cargo transfer have been exchanged where requested. ข้อมูลความปลอดภัยจำเพาะสำหรับขนถ่ายสินค้ามีการแลกเปลี่ยนตามที่ต้องการ			P R	
25	The hazards associated with toxic substances in the cargo being handled have been identified and understood. ได้มีการบ่งชี้และทำความเข้าใจถึงอันตรายของสารพิษที่ประกอบอยู่ในสินค้าที่บรรทุก				H_2S Content:
26	An international shore fire connection has been provided. มีการจัดเตรียมข้อต่อน้ำสายดับเพลิงสากลแล้ว				Benzene Content:
27	The agreed tank venting system will be used. มีการตกลงเกี่ยวกับการระบายอากาศในถังสินค้า			A R	Method:
28	The requirements for closed operations have been agreed. ข้อบังคับสำหรับการปฏิบัติงานสินค้าแบบปิดได้มีการตกลง			R	
29	The operation of P/V system has been verified. ได้มีการตรวจสอบระบบการทำงานของ P/V วาล์ว				
30	Where a vapour return line is connected, operating parametres have been agreed. ที่ซึ่งท่อไอน้ำมันไหลกลับมีการต่อ มีการตกลงวิธีการทำงานเรียบร้อยแล้ว			A R	
31	Independent high level alarms, if fitted, are operational and have been tested. สัญญาณเตือนระดับของสินค้าสูง, ถ้ามีการติดตั้ง, ทำงานปกติและมีการทดสอบระบบ			A R	
32	Adequate electrical insulating means are in place in the ship/shore connection. ข้อต่อระหว่างเรือกับท่า ฉนวนมีเพียงพอ			A R	
33	Shore lines are fitted with a non – return valve, or procedures to avoid back filling have been discussed. ท่อของท่าได้รับการติดตั้งวาล์วกันกลับหรือขั้นตอนการหลีกเลี่ยงการไหลกลับได้มีการอธิบายแล้ว			P R	
34	Smoking rooms have been identified and smoking requirements are being observed. ได้มีการบ่งชี้ห้องสำหรับสูบบุหรี่และมีการตรวจสอบการปฏิบัติตามข้อบังคับ			A R	Nominated smoking room:
35	Naked light regulations are being observed. มีการตรวจสอบตามระเบียบข้อกำหนดเรื่องของหลอดเปลือย			A R	
36	Ship/shore telephones, mobile phones and pager requirements are being observed. มีการตรวจสอบโทรศัพท์เรือ/ท่า, โทรศัพท์มือถือและ เพจเจอร์			A R	

37	Hand torches (flashlights) are of an approved type. ไฟฉายเป็นแบบที่อนุญาติให้ใช้งาน				
38	Fixed VHF/UHF transceivers and AIS equipment are on the correct power mode or switched off. เครื่องรับ VHF/UHF แบบติดตั้งอยู่กับที่และ อุปกรณ์ AIS ใช้กำลังส่งอย่างถูกต้องหรือ ทำการปิด				
39	Portable VHF/UHF transceivers are of an approved type. เครื่องรับ VHF/UHF แบบเคลื่อนย้ายเป็นแบบที่ได้รับอนุญาติให้ใช้งาน				
40	The ship's main radio transmitter aerials are earthed and radars are switched off. สายอากาศเครื่องส่งวิทยุตัวหลักของเรือต่อสายดินและเรดาร์ได้ทำการปิด				
41	Electric cables to portable electrical equipment within the hazardous area are disconnected from power. สายไฟฟ้าของอุปกรณ์ไฟฟ้าชนิดเคลื่อนย้ายได้ในพื้นที่เสี่ยงอันตรายได้ถอดออกแล้ว				
42	Window type air conditioning units are disconnected. เครื่องปรับอากาศชนิดติดหน้าต่างได้รับการถอดสายและปิดเครื่องแล้ว				
43	Positive pressure is being maintained inside the accommodation , and air conditioning intakes, which may permit the entry of cargo vapours are closed. ควบคุมแรงกดอากาศภายในที่พักอาศัยให้เป็นบวกและทางดูดของระบบปรับอากาศซึ่งอาจจะทำให้ไอระเหยจากสินค้าเข้ามาได้รับการปิด				
44	Measures have been taken to ensure sufficient mechanical ventilation in the pump room. ได้มีการตรวจสอบเพื่อให้แน่ใจว่าระบบระบายอากาศในห้องปั๊มสินค้ามีเพียงพอ			R	
45	There is provision for an emergency escape. มีการเตรียมการสำหรับทางหนีฉุกเฉิน				
46	The maximum wind and swell criteria for operations have been agreed. กำลังลมสูงสุดและความสูงคลื่น เกณฑ์สำหรับการปฏิบัติการมีการตกลง			A	Stop cargo at: Disconnected: Unberth at:

47	Additional shore mooring requirement, if any. มีความต้องการทีมรับ-ปลดเชือกจากทางบกเพิ่มเติมจากปกติหรือไม่			A	
48	Security protocols have been agreed between the ship security officer and port facility security officer, if appropriate. ระเบียบรักษาความปลอดภัยได้มีการตกลงระหว่างเจ้าหน้าที่รักษาความปลอดภัยเรือและเจ้าหน้าที่รักษาความปลอดภัยท่าได้เหมาะสม			A	
49	Where appropriate, procedures have been agreed for receiving nitrogen supplied from shore, either for inerting or purging ship's tanks, or for line clearing into the ship. มีความเหมาะสม, ขั้นตอน ได้มีการตกลงสำหรับการรับไนโตรเจนจากทางท่า ไม่ว่าจะเป็นการ ไล่ก๊าซเฉื่อยหรือการระบายก๊าซในถังของเรือหรือการทำให้ท่อโล่งถึงเรือ			A P	

Remark: Agreement to stop cargo operation under specific circumstance.

Shore Stop		**Signature**	

Declaration: We, the undersigned, have checked the above items where appropriate in accordance with the instructions, and have satisfied ourselves that the entries we have made are correct to the best of our knowledge.

เราได้ทำการตรวจสอบตามรายการข้างต้นซึ่งเป็นไปตามข้อแนะนำและเป็นที่พอใจของพวกเรา การลงข้อความต่าง ๆ เราได้ทำด้วยความถูกต้องอย่างสุดความสามารถ

We have also made arrangements to carry out repetitive checks as necessary and agreed that those items with the letter "R" in the Check-List should be re-checked at intervals not exceeding _____ hours.

เราได้จัดการให้มีการตรวจซ้ำตามความจำเป็นและตกลงให้รายการกำหนดเป็นอักษร R ในรายการข้างต้นต้องมีการตรวจสอบซ้ำไม่เกิน _____ ชั่วโมง

For Ship	For Shore
Signature : ----------	Signature : ----------
Name : ----------	Name : ----------
Rank : ----------	Rank : ----------
Date/Time : ----------	Date/Time : ----------

Date	Time	Signature	Date	Time	Signature

Mekong River Commission

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