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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**AN INTEGRATE APPROACH TO HIGHLY PORT
PERFORMANCE, IMPROVEMENT OF CONTROLLING
DANGEROUS GOODS IN THAI PORTS**

By

WATTANAPONGPISAL PITAK

THAILAND

A dissertation submitted to the World Maritime University in partial
fulfillment of the requirements for the awards of the degree of

MASTER OF SCIENCE

in

PORT MANAGEMENT

1999

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University

..... (Signature)

..... (Date)

Supervised by

Name: J.R.F.(Dick) Hodgson

Office: Associate Professor
World Maritime University

Assessor Jan-Åke Jönsson

Office: Associate Professor
World Maritime University

Co-assessor:

Name: Karsten Brünings

Office: Managing Director
Port and Transport Consulting GmbH
Bremen, Germany.
Visiting Professore, World Maritime University

ABSTRACT

Title of Dissertation: **An Integrate approach to highly port performance, improvements of controlling dangerous goods in Thai ports.**

Degree : **Master of Science**

This dissertation is study of the challenge problem associated dangerous goods through port all activities the ship inducing its access to channel, berthing handling, storage and delivery. Since dangerous goods enter in port areas need be controlled, and in order to ensure that general safety standard are maintained, it is considered essential to harmonize the rule and administration that apply within port areas with the rules that are applicable to the ship in order to ensure smooth operation, and to avoid misunderstanding between ship and shore.

This dissertation is describe the existing port activities and identify their important problem and cause, namely administration system, the geographic location of the port aspects, financial aspects, legal aspects, technical aspects and environmental aspects, by look at from experience. Also, analysis the case study of the main requirement and precaution for transport of dangerous good and the contingency plan arrangement.

The conclusion chapters will proposed the improvements of controlling dangerous goods in Thai ports, and makes the general principle recommendations for the future shall be done.

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- 5.7 Develop system for training in the transport and handling of dangerous goods (i.e. seafarer, pilot, shore staffs and cargo interests)
- 5.8 Adopt efficiency procedures for existing resource and develop new efficiency procedures (i.e. port facilities, administration system operation procedure, documentation, risk analysis and information flow)
- 5.9 Formulate a contingency plan of action which will meet the safety and reliable requirement
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LIST OF ABBREVIATION

ADR	International Provision Concerning Carriage of Dangerous Goods by Road
ADNR	The European Provision Concerning International Carriage of Dangerous Goods on Inland Waterways
APELL	Awareness and Planning for Emergencies at Local Level
EIA	Environmental Impact Assessment
ESCAP	Economic and Social
ECOSOS	The United Nations Economic and Social Council
IMO	International Maritime Organization
HD	Harbor Department
IMDG Code	The International Maritime Dangerous Goods code
RID	International Provision Concerning Carriage of Dangerous Goods by Rail
Na	Sodium
H ₂ O	Fresh water
NaOH	Sodium hydroxide
H ₂	Nitrogen
MARAD	Maritime administration
M.V	Motor vessel
MRCC	Maritime Search and Rescue Coordination Center
PAT	Port Authority of Thailand
TEU	Twenty foot equivalent units
UN number	United Nations number
UNCTAD	United Nations Conference on Trade and Development

CHAPTER 1

Introduction

1 Introduction

A port is a gateway of interchange between land and sea transport, providing facilities and service in order to effect transshipment of commodities generated by shipping activities in seaborne trade. Rapid advances in ship size have meant that container vessels are now over 310 meters length overall, 40 meters beam and 14 meters draft with space to hold about 6,000 TEU; and tankers for crude oil or petroleum products of almost 0.4 million ton dwt have been built. This has had an impact on port engineering and port operations in order to accommodate these vessels and to enable them to leave port under safe navigation conditions and supported by efficient operations. It is estimated that more than 50% of the packaged goods and the bulk cargoes carried by sea can be regarded as dangerous goods, including harmful substances (marine pollutants), under the IMO classification, design or identification criteria. Between 10-15% of the cargoes transported in packaged form, (including freight containers, bulk packaging, portable tanks, tank-containers, road-tankers, intermediate bulk containers (IBCs), unit loads, overpacks and other cargo transport united) fall into these categories.

As Thailand becomes increasingly industrialized and as the industry itself becomes ever more complex, so the transport by sea of these cargoes will continue to rise, and

the lists of products will grow. It is therefore essential that these cargoes are stored, handled and transported with the greatest possible care.

Thai ports also play a dual role, namely supporting international trade for sea transport and providing logistic platforms. The number of movements of dangerous goods imports in Thai trade has increased dramatically in recent years. From 1994 to 1995, the value of chemicals imported increased by 33% (from 109 billion Baht in 1994 to 145 billion Baht in 1995). In 1995, the value of chemicals imported was 8% of total commodities imported.(Bangkok Bank[On-line WWW].(n.d) http://www.bbl.co.th/eco_inc/9_imports4.htm)

In 1997, the Bangkok Port Authority (Klong-Toey) handled approximately 21 million kg of dangerous goods, (Annual Port Authority of Thailand report, 1997). While the total volume was only 28% of the total commodities inbound to Bangkok Port, the total value of commodities imported was 1,839,823.20 million Baht, while the value of organic chemicals was 51,675.50 million Baht (Annual Customs Department reports, 1997). It may be seen that the value of organic chemicals imported was only 3% of the value of the total import cargo.

In order to improve efficiency in the handling of dangerous cargoes, especially dangerous cargoes in packaged form, many factors need to be taken into account such as:

- The safety of navigation has to be enhanced. Ships have to be accommodated safely from the moment of arrival off the port until departure. For instance, pilot and tug service, navigation aids and all need to be provided efficiently, reliably and cost-effectively to the user.

- Operational procedures, management systems, cargo storage, segregation and emergency responses are all significant factors in order to effect the movement or transfer of dangerous goods between ships and other modes of transport.
- During cargo receipt and delivery operations in the port, road vehicles, rail wagons, barges and coastal vessels are all needed to ensure that such operations are as efficient as possible, for all possible circumstances in which dangerous goods are present in port areas.
- It is necessary to ensure that national requirements concerning the transport and handling of dangerous goods are compatible with the relevant international conventions. For instance, labeling and placarding requirements, including documentation, should ensure that the shipper is clearly identified as responsible for coordination and for taking the necessary initiatives to contact shipowners and cargo interests when incidents happen.

In order to achieve a cost-efficient, transit time, and a safe environment for the movement of all dangerous goods across ports and through the inland network, Thai ports have to establish that all national requirements are met and that systems and procedures for all involved personnel and information systems, including those relating to ships, are managed safely and reliably.

The objective of this dissertation

The object of this study is to analyze the challenges associated with the movement of dangerous goods in packaged form transported through ports in Thailand, and to address all activities of the ship including its access to the channel and the berthing, handling, storage and delivery of all its cargo. Since dangerous goods entering a port area need to be controlled, and in order to ensure that general safety standards are maintained, it is considered essential to harmonize the rules that apply within port

areas with the rules that are applicable to the ship in order to ensure smooth operations, and to avoid misunderstandings between ship and shore.

This objective will be achieved by describing the current port role, analysing the current problems, and then introducing proposed new systems designed to address current shortcomings in the control of dangerous goods.

Methodology and scope of study

The sequencing in the analysis is as follows:

- To describe existing port activities for the management and control of dangerous goods
- To identify the problems and to analyze their importance and causes.
- To examine the current administration system in Thai ports for the handling and storage of dangerous goods.
- To examine the legal, financial, commercial, technical and political factors necessary to achieve the efficient movement of dangerous goods.
- To propose reforms for port administration, and make other recommendations.

There are six chapters in the study.

Chapter 1 focuses on a brief introduction of what is going to be presented in this paper, including the background, the objective, the methodology and scope of this study.

Chapter 2 introduces the current legal and administrative systems of the port organization in Thailand, including the principles and procedures that have been followed in applying international conventions to Thai law.

Chapter 3 analyzes the shortcomings in the existing administration system for the handling and storage of dangerous goods in Thailand.

Chapter 4 evaluates the main factors that need to be taken into account in order to improve the management and control of dangerous goods, namely the financial, commercial, legal, technical and environmental considerations, information analysis and geographic location, and including a proposed case study of the contingency plan.

Chapter 5 proposes ways to improve the safety management regime and effectiveness of the transportation of dangerous goods, including making recommendations on the general principles that should guide the administrative systems for handling dangerous goods. It also outlines the steps to be taken in the future.

Chapter 6 concludes the study.

CHAPTER 2

Port locations and roles

2.1 Introduction

Port service is a key factor in the provision of maritime transport to the customer. Within the transport process the transport challenge is magnified by the fact that a whole range of goods, sometimes in one shipment, have to transit corridors which often pass through population centers. Due to this circumstance, incidents have increasingly occurred during the process of loading and unloading, or in the storage and segregation of cargoes. The geographical location of ports and their roles are both significant factors in achieving an effective maritime transport chain. A study in Thailand has shown that 60% of accidents involving dangerous goods occurred during transportation. Therefore, the means for controlling the movement of dangerous goods needs to be analyzed so as to effect improvements in procedures.

This chapter is divided into 4 sections. First of all, it describes the location of the various ports, and in particular those Thai ports offering deep access. Secondly, it introduces the port administration system, including the structural autonomy of public ports and private ports. Thirdly, it addresses the environmental impact assessment (EIA) requirements for ports and harbour development projects. Finally, it addresses the role of those organizations having responsibilities for the safe transport of dangerous goods and related activities in port areas, including the roles of the ports and the Maritime Administration (MARAD) with respect to legislation, regulation and international conventions.

2.2 Location of Thai ports

The Kingdom of Thailand is located in Southeast Asia. It has a population of 61 million inhabitants and covers a total area of 514,000 sq. km. with a land surface of

511,770 sq. km and water surface of approximately 2,230 sq. km. Also, there is 219 km of the total coastal line extending along two ocean coastlines, namely the Pacific Ocean and Indian Ocean. In varies of its strategic location and open economic system, Thailand is well placed to establish trade connections with various countries worldwide. During the 1997-1998 fiscal year, from October to August, the volume of dangerous goods in packaged form processed by the Bangkok Port Authority amounted to 251,591 packages or 20,916,382 kg.

The principal dangerous goods operations in port areas can be divided into two types of trade, namely domestic and foreign. It is difficult to differentiate between the trades because some ports service commodities that comprise both domestic and foreign trade, including transshipment cargoes.

The geography of ports fall into three categories: river ports; river ports with deep channels; and coastal ports or seaports.

2.2.1 River ports

The principal navigational and berthing facilities consist of small wharves or jetties for inland water transportation, for instance, the private wharves along the Chao Phraya River, and the Ayuthaya, Nakhon-Sawan wharves. Moreover, Mea-Sai's Port is riverine, situated on the Mekong river, which flows from China, through Myanmar, the Peoples' Republic of Lao, Thailand to Cambodia.

2.2.2 River ports with deep channels

These are riverine ports situated at different locations on rivers. The principle feature is a deep navigational channel that can receive ships of more than 500 grt and draft of 3-8 meters. The principal locations of the river ports with deep channels are:

- Bangkok Port Authority, and the private wharves that lie on the other side of the Chao-Phraya river, from the entrance of the Chao-Phraya river up to the Bangkok bridge. (shown in Appendix 1).
- The Port of Chanthaburi, at the mouth of Chanthaburi river.
- The Port of Kantang, on the bank of the Trang River.
- The Port of Khanom, Suratthani province, Southeast coast
- The Port of Tha-Thong, estuarine port at the confluence of the Tapi river and the Tha-Thong canal.
- The Port of Krabi, on the left bank of the Krabi River
- The Port of Pattani, on the right bank at the mouth of Pattani River
- The port of Ban Don, Suratthani province, on the bank of the Ban-Don River.

2.2.3 Coastal ports or sea ports

Normally, all of these ports support foreign trade with deep channels. The principal locations of the coastal ports are;

- Leam-Chabang Deep Sea port, located in the Eastern Seaboard area.
- Sriracha Harbor seaport, located in the Eastern Seaboard area.
- Mab Taphud Port, a specialized port for heavy industries located in the Eastern Seaboard area.
- Songkla Port, a regional port on the Eastern side of the peninsular, located on the Southern Seaboard
- Phuket Port, a regional port on the Western side of the peninsular, located on the Southern Seaboard.

All of them are shown in Appendix 2

2.3 The Port administrative system

The Kingdom of Thailand is a constitutional monarchy. Constitutionally, power rests with the Prime Minister, a Cabinet, and a bicameral legislature composed of an appointed senate and elected house representatives. The ports administrative systems are quite varied. For instance, the Port Authority of Thailand (PAT) was established as an autonomous body under the general supervision of the Ministry of Transport and Communications. Its administration and operational policies are laid down by the Board of the Port Authority, consisting of a Chairman and ten members. The Board, with the approval of the Cabinet, appoints the PAT's Director General who may also be a Board member. The Director General manages the Authority with the support of his deputies and directors of departments whose organization is shown in the appendix 3 Another example is the Harbor Department, established under the administrative and operational policies of Ministry of Transport and Communications. It is a governmental organization.

This means that there are a number of different organizations responsible for activities at each port, for instance

- Leam-Chabang Deep Sea Port is under the responsibility of the Port Authority of Thailand, Ministry of Transport and Communication. In addition, parts of the terminal are operated by private leasing companies.
- Sriracha Harbor seaport, which is located in the eastern seaboard area, is a private port.
- Mab Ta-Phud Port is under the responsibility of the Industrial Estate Authority of Thailand, Ministry of Industry.
- Songkla Port is under the responsibility of the Harbor Department, Ministry of Transport and Communications. Nowadays, it is a landlord port.
- Phuket Port is a landlord port, operated by a private company.

- Private ports are under the control of the Harbor Department (HD) with respect to safety handling of operations between ship to shore, shore to ship, or ship to ship.

With regard to the management concept, it may be seen that ports in Thailand exist under a variety of different responsibilities and organizations.

2.3.1 Service port management

Under the 'service port' concept the port itself develops, owns and maintains the infrastructure, superstructure and stevedoring equipment. All stevedoring workers are employed by the port management. Functions other than stevedoring are either the responsibility of the port itself or are privatized. The Port of Singapore is a good example of this type.

2.3.2 Tool port management

Under the 'tool port' concept the port itself owns, develops and maintains the infrastructure and superstructure and provides and maintains the stevedoring equipment. Stevedoring workers may be contracted to private stevedoring companies. Also, functions other than stevedoring are either the responsibility of the port itself or are privatized. The Port of Le Havre, France and the Bangkok Port Authority are good examples of this type.

2.3.3 Landlord port

Under the 'landlord port' concept the port itself develops and maintains the infrastructure. The superstructure, and the operation of stevedoring equipment are provided by private companies. Pilotage, bunkering, tugs, inland transport, warehousing and distribution may also be operated by private companies. In addition, stevedoring labor may be contracted to private stevedoring companies. The Port of Rotterdam is a good example of this type.

2.3.4 Private port.

A privatized port itself owns, develops and maintains the infrastructure and superstructure, and provides and maintains the stevedoring equipment. Pilotage, bunkering, tugs, inland transport, warehousing, stevedoring labor and distribution may be operated by private companies or the port itself. The Sriracha Harbor is a good example of this type. The safety operation during ship berthing is under the responsibility of Harbour Department, and the storage process is under the responsibility of the port itself and the Industrial Department.

Table 2.1: A comparison of the major types of port management

types of port management	Infrastructure • Approach channels • Quays • Road, rail, pipeline	Superstructure • Warehouses. • Equipment.	Stevedoring Labor
Service port	Public	Public	Public
Tool port	Public	Public	Private
Landlord port	Public	Private	Private
Private port	Private	Private	Private

Source: Modified Mancion, 1998

It may be seen that ports in Thailand existing under variety of different responsibilities and organizations. For instance, the Bangkok Port Authority (Klong-Toey) operates as a tool port, Leam ChaBang and Songkla ports function as landlord ports. Private port operations apply at Sriracha Harbor port where the stevedore companies are private companies.

2.4 Environmental Impact Assessment (EIA) requirements for ports and harbor development projects

Environmental impact assessment (EIA) provides the means to assess how human disturbances are likely to affect the environment. Where a need arises for expansion of the infrastructure at a port, or the construction of new ports or jetties, the port owner must seek permission from the Ministry of Transport and Communications, and the Environment Impact Assessment Institute in order to ensure that the infrastructure does not obstruct the channel, change the direction of the current, nor adversely affect the environment in and around the vicinity of the port.

Such disturbance could give rise to both social effects (loss of fishing, pollution of water) and biological effects (reduction in bio-diversity of reefs near the development).

In terms of the biological assessment, it is very important to follow the proper procedures when sampling the environment. This means, taking samples before and after the disturbance at both control and impact sites. For example, if a harbor was to be constructed at place "A", the reef would need to be sampled, (i.e. fish, corals counted, etc) in this location several times before the development, (say every 3 - 4 months for several years), and several times after the development has been built. Also, the same techniques would need to be used before and after, at several other locations "B", "C", "D", etc. which are similar to "A", but will not be disturbed. These are the "control" locations. In the analysis of the data to assess the impact of the development at site "A", the number of fish and corals at site "A" should be tested to establish whether the number went down after development, compared with total numbers at the control location B, C and D.

It is very important to have both the before and after data at the impact and control locations. If either are missing, it is impossible to assess the effects of the disturbance.

Table 2.2: The comparison of the status of EIA requirements for Port and Harbor Development Projects.

Countries/Areas	Status of EIA		Requirements	
	A	B	C	D
Thailand		♥		
Republic of Lao				♥
Indonesia		♥		
Malaysia	♥			
Japan	♥			
Philippines		♥		
Singapore		♥		
Brunei			♥	

Source : Summary of "Questionnaire on Environmental Impact Assessment in your port (s), April 1991" TACD, ESCAP

Type of EIA legislation (♥)

A: Specific legislation on EIA

B: Approval required from a government agency for particular project

C: No local requirements for EIA, except through the request of international funding agencies such as the World Bank or Asian Development Bank

D: No particular requirements for EIA

2.5 The role of MARAD, the organization responsible for the safe transport of dangerous goods and related activities in port areas

There is a need for surveillance by the state (MARAD) when ships enter territorial waters, and this need continues in port or harbor areas until they leave. Controls also need to ensure safety of navigation in approaches to the port to avoid collision or grounding. Loading and unloading operations may involve both ship's crew and shore personnel. The methods of cargo handling, and identification of types of commodities, as well as their storage and segregation requirements, need to be clearly established in order to ensure that cargoes are handled in the proper way. If an incident occurs, it may affect not only those involved in the operations, but also people living near to port areas.

Environmental deterioration in a port area could result from a possible accident, from port development, from day-to-day port operations or from developments in neighboring cities.

Regarding safety and effectiveness, the legal requirements need to be compatible, with the other modes of transport. In fact, it is essential that the various legal requirements apply to different modes of transport, so as to avoid overlapping of jurisdictions, as well as the potential for gaps in standards.

A port is a large, complex organization involving, people, sea-going ships, inland transport, shipping companies, customs and immigration. In fact, these conditions vary from port to port. Each port can design its own regulations, special operations or administrative procedures for dangerous goods by extending them to incorporate local conditions. The authority has to be based on national law and international regulations. Both international and local regulations should apply to the ports in order to ensure conformity and cooperation between various users.

2.5.1 The status of dangerous Goods in relation to Thai's maritime transport legislation

The status of dangerous goods, dangerous substances and hazardous substances in relation to Thai law is quite complicated. It is for example, difficult to answer the question as to what constitutes dangerous goods. It is apparent that dangerous goods have been defined in various ways, depending on the user objective and the respective purpose, but these definitions are not the same. (Thai-Working session Report of Group Experts on chemical Classification for the Transport of Dangerous Goods, November 18 1997, p 4, translated). Moreover, each government organization defines 'dangerous goods' in different ways.

In the period following 1974, when the International Convention of Safety of Life at Sea (SOLAS 74) was adopted, the government of Thailand, under the responsibility of the Ministry of Transport and Communications, and more specifically the Harbor Department, ratified this Convention which entered into force 1984. Under the provision of this Convention, Chapter III, "Packing, Identification, Marking, Labeling and Placarding of Dangerous Goods" calls for enactment of national law so as to classify substances as follows: class 1:explosives, class 2:gases,, class 9: miscellaneous dangerous substances. This now forms part of the law of navigation in Thai territorial waters (B.E. 2456) 1913, but the details of transportation procedures are not set out in the regulations.

2.5.2 The main international conventions and codes are accommodated in Thai maritime transport legislation

The main international conventions and codes are accommodated in *The Navigation in Thai Territorial Water Act B.E.2456* (1903) based on maritime transport and port activities as follows:

- The recommendations on the Transport of Dangerous Goods prepared by the United Nations Economic and Social Council Committee of Experts. It is called the "Orange Book"
- International Convention for the Safety of Life at Sea, 1974, and its Protocol of 1978 (SOLAS (amended) 74/78).
- International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 thereto (MARPOL (amended) 73/78).
- International Convention on Standards of Training, Certification... and Watchkeeping for Seafarers, 1978, as amended (STCW (amended) 95)
- Convention on Facilitation of International Maritime Traffic (FAL), 1976.
- The International Maritime Dangerous Goods Code (IMDG Code).
- The Code of Safe Practice for Solid Bulk Cargoes (BC Code).
- The International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code or IBC Code).
- The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (International Gas Carrier code or IGC Code).
- The Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on board Ships (INF Code).
- Bulk Chemical Code (BCH Code).

2.5.3 The main international instruments influencing the safe transport of dangerous goods and related activities in port areas

Basis: UN recommendations for the carriage of dangerous goods for all modes of transport.

2.5.3.1 International Conventions

- SOLAS 74 (IMO)-chapter II-2, as amended, deals with the construction, fire protection, detection and fire extinction of ships. Part C (fire safety measures for cargo ships) contains, in regulation 53, the requirements for the fire protection arrangement in cargo spaces, and in regulation 54, in addition to the requirements of regulation 53, the special requirements for ships carrying dangerous goods.
- SOLAS-Chapter VII, as amended in 1996, regulation 1 of part A- requires each Contract Government to issue, or cause to be issued, detailed instructions on safe packing and storage of dangerous goods which shall include the precautions necessary in relation to cargoes. The other six regulations of part A (including new regulation 7-1) deal with: the packing, identification, marking, labeling and placarding of dangerous goods; the documentation which is to be provided; storage and segregation requirements; the carriage of explosives on board passenger ships; and reporting of accidents involving dangerous goods. Regulation 2 divides dangerous goods into nine classes, class 1: explosives, class 2: gases, ...class 9: miscellaneous dangerous substances (classification of cargoes as defined in Appendix 4). Also this chapter contains mandatory requirements, and provides the necessary legal basis for international and national regulation for the transport of dangerous cargoes by sea.
- MARPOL 73/78 (IMO), This convention adopted in 1973 covered six chapters as Annexes: I Pollution by Oil, II-Chemical, III-Harmful Substances in Packaged Form, IV-Sewage, V- Garbage, and Annex VI Air Pollution. The objective behind the regulations contained in Annex III is to identify marine pollutants to ensure packing and storage on board ship in such a way as to minimize accident pollution as well as to aid recovery by using clear marks to distinguish them from other (less harmful) cargoes. (Focus on IMO, MARPOL-25 years, October 1998). The regulation requires the issuing of detailed standards on packing, labeling, marking,

documentation, storage, quantity limitations, expectations and notifications for preventing or minimizing pollution by harmful substances.

- FAL(IMO), which covers the use of a declaration standard form of documents for transport of goods.
- OPRC (IMO) International Convention on Oil Pollution Preparedness, Response and Co-operation was adopted in November 1990 and entered into force on 13 May, 1995. It provides for a global framework of international co-operation in combating major accidents or threats of marine pollution from oil.
- HNS (IMO). The convention on Hazardous and Noxious Substances introduces strict liability for the shipowner, higher limits of liability than the present general limitation regimes and a system of compulsory insurance and insurance certification.
- CSC (IMO), The objective of this Convention is to maintain a high level of safety of human life, as well as uniform international safety regulations in the transport and handling of containers, by providing generally acceptable test procedures and related strength requirements which have proven adequate over the years, including procedures for dangerous cargo carriage in container freight.

2.5.3.2 Codes

- IMDG Code (Dangerous goods in Packaged form) covers chemicals, and provides guidelines for packaging manufacturers, packers, shippers, forwarders, carriers, and port and terminal operators on classification, terminology, identification, packing and packaging, marking, labeling and placarding, documentation and marine pollution aspects. Port authorities, terminals operators and warehousing companies all consult the IMDG Code in order to segregate and separate dangerous cargoes in loading, discharging and storage-keeping areas.
- BC Code (Bulk carrier). The principal thrust of this Code is the provision of an international standard for the safe transport by sea in bulk (gain) of dangerous

goods such as iron ore, by prescribing the design and construction standard of ships, regardless of the tonnage involved in such transport, and of the equipment they should carry, so as to minimize the risk to the ship, its crew and to the environment, having regard to the nature of the product carried.

- IBC Code (Chemical Tanker). The principal thrust of this Code is the provision of an international standard for the safe transport by sea in bulk of liquid dangerous chemicals, by prescribing the design and construction standard of ships, regardless of the tonnage involved in such transport, and the equipment they should carry so as to minimize the risk to the ship, its crew and to the environment, having regard to the nature of the product carried.
- IGC Code (Gas carrier). The principal thrust of this Code is the provision of an international standard for the safe transport by sea in bulk of liquefied gases and certain other substances, by prescribing the design and construction standard of ships engaged in such transport, and the equipment they should carry, so as to minimize the risk to the ship, its crew and to the environment, having regard to the nature of the products involved.
- INF Code (Irradiated Nuclear Fuel on board Ships). The principal thrust of this Code is this provision of an international standard for the safe carriage of Irradiated Nuclear Fuel, plutonium and high-level Radioactive Wastes in Flasks on board ships, including a requirement for a shipboard emergency plan for any vessel carrying INF Code material and a provision for notification in the event of an accident.
- Code for the Safe loading & unloading of bulk carriers, where the principal thrust of the Code is the provision of an international safe standard for cargo loading and discharging.
- Code of Safe Practice for Cargo Stowage and Securing (CSS Code) where the principal thrust is the provision of an international safe standard for cargo stowage and securing arrangements on board.

2.5.3.2 Guidelines

- UN/ECE/ILO/IMO Guidelines for Packing of Cargo Transport Units(CTU)
- OECD Guiding Principles for Chemical Accidents(OECD/IMO Port supplement)
- UNEP Awareness and Preparedness for Emergencies at the Local Level (APELL)

2.5.3.3 Recommendations

- The recommendations on the transport of Dangerous Goods.... "Orange Book", which was developed by the UN's Economic and Social Council (ECOSOC), established the minimum requirements applicable for the transport of dangerous goods by all modes. These recommendations offered the general framework within which existing regulations could be adapted and developed, the ultimate aim being word-wide uniformity across all modes of transport.
- AGENDA 21 of the Rio Conference is mainly to be found in Chapter 17, which particularly concerns the protection and sustainable development of the marine and coastal environment and its resources.
- The recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas (IMO) address the need to harmonize the rules applying within port areas with the rules that are applicable to ships, in order to ensure smooth operations and to avoid misunderstandings between ship and shore, including the packing and stowage of its cargoes.

2.5.3.4 Other instruments, e.g. European Transport Regulations

- RID (Rail Transport).
- ADR (Road Transport).
- ADNR (Inland Waterway Transport).
- Transport Regulation of International Atomic Energy Agency (IAEA).

2.5.3.5 The major non-governmental organizations dealing with protection of the environment in port areas

- IAPH (International Association of Ports and Harbors), which is mainly concerned with dangerous materials, water pollution, impacts on port development, risks of accident, impacts on quality areas, regulations against pollution.
- CMI (Comité Maritime International), who organized a seminar on the various aspects of liability and indemnification related to marine pollution.
- PIANC (Permanent International Association of Navigation Congress). The congress that foster progress operation of inland and maritime waterways, of inland and maritime ports and coastal areas, for the benefit of mankind; compiled and publish information about subjects in its field.

CHAPTER 3

Analysis of the current administration system in Thai ports for the handling and storage of dangerous goods

3.1 Introduction

Millions of tons of chemical and petroleum products are transported by seaborne trade. It is estimated that more than 50% of packaged goods and bulk cargoes can be regarded as dangerous, hazardous and/or harmful (marine pollution) under the IMO classification, designation or identification criteria. (IMO lecture notes, 1996). Many of them are defined as raw materials used in the industrial production process.

As the Kingdom of Thailand becomes more industrialized, large quantities of complex, dangerous goods are being transported by ships through the ports, before delivery to the industries or other users. In 1993, the ports handled 90% of total import and export commodities, of which a little over 35% was classified as dangerous goods. In 1994, the Bangkok Port Authority was visited by some 3,500 foreign ships, and handled over 10 million tons. Around 300,000 tons of goods were classified as dangerous. (BSAA 1994, pp. 122). The movement of dangerous goods may be handled by direct or indirect means depending on port rules, client needs, or its nature. For instance, dangerous cargoes class 1 (explosives), class 6.2 (infectious dangerous substances), and class 7 (radioactive materials) are basically direct movements. Within the handling process the problems are magnified since a whole range of goods have to transit or be stored.

Because of limitations in resources, such as expertise and lack of up-to-date legislation, incidents and accidents involving dangerous goods occur all too frequently. Any improvement in the present situation needs to recognize agreement required in the administration, regulations, operational procedures and emergency response requirements as well. The need to increase safety in transportation and handling of dangerous goods also need to analyzed.

This chapter analyzes the national and port administration systems for handling and storage of dangerous goods in ports areas. It is divided into three 3 main topics. First of all, an analysis is made of the respective roles of Maritime Administration, port and cargo interests in the responsibilities in the developed of legislation, rules and regulation. Secondly, an analysis is provided the regulatory process as it affects ships, shore and cargo interests. Thirdly, a case study is made of the requirements and precautions necessary for the transportation of class 5.1 cargoes under the IMDG Code in Thai ports, including consideration of safe transport and technical aspects.

3.2 Analysis the roles of the Maritime Administration, ports and cargo interests in the development of legislation, rules and regulations

The roles of government agencies controlling the movement of dangerous goods in Thailand is highly complex, especially in maritime transport. The safe transportation of dangerous goods in Thailand is difficult to effect successfully because of the large number of government ministries and agencies, which number more than 24 organizations each having varying degrees of responsibilities. This confuses the line of command and introduces a large number of Acts and regulations, many of which are in conflict with each other. The related administrative procedures in terms of documentation, information transfer between agencies, and coordination is overly

complex, and the technical regulatory framework also causes additional problems in enforcement.

For instance, the policies and practices of local agencies such as private ports, that control the movement of dangerous goods, are grossly inadequate and outdated and there is a lack of harmonization of legislation and regulations between the organization and nationally recognized requirements. This has created a complex and unsafe situation for the transport of dangerous goods. Furthermore, there is no will to participate in developing the rules to be followed internationally until or unless an incident actually occurs. In addition, a variety of laws overlap, or serve to confuse cargo interests in their efforts to make appropriate transportation arrangements.

The significant factors influencing the handling and storage of dangerous goods can be itemised as follows:

3.2.1 Rules, regulations, legislation, Acts

There currently existing a wide variety of rules, regulations and different Acts because each agency has interpreted and enforced them under their own rules. There is no central body to act as a focal point to address concerns related to transport, and the central government has been unable to provide a suitable basis for regulation under one umbrella in order to facilitate uniform application, and ensure harmonizing of rules and regulations, that reflect stipulated safety levels for the transport of dangerous goods transport across modal.

The central government is responsible for exchanging knowledge and seeking agreement in international fora. Moreover, sometimes the government appoints a wrong participant to attend international conferences. This means that some related organization may not follow international regulation changes, for example private

ports may not follow safety requirements such as an increase in the port equipment, documentation and staff training called for under international agreement.

In addition, the rules and regulations are out-of-date and lack detailed classification of dangerous goods, particularly with regard to construction labeling and type approval of packing, as well as inspection processes for specific documentation for dangerous goods, and written instructions for emergencies.

The related Acts do not go further than the standards called for by international conventions because of the lack of awareness of the government due to the current political situation.

3.2.2 Coordination and cooperation

The means of coordination between responsible ministries and authorities and other bodies have not been defined in a way which is clear and easy to grasp. Because of the differing legislative requirements and different levels of responsibility, the ministries and agencies play their own roles; sometimes their policy and enforcement responsibilities are confused too, for instance, the line of command may be interrupted by the other organizations.

Moreover, there is a lack of commitment to communication and harmonizing regulations which causes problems among the governmental organizations as well as among institute research and testing institutes. For instance, in relation to inspection of packaging of dangerous goods in packaged form, it was found that cooperation between the Harbor Department as the competent authority, and the testing institutes never occurred until a serious accident occurred. Another example is the lack of coordination between stevedores and port workers during dangerous goods movements from ships to land sites.

At the port policy and planning level, the lack of coordination and liaison between the various links in the transport chain shows up at the terminal and large number of unnecessary handling operations, therefore, grossly prolongs the inland cycle times for dangerous goods.

3.2.3 Enforcement

The confused situation with regard to enforcement of rules clearly influences the shipping business as well as government agencies, for instance, shippers need to increase budgets and responsibilities in order to fulfill the regulation requirements for safe transportation in such areas as documentation, staff and overhead administration. The confusion may involve over overlap of lines of enforcement as well as the large number of Acts to be complied with due to the varying governmental agencies responsible. Furthermore, it will take a long time for many regulations to be developed to support a well functioning system and for technical regulations to be clear and understandable. In addition, authorities responsible for the enforcement are not clearly identified, and personnel performing the checks are not well trained, and lack expert knowledge.

Ineffective enforcement procedures may lead to increases in of documentation and even in permits, as a tool in governing transportation. Also, the absence of a well developed system of rules and regulations for dangerous goods may adversely affect MARAD, ports and cargo interests, for instance, by increasing documentation and the processing of permits.

3.2.4 Human resources

There is a lack of expertise among personnel involved in the handling and storage of dangerous goods. Also, the nature and size of the education and training programme required has not been defined. Nor have the target groups been identified, nor when

and how the system as a whole or its various parts should be introduced. Generally, training of staff is based on site visits and class lectures. Another example is lack of necessary degree of awareness and commitment of all agencies required in order to fulfill the development of a comprehensive training programme for different target groups, such as seafarers, shore staff, pilots, and administrators.

3.2.5 Information system and risk analyses

The relevant information system on the properties of dangerous goods does not cover all the relevant classification, labeling and handling requirements of all modes of transportation since dangerous goods are moved by multimodal transportation. The existing extensive databases are not aligned with international regulations, and there are no linkage in systems between counterparts in government agencies. Each agency has adopted its own database system in order to carry out its activities, and to collaborate among agencies. For instance, identification, classification, reports and documentation on the properties of dangerous goods transported by sea and delivery to road or inland waterways are classified in line with following the international regime. On the other hand, land transport is still based on local requirements.

The central government lacks commitment to set up a general information database system under one umbrella such as emergency services and details of locations of sophisticated equipment to be used in serious accidents.

Risk analyses is an instrument to minimize the risk for accidents and severe consequences during the transport of dangerous goods. It is important to develop models for the risk analyses in order to cover all accidents, such as evaluating the specific situation and the environment changes in different situations. No such models prescutly exist.

3.3 Analysis the regulatory process

Dangerous goods are packed in drums, cases or containers, and they are transported by the processes of, handling, storage and delivery carried out by the user. The majority of processes involve a ship carrying dangerous goods, include arrival in the port area, berthing, loading, discharge, transit, storage and delivery to the customer. The operation process can be broken down into the following categories.

3.3.1 Acceptance of dangerous goods in port areas

Due to the wide variety of Acts, as well as its own regulations, it is quite difficult for a port to follow international regulations exactly. Experience has shown that, in order to reduce costs, there is a presently on the part of some shippers not to declare goods as dangerous. Also some ports allow certain types and quantities of dangerous goods to transit or load and unload without the knowledge and agreement of port staffs. Important shortcomings include the lack of MARAD regulation in order to enforce the use of facilities and the location of port requirements. This is due to a lack of up-to-date regulatory provisions.

3.3.2 Advance notification

Regarding loading and unloading in port areas, there is a requirement for a ship to notify MARAD and the port of call at least 24 hour before the ships is due to enter into Thailand territorial waters.

In practice there is insufficient notification provided to the authority in order to allow its to check and handle cargoes, including placing limitation type and quantities of cargoes. In other words, MARAD and the port of call can not verify details such as the classification, type, quantity, and packing group of cargoes, and arrange any necessary

correction in advance. As a result, MARAD and the port of call can not take the necessary precautions in case of a specific risk from such goods.

Furthermore, such notification is only used in the processing of government requirements and papers reports, not for the evaluation and preparation of possible corrective measures in order to improve the safety and efficiency of operations. For instance, imported dangerous goods, whether loaded or unloaded, must be permitted by MARAD and the port of call before ship operations can commence. On the other hand, exported dangerous goods loaded and cargoes remaining onboard do not need a permitted and no advance notification by MARAD and the port of call is required before operations proceed. This means that for domestic movements of dangerous goods, especially cargoes loaded in Thai's ports, MARAD and the port of call do not have effective control over the safety of operational processes.

The master and ship's agents should provide advance notification to the state in line with IMO recommendations as follows:

SOLAS regulation VII/5 and MARPOL 73/78, Annex III, regulation 4, were amended to include the requirement for ships to make available, to the port State authority, a detailed stowage plan and a list of all dangerous goods with their stowage position on board prior to leaving the port. This serves to ensure the availability of information on dangerous goods on board in cases where the relevant cargo documents cannot be obtained or communication is impossible due to an accident involving the ship. It can be used to ensure advance notification to the next port of call. (The Safe transport of dangerous cargoes in port areas, p 27, IMO)

In practice ship masters, shipowners, or ship agents, never submit to the MARAD a detailed stowage plan, nor a list of all dangerous goods with their storage position on board prior to or after leaving port. Furthermore, MARAD and the port of call do not have necessary regulatory requirements to complete ship masters, shipper, shipowners, or ship agents to inform the state. The regulation required only that

dangerous goods arriving from aboard shall be permitted by MARAD before operations processed. On the other hand, dangerous goods departing from Thai ports, loaded or unloaded, do not need to be permitted nor does documentation submitted to MARAD.

In addition, database requirements, and a data-bank of dangerous goods such as types, qualities and the specific areas for damaged cargoes, are not available in an appropriate format in order to support emergency response operations during an accident. For instance, the designated location of documents, details on each special area for emergency accidents, repacking of damaged dangerous goods, and wastes contaminated with dangerous goods.

3.3.3 Berthing, load, discharge and transit of goods

The berthing areas in Bangkok Port are located on both side of the Chao Phaya river. There is a large hinterland supporting the chemical product industry. This has resulted in expansion of a city and growth in the population due to people moving to nearby port operational areas. The dangerous goods and chemical products are serious issues that influence the safety of ships as well as people within port areas. There is a lack of quality control in operational safety procedures such as a check list with standard procedure for loading, discharging and transit of goods. Therefore, in the restricted area of the Chao Phaya river, ships can not be removed along until their cargoes to specific areas, if an accident occurs during ship berthing, loading or unloading of dangerous goods.

Since 1996, the government has been pressuring a two year project to move chemical operations from the other side of the Chao Phaya river to specific areas such as the Eastern Seaboard areas. Presently, the mission has not yet been successful because it has been opposed by several interests in the chemical industry, especially in the

private sector. These private chemical wharf owners have tried hard to convince the government to postpone the proposed changes.

3.3.4 Inspection

MARAD and the ports of call do not make regular inspections to ensure the implementation of the safety precautions for handling of dangerous goods. The principal reason is because staff, crews and cargo interests are not aware of handling requirements for dangerous goods, and also they are not well-prepared to participate in inspection processes. An other reason is the insufficiency of inspector's knowledge that may cause delays in the of inspection process, and inadequate enforcement of regulations.

Futhermore, procedures are difficult too because there are no clear legal obligation nor a dedicated budget to support inspection which gives rise to bureaucratic delays in the decision-making process. In addition, lack of motivation can be identified as a cause of inefficiency in the application of procedures for inspection.

The process of inspection involves the following elements:

- Inspection of documentation and certificates concerning the safety precautions taken by ships, handling procedures and storage conditions.
- Inspection of the processes for handling dangerous goods, including how storage of damaged dangerous goods might affect the environment in port areas, for instance, human, marine life and other cargoes.
- Inspection of the physical condition of all packages, unit loads, tank-containers, portable tanks and vehicles containing dangerous goods to ensure that they have current safety approval plates in accordance with the international regulations such as SOLAS, CSC and IMO/ILO guidelines

3.3.5 Emergency procedures

There are more than 20 wharves in the Chao Phaya river. Every port has its own emergency response arrangement, but there are lack of cooperation, both within port's departments and outside the port area. Also, the appropriate emergency arrangements are not set out clearly as to how they are to be appropriately achieved. There is a lack of regular emergency procedures training for users both on-shore and on-board. In addition, the port emergency plan is not harmonized with National Emergency Plan. For instance, the port emergency plan is not recognized in any part of the National Emergency Plan, such as the National Oil Spill Plan or National Rescue Emergency Plan. This means that response teams would not be able to coordinate their actualities effectively.

Nowadays the principal elements of the port's emergency response plan in Thailand do not follow the hazardous standard procedures, such as:

- Hazardous identification; chemical: type, location, quantity, properties, behaviour.
- Vulnerability analysis: vulnerable zone, population within vulnerable zone, private and public property that may be damaged, environment that may be affected.
- Risk analysis: probability of hazardous occurrence, consequences if people are exposed, consequences for property, consequences for the environment, probability of simultaneous emergencies, unusual environmental conditions.
- Emergency response resource evaluation (reduction of consequences): personnel, equipment, supplies necessary for damage control and mitigation, emergency medical service, protective actions, traffic control, etc.

3.3.6 Reporting of accident

The ports, MARAD, fire brigade and local organizations have not agreed upon a common standard procedure for the accident report. A prompt and effective response and treatment of injured personnel requires a concise and accurate description of the incident that is made available to the emergency response center as quickly as possible. Despite this, the actual situation in the inland waterways, especially the more than 20 private wharves in the Chao Phaya river, in that the National Emergency response standard is not complied with. Furthermore, the description is not available for use by the emergency response, combating teams. The description should include such detail as

- Nature and time of incident
- Precise location
- Type, quality and condition of cargo involved.
- Particular hazards present and marine pollutant.
- Details of marks and labels
- Shipping name/IMDG code class, UN number.
- Name of the manufacturer of the cargo
- Extent of damage and pollution
- Sequence of events leading to the incident
- Number and type of injuries and fatalities

3.3.7 Port facilities

The quantity and type of dangerous goods give rise to the need for separate storage areas to ensure adequate safety by ensuring separate ventilation, drains and fire-resistant walls, especially in the area of the warehouse and the terminal. Virtually no terminal

have a strategic plan and equipment planning the storage of dangerous goods in specific areas, especially the small private wharves.

Furthermore, efficient facilities are difficult to provide because of the limitation of port area, for instance,

- Lack of repair or maintenance work areas, ship fumigation facilities and specific warehouse facilities, especially in Chao Phaya river, where there is no room to fumigate ships when an accident happens.
- Reception facilities for contaminated bilge water, ballast waste and slops.
- Checklist procedures in the utilization of existing port equipment for bunkering when special permission is required as a precaution against damage. For instance, bunkering petroleum products to foreign ships.
- Barges used for transport by inland waterway. It is a serious situation when a barge is used to carry explosive cargoes or chemical products in inland waterways. The lack of knowledge of crews and lack of availability of existing equipment at small wharf constitute a threat to efficiency and safety.

3.3.8 Sensitivity cargoes

Sensitive cargoes include those such as cargoes class 1-explosive cargoes, class 6.2-infectious substances, class 7-radioactive materials. It has been the practice for MARAD to permit ships only to load/unload at the anchorage at Mid Paknam, a specific area in the Chao Phaya river.

Nowadays, this area is densely of populated so if there is an accident, there is a high risk of major disaster. Moreover, the operational procedures and emergency response for such ships is not provided in an appropriate safety standard procedure even if for direct shipment cargoes.

Regarding the General Introduction, Annex I, the indices and list of definitions, in the IMDG Code, the details of the nine classes of dangerous of goods, are as follows:

- Class 1- Explosives
- Class 2- Gases
- Class 3- Flammable liquids
- Class 4- Flammable solids or substances
- Class 5- Oxidizing substances (agents) and organic peroxides
- Class 6- Toxic and infectious substances
- Class 7- Radioactive materials
- Class 8- Corrosive materials
- Class 9 -Miscellaneous dangerous substances

(The classification of dangerous goods is defined in Appendix 5)

3.4 Case study

In order to study the status of dangerous goods, and the main requirements and precautions, for the transport of dangerous goods and its storage in their warehouses a case is here provided. Figure 3.1 shows the location of cargoes before storage of class 5.1 in warehouse. This issue here is to decide what are the main requirements and precautions to taken for transportation of dangerous goods class 5.1 and, taking into consideration other cargo shipments to be stored. Where should it be stored. At A or B, or C ?

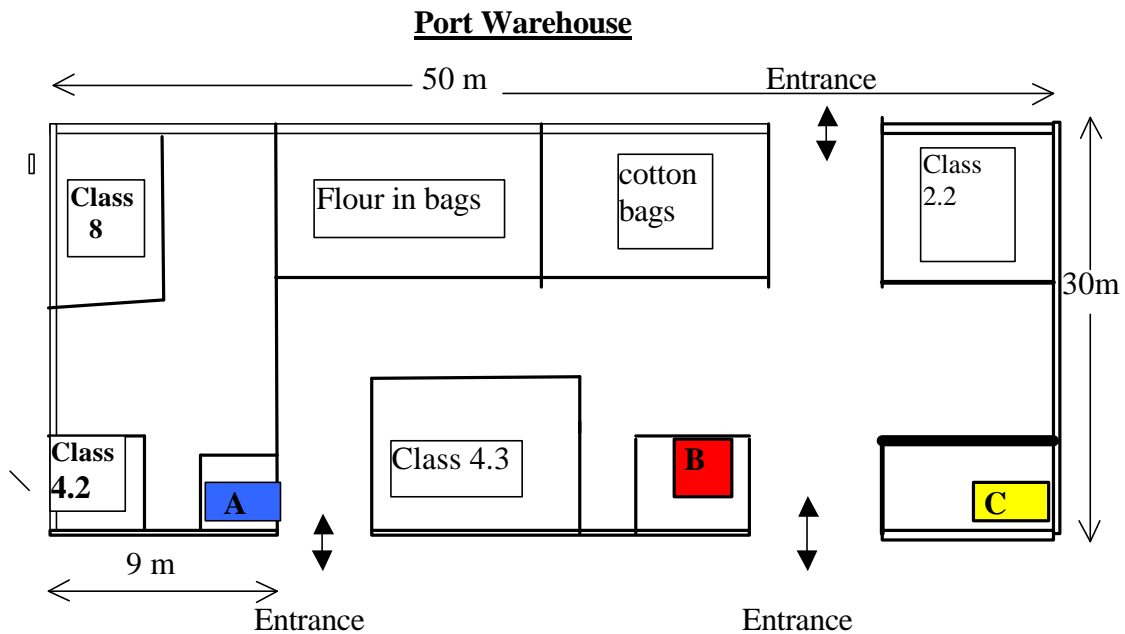


Figure 3.1: The port warehouse plan

Source: Modified Brünings, 1998

The main requirements and precautions to be taken into account in considering the safe storage of class 5.1 of the IMDG Code oxidation substance are packaging, storage, segregation, marking, labelling and documentation.

3.4.1 Basic elements of substance

Oxidizing substances, Class 5.1, are materials which cause, or contribute to, burning of another material by yielding oxygen or another substance that yields oxygen. It means that when dealing with oxidizing substances, although not necessarily combustible in themselves, the risk and intensity of fire may be increased by giving off oxygen. When it is mixed with other substances, it can violently ignite, generate toxic gas and burn with explosive force. Some oxidizing substances have corrosive properties, or have been identified as harmful to the marine environment (marine pollution).

There are many oxidizing substances in this class, for instance, calcium, chlorites, potassium permanganate and ammonium nitrate fertilizers.

3.4.2 Requirements

3.4.2.1 Regulations related to transportation of dangerous goods

Depending on the types of substance, transportation has to comply with the national law and international safety regulations, conventions, codes and recommendations such as the MARPOL Convention 73/78, IMDG Code, BC Code, IBCs Code, the UN recommendation for the of transport of Dangerous Goods (Orange book), and the Recommendations on the Safety Transport of dangerous goods and Related Activities in port areas.

3.4.2.2 Packing

Packing depends on the properties, description, and nature of substances according to the degree of danger. The packing group of substances are: group I (greater danger), group II (medium danger), group III (minor danger). Packages of solids should be "effectively closed". Hermetically sealed packages are required for those in packaging group I. Parts of packaging that indirectly contact with oxidizing should not be affected by chemicals or other reactions with this substance. Where a significant internal pressure may develop in a package by the evolution of gas, a vent may be fitted. When filling packaging with liquids sufficient ullage should be left to prevent leakage produced by expansion of the liquid caused by changes in temperatures. In addition, mixtures possessing more than one hazard should be in accordance with the IMDG Code.

3.4.2.3 Correct Marking/ Labelling/ placarding

Each package containing dangerous goods should be durably marked, so as to last at least 3 month's immersion at sea. The marking, labelling and placarding (proper shipping name placard, UN number) should identify the dangerous goods inside, also the size and color of labels should follow IMO standards (i.e. the labels for packages should not be less than 100 mm x 100 mm except in the case of packages which, because of their size, can only bear smaller labels). For oxidizing substances it is compulsory to state clearly the sub-class (.1) on both placards and labels. The appearance of the text showing the class name is optional. The label used in this class, depending on the individual schedules can be:

Class label (compulsory):

- Oxidizing Agents

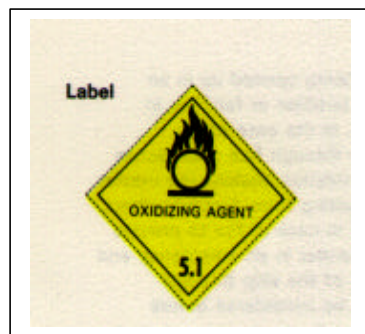


Figure 3.2: The label and placard of substances, Oxidizing Agents

Source: IMDG Code

Subsidiary risk labels

- Poison



Figure 3.3: The label and placard of substances, Poison.

Source: IMDG Code

- Corrosive

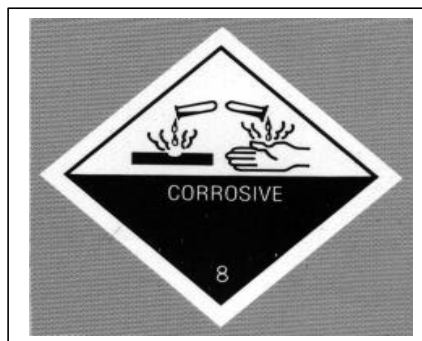


Figure 3.4: The label and placard of substances, Corrosive

Source: IMDG Code

- Marine Pollutant

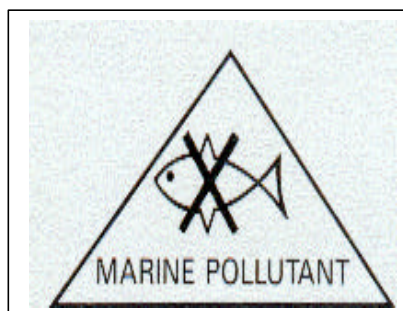


Figure 3.5: The label and placard of substances, Marine Pollutant

Source: IMDG Code

3.4.2.4 Stowage

Before loading and after discharge, or storage in the warehouse, the cargo space should be cleaned of all combustible material. Non-combustible securing and protecting material should be used if possible. Penetration of oxidizing substances into cargo spaces containing combustible material should be avoided.

Packages from which there is apparent leakage or spillage should be refused for shipment. Where on-deckstowage is permitted or under-deck, under-deck storage is preferred. If stowage is on deck, preference should be given to stowage on sheltered area of exposed decks.

Class 5.1 oxidizing substance should be stowed as indicated in the individual schedules in accordance with one of the categories specified below, for cargo and passenger ships. A passenger ship is considered to be a cargo ship for stowage purposes when it does not carry more than 25 passengers or 1 passenger per 3 meters of overall length, whichever is the greater number.

Table 3.1: Stowage category of cargoes stored onboard

Stowage category	Cargo ships	Passenger ships
A	On or under deck	On or under deck
B	On or under deck	Ondeck only
C	Ondeck only	Ondeck only
D	Ondeck only	Prohibited
E	Ondeck only	Prohibited

Source: IMDG Code

Onboard stowage can be done in five different ways shown as:

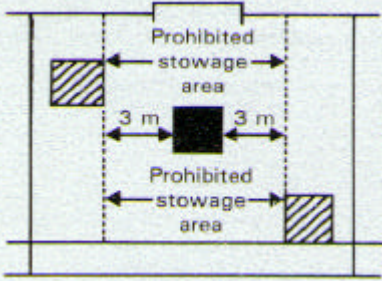
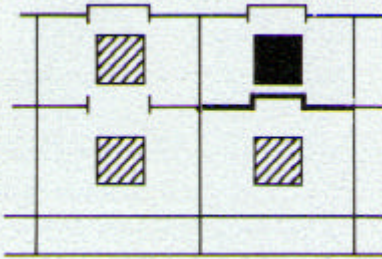
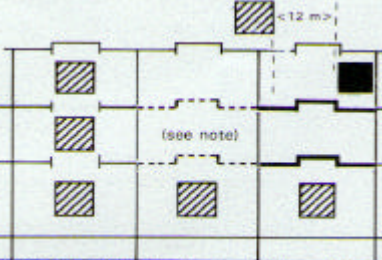
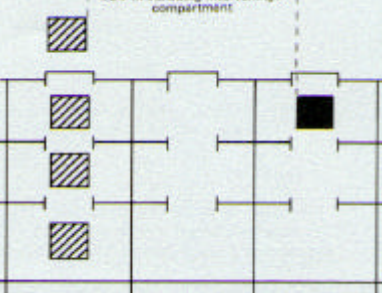
SEGREGATION	SCHEMA
“Away-from”	
“Separated-from”	
“Separated by a complete compartment or hold from”	 <p data-bbox="790 1310 1173 1346"><i>NOTE:</i> One of the two decks must be resistant to fire and liquid.</p>
“Separated longitudinally by an intervening completed compartment or hold from”	
“Segregation, if any, is shown in the individual schedules”	

Figure 3.6: Cargoes stowage in different ways

Source: IMDG Code

3.4.2.5 Segregation and handling (onboard and in port area, in packed and in bulk)

Two substances or articles are considered mutually incompatible when their stowage together may result in undue hazards in case of leakage or spillage; therefore, they must be segregated. The extent of the hazard may vary, and how so will the segregation arrangement. Segregation is achieved by creating a certain distance between incompatible dangerous goods. The IMDG states four segregation terms, which are shown in task for both, packages and bulk cargoes.

- **Onboard** : The oxidizing substance should be segregated from other hazardous materials following the criteria shown in the following chart:

Table 3.2: Segregation arrangement of dangerous goods onboard

Class	Code	Class 5.1(Segregation)
Explosives	1.1, 1.2, 1.5	4
Explosives	1.3	4
Explosives	1.4	2
Flammable gases	2.1	2
Non-toxic, non-flammable gases	2.2	x
Poisonous gases	2.3	x
Flammable liquids	3	2
Flammable solids	4.1	1
Spontaneous combustible substances	4.2	2
Substances dangerous when wet	4.3	2
Oxidizing substances	5.1	x
Organic peroxides	5.2	2
Poisons	6.1	1
Infectious substances	6.2	3
Radioactive materials	7	1
Corrosives	8	2
Miscellaneous dangerous substances	9	x

Source: Compiled IMDG Code

Remarks.

- 1 -"Away from." 2 -"Separated from." 3 -"Separated by complete compartment"
 4 -" Separated longitudinally by complete compartment or hold from"
 x - "No segregation unless otherwise specified"

- **In port areas**, class 5.1 has to be formed with other class material following the criteria described above.

Table 3.3: Segregation arrangement dangerous goods in port areas

Class	Code	Class 5.1(Segregation)
Flammable gases	2.1	s
Non-toxic, non-flammable gases	2.2	0
Poisonous gases	2.3	0
Flammable liquids	3	s
Flammable solids	4.1	a
Spontaneous combustible substances	4.2	s
Substances dangerous when wet	4.3	s
Oxidizing substances	5.1	0
Organic peroxides	5.2	s
Poisons	6.1	a
Corrosives	8	s
Miscellaneous dangerous substances	9	0

Source: Compiled IMDG Code

Remarks.

a : Away from (0-3 meters)

s : Separated from (3-12 meters)

0 : No segregation necessary.

The segregation in port areas depends on the unit load and storage available.

- If the substances in class 5.1 are transported in **packaged form**, **segregation from bulk material** of other class has to be observed according to the following table:

Table 3.4: Segregation of Oxidizing substances in bulk and other goods
in packaged form onboard

Goods in packaged form	Oxidizing substances in bulk
1.1, 1.2,1.3,1.5	4
1.4,2.1	2
2.2, 2.2	x
3	2
4.1	1
4.2	2
4.3	2
5.1	x
5.2	2
6.1	1
6.2	3
7	1
8	2
9	x

Source: Compiled IMDG Code

Remarks

1 -Away from

2 -Separated from

3 -Separated by a complete compartment or hold from

4 - Separated longitudinally by a complete compartment or hold from

x - No segregation unless otherwise specified.

3.4.2.6 Documentation

Documentation should be accompanied by special information and declaration, following IMO standards. For instance, the basic information relative to the hazards of the goods, classification, commodity, UN and IMDG number, packaging group, quantity and minimum flash point in °C. The document declaration has to be filled with the proper shipping name by the shipper.

3.4.2.7 Precautions

- To ensure that ships, stevedores, warehouses or terminal operators have a basic knowledge of the cargoes they handle. Before loading and after discharging cargo spaces should be kept clean in order to avoid the penetration of oxidizing substances into other cargo spaces which may contain combustible from all combustibles material.
- Where leakage or spillage of such substances occurs in an underdeck cargo space. Precaution should be taken to prevent the inadvertent pumping of such spillage or leakage through the machinery space bilge piping and pumps.
- Substances harmful to the marine environment (marine pollutant), secondary risk; special consideration should be given to stowage on a well protected deck or to stowage inboard in a sheltered area.
- Some substances in this class give off oxygen when involved in a fire, therefore, the use of steam, carbon dioxide (CO₂), or other inert gas extinguishers may be ineffective. Fire retardant, such as dry chemicals, neutralizing powder and sand, should be used.
- Ships should always be berthed in a well ventilated space in order to prevent the accumulation of oxygen and the build-up of explosive editions. Also, cargoes which tend to be self-reacting are usually transported under controlled temperatures and/or by adding inhibitors to render stability and safety.

Storage position "C" should be recommended because the segregation table recommends the following:

- Position A should be "separate from" (3-12 meters) class 4.2

- Position B should be " Away from 4" (0-3 meters) class 4.1
- But position C no segregation necessary with class 2.2

CHAPTER 4

Evaluates the main factors that need to be taken into account in order to the improve the carriage of dangerous goods in Thailand

4.1 Introduction

Efficient seaborne trade, especially as it relates to the movement of dangerous goods in world trade, creates important challenges for existing ports, and makes it essential that these ports adjust themselves to the range of trends. The challenges for ports arise from the following:

- Growth in seaborne trade. The need to move goods from one place to another creates a demand for maritime transport. The volume of seaborne trade creates continuous challenges to ports as the demand for cargo to be handled steadily increases. Even though, according to the Thai's economic indicator, total national growth declined from 8.6% to 8.2%, total commodities moving through Thai ports meaning inward-outward, increased from 92 million tons in 1995 to 106 million tons in 1996. The impact has resulted in the ports becoming more specialized.
- Increase in ship size. As a result of trade growth, ships have increased in size in order to maximize volume carried, and hence reduce transportation costs. This has had consequences for ports as part of the chain of maritime transport, since they must ensure that existing facilities are upgraded to accommodate increased ship size. Enhancements may include improved access to the deep channel approaches to the port, increased length/depth of berth, increased capacity of loading/unloading facilities at berths, and increased efficiency of equipment.

- Space utilization and new special trades. Tankers, chemical carriers, ro-on/ro-off vessels, bulk carriers, container vessels each require special terminal facilities that are able to handle complicated and troublesome commodities. Special storage facilities for dangerous goods are also needed to accommodate safety concerns.
- Increased sailing speeds. In order to improve economic performance, shipowners try to reduce ship turnaround time. Ports need to ensure the provision of adequate safety without causing undue delays.
- Regularity and timely service. It is important for a port to offer all services needed without delay. Nowadays port strategy is to try to attract shipping to the port and ensure that the client will have a variety of choices.
- Fluctuation in demand. The changing world economy, trade, climate, considerations, political events, economic structure, economic policy etc., all have a direct impact on maritime transport demand, including on the port itself. Indeed demand may be completely out of the port's control and, as a result, present enormous challenges. With regard to tariffs for its service, ports need to take to account the many factors that are involved.
- Technology change. Nowadays globalization demands that a port provide facilities that utilize modern technological innovations. Thanks to EDI (Electric Data Interchange), VTM (vessel traffic management) and a data-Processing Hub, there is an efficient means of communication between the 250 port professionals and their international partners.

Particularly with regard to transportation of dangerous goods, the principal function of a port is to receive ships carrying dangerous goods and to provide them with efficient services such as berth facilities, quay transfer, storage and delivery. Technical services are needed in order to contain incidents before they get out of control. Thus, many of those involved, such as ships' crew, shore staff operations, shippers and ship's agents should be aware of the safety risk. High costs, differing legal requirements, conflicts and lack of commitment are the main problems when establishing a safety system in a port area.

Government organizations, port operators, shipowners, ships' agents, shippers, crews, harbor masters, port officers, stevedores and others involved in the system of handling of dangerous goods should ensure that the safety procedures are established in order to respond to and solve, potential safety problems.

The significant factors that influence the handling of dangerous cargoes, including regulation of safety facilities in port areas, can be addressed as follow:

- Financial and commercial aspects.
- The geographic location of port aspects
- Legal aspects.
- Technical aspects
- Environment aspects.
- Information analysis.
- Case study- Analysis of the current response process.

4.2 Financial and commercial aspects

The economy of Thailand has declined in the last few years. Imports increased only 6.4% in the first three quarters of 1996, compared with 30.5% for 1995. (The Bangkok Shipowners and Agents Association handbook 1996-1997, p29). Port capacity has only grown sufficient to meet national economic performance in foreign trade. Port policy in this situation is directed at maintaining and renewing existing assets, as well as constantly improving the quality of service. In 1998, the turmoil in Thailand's economy, the slow down in the economy and the increasing current account deficit, has not only affected port investment and equipment maintenance but also a number of commodities passing through the port. Furthermore, ships' agents and shipowners are

trying to reduce unnecessary expenses incurred during transportation in order to survive in the competitive market.

Regarding investment in new facilities and equipment as well as in existing state enterprise ports, the financial resources are mainly from the fiscal budget allocated by the government. A number of different and influential factors should be noted as follows:

- Limitations on government budget.
- The difficult national economic and financial situation.
- The uncertain political situation in financial terms.
- The problem of ensuring effective financial management. For instance, balance of payment, return on investment, profitability and flexibility.
- The over-employment situation.
- The political situation adding to the difficulty of reducing the work force.
- Ineffective cost control systems due to over-staffing, loose control over expenses and corruption.
- Increased maintenance requirements for infrastructure.

History shows that the primary objectives and justification for state-own enterprise ports is to support national cargoes under the reservation scheme. Obviously, its policy and strategic business initiative have not been aggressively focused on competition with different ports. Nowadays, state-own enterprise ports are trying to adapt their operations, such as handling and storage of various dangerous goods, to ensure that the productivity of ports is increased. Assigned areas and efficient equipment are key requirements for the handling and storage of dangerous goods so as to generate income and improve safety.

4.3 The geographic location of ports

4.3.1 Land-use

Economic growth has led to intensive pressures to ensure efficient use of space to fit customer needs as well as to ensure good performance. For instance, topographic conditions such as unevenness of land and the other physical features need to be removed before a terminal can be constructed. The port may already own suitable land, or may need to acquire new land which may either have value involving and acquisition expense, or be waste land and therefore of little value. Moreover, the capacity requirement of the cargoes for distribution to the hinterland depend upon the purpose of the terminal, especially for storage and handling of dangerous goods. For instance, the tanker terminal should be far from the community, and there is a huge land requirement for container terminal storage and for open storage.

History has shown that Thai's ports are located near to communities in order to provide full service to customers such as the Bangkok Port Authority. Regarding national economic growth, the expansion in the community will occur near the port area, since it is the principal source of business that generates income. Some port areas can not be expanded because of the density of the community living around port areas. Also, the planning of land-use and the expansion of locations in restricted areas are directly affected by the cumulative risk of cargoes to the environment around port areas. For instance, it is not permitted to handle dangerous goods in classes 1 (explosives), 6.2 (infectious substances) and 7 (radioactive materials) at the Bangkok Port Authority quay whereas dangerous goods classes 2, 3, 4.1, 5, 5.1, 5.2, 6, 9 are permitted to be handled without storage at the Bangkok Port Authority quay. Also, the population in the vicinity of the port is sensitive about the environment and the impact of port activities. The results of planning for land-use are therefore extremely important.

For the main state-own enterprise ports in Thailand, namely Port Authority of Thailand, Songkla Port, Phuket Port and the Industrial Estate Authority of Thailand, municipalities are still providing port areas near to the coast for new facilities or for the upgrading of existing facilities. In view of private sector interests ports owners have to compete for the land they need to acquire, including hinterland requirements in order to connect to local or central government infrastructure such as road and rail.

As result, the cost of the land is a critical factor in the construction of a port tariff, especially areas required for the handling and storage of dangerous cargoes. For instance, tanker terminals should be far from communities and close to the sea in order to prevent pollution. The distance from the port to industries or market is a crucial factor influencing both cost and time in a competitive market. The farther the distance it has to move the more the cost will increase.

4.3.2 Nautical considerations

Nautical considerations address the capacity of the ship that can be accommodated in the port as follows;

- Hydrographic considerations, the nature of sea-bed alongside the terminal site.
- Climate considerations, prevailing winds and weather conditions affecting ship maneuvering in the port area.
- Oceanographic conditions, swell and current, affecting the structures such as piles, and the vessel.

An example of the nautical approach is the access channel, navigation aids and break waters.

The disadvantage of the Bangkok Port is the shallow access thus necessitating more time to access to port. Wind will also cause delays in ship turnaround times, for

instance, vessels can spend 2-3 hours in the access channel to Bangkok Port Authority, where the limitation of draft is about 7-8 meters. The tide is also an important factor for ships accessing the Bangkok Port Authority. The increasing sediment is the direct result of wave and current. This leads to high expenditure on port dredging.

By these reasons, the main port should be close to nautical areas and a closed location in case of accident so as to prevent environmental damage and for safety response purposes.

4.3.3 Superstructure

Superstructure encompasses rail or road and storage equipment, open storage, shed and warehouses. It has been found that the cost of handling dangerous cargoes for class 3 in Bangkok Port Authority is cheaper than in private ports because of the reasons mentioned with regard to government assistance.

Inefficient use of equipment and inadequate maintenance is a feature at some private port. This affects the skill of engineers required to introduce prevention and maintenance schemes which in turn results in an increase in cost.

4.3.4 Infrastructure

The state provides the budget for the maintenance of heavy structures such as jetties, basins and quaywalls. The financial resources are mainly drawn from the fiscal budget allocated by the government. Therefore, a number of different factors can affect financial port activities, such as political influence and limitations placed on the of government budget. For these reasons the infrastructure is in poor shape.

A dedicated service is needed for dangerous cargoes to be handled safely. This results in the handling tariff of dangerous goods being higher than that of general commodities.

Thus, the cost of the necessary infrastructure is a crucial point when considering the handling and storage of dangerous goods.

4.4 Legal aspects

The principal problem is that Thai's port regulations differ from port to port, and usually these regulations are not translated into the English language. Furthermore, some port regulations are available only for local purposes. Ship's agents can not fulfill their obligation to inform ship's masters about technical and legal terms. Regulations in the local language and pilots without language skills are major communications obstacles to be overcome

4.5 Technical aspects

Because of the rapid changes in technology in port activities, port staff are facing difficulty in keeping up-to-date and coping with such changes. Not only do staff need to be well-trained but also a high investment is necessary to respond to the increasing sophistication. The principal weaknesses and difficulties of staff can be identified as follows:

- Safety of port navigators, namely pilots and tug masters. Safety of navigation staff involved in the communication between pilots and tug masters use the local language only. As a result, the master or officer is deprived of the necessary direct information about the traffic situation and the risk of interference during maneuvering.
- The communications from ship to shore, shore to ship or ship to ship operations do not utilize a universal language.

- Lack of specialists in the port business such as marketing, operational management skills, etc.
- Lack of up-to-date equipment and investment in modern technology.
- Lack of interdepartmental coordination, proper communication and information exchange between ports and Customs Department, the Harbor Department, the Immigration Department and the Ministry of Transport and Communications.

4.6 Environmental aspects

Port development is the primary concern of the human population. Water circulation in these areas is often limited and shipping activities produce contamination, including oil wastes and cargo damage, and human wastes are released from shipboard. Port infrastructure development provides a wide range of services and support facilities, including coastal construction and road building, but the mining of sand beaches for construction material obliterates shoreline habitats. This often increases coastal erosion and damages habitats such as seagrass beds and coral reefs.

Exotic species are introduced from ships' ballast water and this threatens human health. Also, the dredging not only stirs up contaminated material, and reintroduces it into the water column, but also creates the problem of dredge spoil disposal, and may give rise to changed patterns of water circulation.

The impact of dangerous goods on the environment depends on the types and quantity of goods, their spill potential, flammability and toxicity. One might cite as an example an incident involving a petroleum product spill in an estuarine wetland. If the vegetation is thick, the heavy oil contaminant would be restricted to the outer fringes of the vegetation. With penetration and light oiling further inland, because light oil can penetrate more deeply into the wetland, at high-tide time. Medium to heavy oil does not readily adhere or penetrate the wet, muddy sediments, but can pool on the surface and in depressions.

The environmental impacts associated with port development are particularly important for the biological community, and resident marine species, such as invertebrates, fish, birds and even reptiles.

4.7 Information analysis

The availability of data and statistics is a crucial factor in providing insights into port performance. The lack of data analysis and detailed empirical studies highlight the deficiency of information about actual and potential dangerous goods for production and business evolution. This is due to a lack of medium and long term planning, and unclear expectations regarding the growth in each type of dangerous goods handling. Sometimes, information about technology, economy, commerce and industrial change can affect the type or volume of cargo, and so impact on port development.

The trend of decision-makers, regulations and equipment required has been re-active action. There is a lack of commitment to, and support of, directly government research organizations in maritime field such as maritime research institutes and human resource development. In addition, a common phenomenon in port project is the poor use made of local staff versus belief in foreign consultants, not only on government sites but also private sites. Thus, the younger generation of researchers, who are interested in studying in the maritime field are not being given any chance. Because sources of information for monitoring performance in marketing or any other performance indicators are either inaccurate, incomplete or irrelevant, so the evaluations of indicators will lead to the wrong conclusions and hence the wrong port strategy in the competitive market.

Research and planning projects, in the short-term, will need no foreign consultants in order to fulfill the future successfully. However there needs to be a parallel long-range effort, to make better use of local research institutes.

4.8 Case Study - analysis of the current response procedures

The scenario is as follows:

Drums of cargo classified by the United Nations with the number 1428 have been damaged and have caught fire on board a ship. The ship is anchored in the gulf of Thailand, some 5 miles from the Bangkok Bar. As the person in charge of response operations you have to activate the contingency plans and you have to ensure that the action indicated in the plan is followed. At the end of a successful operation, you are required to write a brief report in which you explain the specific steps to be followed according to response procedures, in particular emphasizing the means used for fire fighting.

Introduction

On 9 September, 1998, 1500 hrs, a fire occurred on board the 'M.V.TUK'. The vessel was anchored in the gulf of Thailand, some 5 miles from the Bangkok Bar. At the same time, Bangkok radio received a message from the master of 'M.V.TUK' advising that the ship was carrying drums of dangerous cargo UN number 1428. Bangkok radio then reported this situation to the maritime administration (MARAD) who was responsible for this area, in line with the alerting procedures.

MARAD was clearly identified as on-scene commander in the contingency plan, and the MRCC was on standby, working 24 hours. On September 10, at 1200 hours after receiving advice regarding the fire onboard, the on-scene commander initiated planning and operating communications and arranged to meet as quickly as possible, and establish a workgroup, so as to follow step by step the contingency plan. A team of experts was also formed.

The issues to be considered and evaluated were as follows:

- The type of cargo was Sodium, class 4.3, this is a substance which, in contact with water, emits flammable gas, floats on the water and is a white, ductile and soft metal. It reacts violently with moisture, water or acids, evolving hydrogen, which may be ignited by the heat of reaction. It is highly reactive, sometimes with explosive effect.
- The risk areas involved the maritime environment, sea and weather conditions.
- Type of fire and appropriate extinguishing agent.
- Response resources and response equipment.
- Coordination with other organizations such as the navy, marine police, shipowners, etc.
- Cost of damage and equipment used.
- Fire fighting capacity.
- Law and regulations applying.
- Vessel familiarization, ship structure, equipment onboard, type of ship, stability of ship
- Definition and hierarchy of the emergency.

The task was decided by the committee, and the command structure was clearly established so as not to confuse. In this case, the messages from the ship passed through the Coast Guard radio to the on-scene commander. The process followed utilized the alerting procedure and the emergency format. It was also imperative that the communication network did not fail.

A strategy was created addressing the scope of the risk, the equipment to be used and the teamwork. required. Activities and operations included how to deal with the fire, and how to arrange communications between the fire unit and the co-ordination center.

Control of the fire needed to bear in mind the properties of the substance. Sodium is a substance dangerous when wet, violently reactive with water, requiring stowage on deck only.

Thus, it was important to avoid all sources of ignition. Also, protective clothing and self-contained breathing apparatus needed to be used. Large fires need to be smothered with DRY inert material, which is then collected and disposed of overboard in a safe manner. If possible receptacles likely to be involved also need to be removed. Time is also important in order to control the spread of the fire.

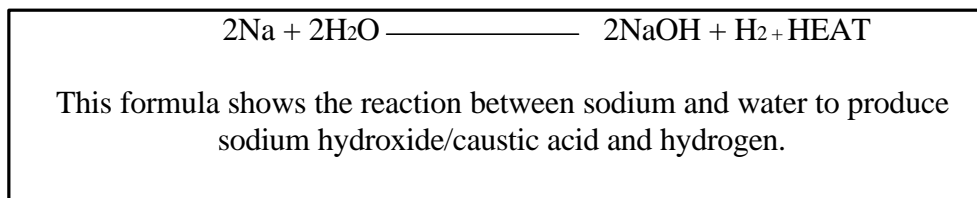


Figure 4.1: The reaction between Sodium and water process

Source: Brünings, 1998

Finally, public relations were important. The responsible organization had to describe and report on the successful handling of the situation to the public.

On September, 12 1998, 1500 hrs, the fire was brought under control by the fire team. There was no oil contaminates spill from on this incident.

RESPONSE PROCEDURES

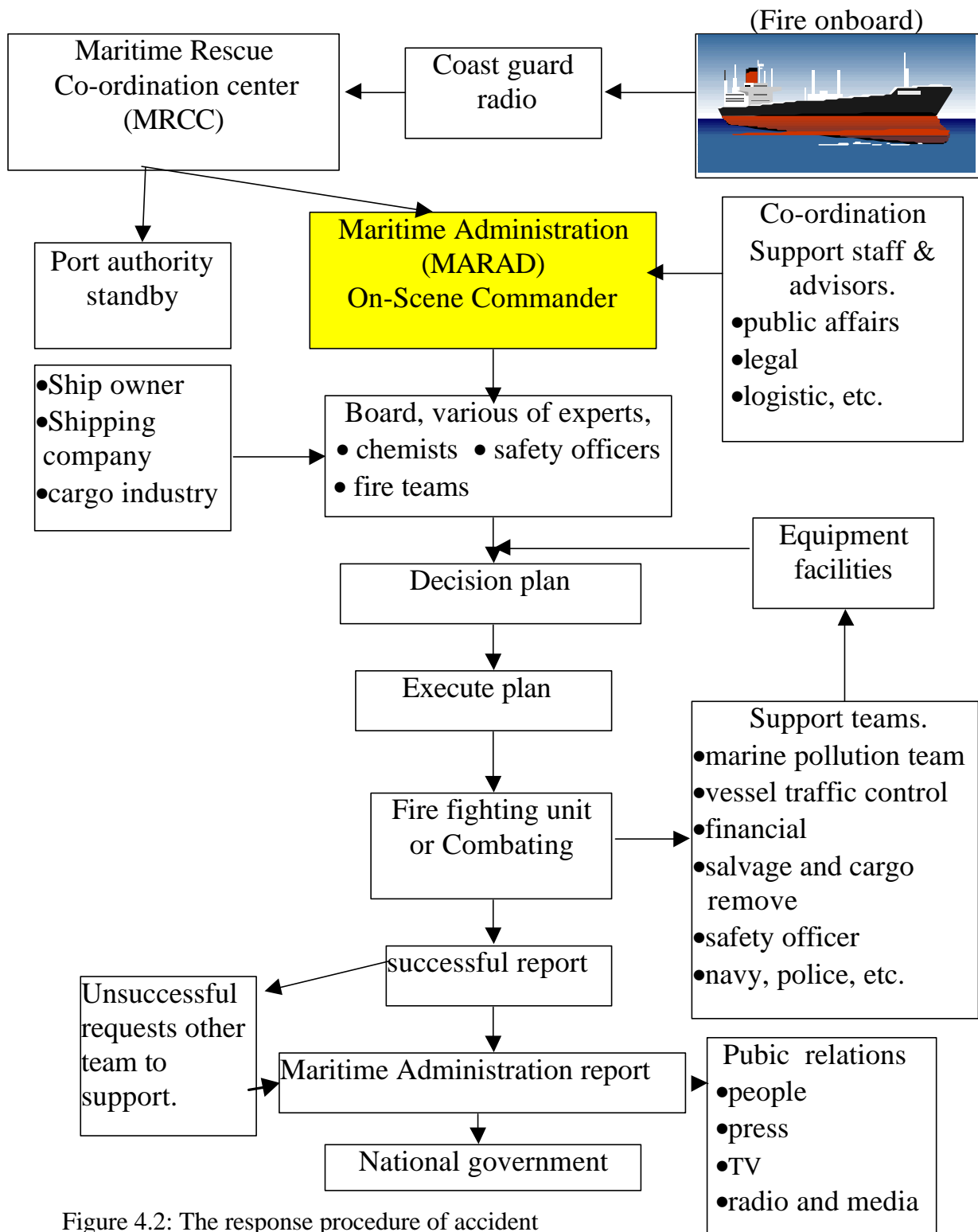


Figure 4.2: The response procedure of accident
 Source : Compiled Pardo,1998

CHAPTER 5

To propose a safety management regime for dangerous goods in Thai ports, and make other recommendations

5.1 Introduction

The process of upgrading safety conditions for the transport of dangerous goods requires the government to issue an appropriate directive for work to begin, and to ensure that a forum for inter-ministerial and agency cooperation exists. In order to establish a safety system in ports, the type and quantity of commodities that they have to handle has to be taken into consideration.

It is common in Thailand for several ministries or agencies to have varying levels of legislation and regulatory responsibility for the transport of dangerous goods. As a result the rules and regulations are not always coordinated between them. The need for changes and revision of existing rules and regulations is obvious in order for a new general safety system to be created. The initial mandate for the process should come from the central government, and include the establishment of a committee to serve as a national coordinating body for issues related to the control and regulation of land transport of dangerous goods. Also, the committee must have sufficient power to ensure the full involvement of all interested agencies.

The potential reforms at the port, in order to enable the central government to make a decision, should comprise the following elements:

5.1.1 National requirements

- Formulation and appointment of members of the committee to determine the general guidelines for work including time-bound formulation and fixing the final date for completion work.
- To establish rules and regulations for transportation including re-structuring the existing laws in order to develop the necessary safety procedures.
- Improve and develop coordination and cooperation between agencies.
- Identify the types of commodities, and classify all dangerous goods listed in international regulations, including limited qualities exception.
- Adopt requirements for consignment procedures and construction and testing of packing, Intermediate Bulk Containers (IBCs), and portable tanks.
- Develop systems for training in the transportation and handling of dangerous goods (i.e. seafarers, shore staff and cargo interests).

5.1.2 Ports requirements

- Adopt efficiency procedures for new or existing resources.(i.e. port facilities, administration systems, operational procedures, documentation, risk analysis and information flow)
- Formulate a contingency plan of action, which will meet the safety and reliability requirements.
- Allocate the necessary funds, and institute research and human resourcing.

5.2 Selection and appointment of members of the committee in order to determine the general guidelines for the work including time-bound formulation, and fixing the final date for completion work

The Prime minister's office should play a coordinating role in all relevant matters. (i.e. managing the national coordinating committee with representative sectors, and being responsible for time-bound outputs. The Ministry of Transport and Communications or the Ministry of Environment, etc. should oversee specific tasks under the central umbrella.

The national committee framework should impose limitations on timing so as to determine the degree of work success.

- The regulations should apply to all modes of transportation in the port area.
- All persons involved in the transport of dangerous good should be aware of the risks posed by dangerous goods and should take appropriate measures to ensure safe transport.
- The producer/consignee has to ensure that dangerous goods are correctly classified, packaged, and labeled, and that the transport documents contain, correctly, all the required information
- The operator has to ensure that the dangerous goods are packaged or handled in accordance with guidelines for transport by a responsible authority. He/she also has to verify that the packages and IBCs containing dangerous goods are correctly labeled, without any defect, and secured to the vehicle. The outer surface of the packages must not be contaminated with the residuals of dangerous goods.

5.3 To establish rules and regulations on transportation including re-structuring existing laws in order to develop necessary the safety procedures.

In the process of establishing and developing a system for the transportation of dangerous goods both government and private sector need to be fully involved. This will assist in ensuring that legislation and regulation requirements not only meet the objectives of government but are also realistic in terms of the private sector being able to comply with them.

From the government sector a large number of ministries and agencies should be directly involved in the process, especially those with a responsibility for regulation and control of transport. Within the main national coordination committee there should be representatives from the private and public sectors and membership should include commercial, environmental protection, industry, emergency management, MARAD and land transport agencies as well as representatives from shippers, the chemical industry and private ports, etc.

As a first step, it will be necessary to establish a subcommittee or working group dealing with specific issues, including identifying the authorities of each agency, such as legislation, rules and regulations, as well as coordination and cooperation arrangements, enforcement, training, and matters related to test and inspection. Secondly, the subcommittee which need to decide whether to recommend the enactment of a new Dangerous Goods Act or, whether present legislation should be strengthened as the basis for future requirements relating to all modes of transport. Finally, in the process the sub-committee will need to first review all existing legislation. Relevant provisions may be found in the legislation dealing with individual modes of transport.

The system of safe handling, storage and transportation of dangerous goods should be developed in line with the IMO recommendation. The following illustrates the proposed scheme of organization of concerned bodies involved in the establishment of a national system for the transport of dangerous goods in port areas.

A NATIONAL SYSTEM FOR THE TRANSPORT OF DANGEROUS GOODS IN PORT AREAS

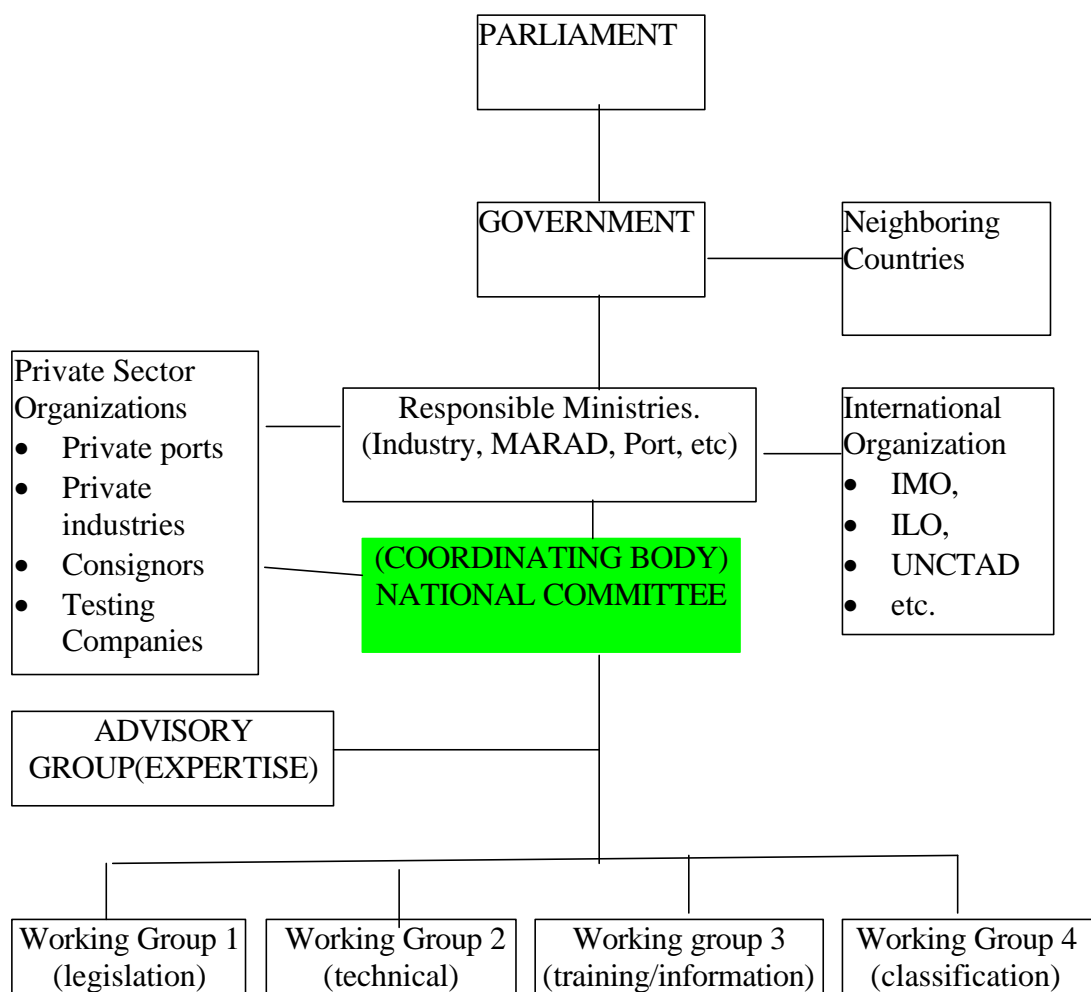


Figure 5.1: To propose the model of a national administration system

Source: Compiled ECOSOC, 1997

5.4 Improve and develop coordination and cooperation between agencies

The need for a single separate Act, relating only to the transport of dangerous goods, is obvious. The concentration of the rules and regulations under one umbrella facilitates uniform application, independent of the means of transport, and the identification of those ministries or authorities that are responsible for issuing the legislation.

Also, the enforcement and investigation responsibility, systems for liability and punishment, and training need obligations can be found in the basic legislation. Furthermore, it simplifies the coordination and cooperation between the responsible ministries and authorities and other bodies, and the users have a defined system which is clear and easy to grasp.

5.5 Identify the types of commodities, and classify the dangerous goods listed in accordance with international regulations, including limited qualities exception

The types, quality and criteria of dangerous goods transported by sea should be classified by the appropriate competent public authority, namely the Ministry of Transport and Communications, and, as well, be under the umbrella of the national dangerous goods committee. For instance, the criterion for classifying class 3 is based on the flash point of the liquid; for class 6.1 the criterion is based on the toxicity of the substance when swallowed, inhaled or by skin contact.

For the other classes 1, 4.1, 4.2, 4.3, 5.1 and 5.2, the choice of relevant criteria is not straightforward. This has required the development of appropriate test methods based on expert guidelines.

The follow shows the example of UN-number and Proper shipping names.

Table 5.1: UN number and Proper Shipping Names

UN-Number	Proper Shipping Names
0030	Detonators (electric) for blasting
1072	Oxygen-compressed
2758	Carbamate pesticides-liquid, flammable, toxic, flash point less than 23 degrees centigrade
2921	Corrosive solid, flammable N.O.S

Source: Compiled IMDG CODE

In relation to the above, the N.O.S. indicated that the proper shipping names should be supplemented with the technical name of the substance, when used in transport documents. The dangerous goods name list is divided into 4 groups; single names for certain composite substances, names by product (i.e. Adhesive), names by particular chemical or technical nature (i.e. Alcohol, N.O.S), or name by qualification (Corrosive, N.O.S.). This system should include testing/analysis criteria and reference to the UN system or IMO recommendation for classification of dangerous goods.

5.6 Adopted the requirement for consignment procedures and construction and testing of packing, Intermediate Bulk Containers (IBCs), and portable tanks

The rules and regulations would address the composition of bodies responsible for issuance of regulations, enforcement, test and inspection of packing and tanks. The responsible bodies should have clear authority. As a basic rule, bodies should be coordinated on technical matters between the competent authority (HD) and institute testing lab. They should also include criminal liability and the penalties.

The feature below is an example of UN marking code.

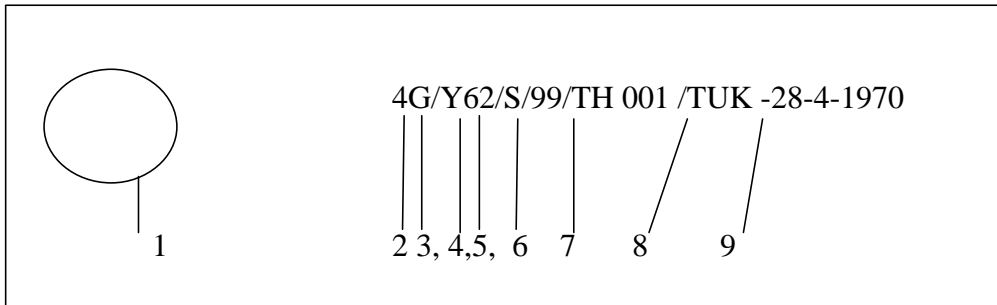


Figure 5.2: UN packaging marking

Source: compiled IMDG Code

This packing is a fibreboard box (4G), packaging group II and III only (Y), gross mass 62 kg (62), intended for solids or inner packaging (S), year of manufacture 1999 (99), country Code for state authorizing (Thailand) the location of the mark (TH 001), name or registered symbol of manufacturer (TUK -28-4-1970)

The following types and codes of packaging are assigned:

1. UN symbol	
2. Packaging code:	
1 - drum	A- steel
2 - wooden barrel	B- aluminium
3 - jerrican	C- natural wooden
4 - box	D - plywood
5 - bag	F - reconstituted wood
	G - fibreboard
	H - plastic
	L - textile
	M - paper
	N - metal (other than steel or aluminium)
	P - glass, porcelain or stoneware
3. Packaging Grade:	
X - acceptable for packaging Groups I, II, III substance;	
Y - acceptable for packaging Groups II, III substance only;	
Z - acceptable for packaging Groups II, III substance only;	
4. The relative density (liquids only) or the gross mass , in kg, for which the packaging was tested	
5. 'S' - means it is intended for solids or inner packaging; or in the case where a hydrostatic test is required (liquids), the test pressure in Kpa is indicated	
6. Year of manufacture	
7. Country Code for state authorizing the location of the mark (Thailand)	
8. Name or registered symbol of manufacturer	
9. Design resignation number	

Figure 5.3: Codes for designating types of packaging

Source: compiled IMDG Code

5.7 Develop system for training in the transportation and handling of dangerous goods (i.e. seafarers, pilot, shore staff and cargo interests)

A system is required for the training of all concerned personal within organizations responsible for, or involved in, the handling and inland transport of dangerous goods in port areas. It would define the nature and size of the education and training requirements, and when and how the system as a whole, or its various parts, should be introduced. For instance, target groups should be defined, and include ship crews, shore staffs, consignors, consignees, drivers, crane operators, storekeepers as well as administrators. A phased introduction will provide time to adjust and for resources to be developed.

The basic requirements concerning the training system, i.e., organization, content and length of the training, training plans, period of training and performance, on the job training, certification and the validity of certificates should be determined and included in the legislation/regulations.

Education for governmental officials and other personnel within ministries, and authorities responsible for the development of rules and regulations, enforcement, emergency planning and response and other activities in the field may be possible utilizing international organization expertise, (IMO, ILO, IAPH, UNCTAD, etc). Confidence in the public institutions having responsibility for the transport of dangerous goods is key to its safe transport.

5.8 Adopt efficiency procedures for existing resources and develop new efficiency procedures (i.e. port facilities, administration systems, operational procedures, documentation, risk analysis, information flow)

5.8.1 Administration system

The administration should be based upon up-to-date and enforceable legislation, in order to improve efficiency and safety and keep in line with the international regulations. The MARAD should establish acceptable standards for dangerous goods, qualities and classes, and identify these which may be permitted to transit or to enter a port area in accordance with existing port facilities requirements. With respect to specific dangerous goods, such as explosives substances, substances harmful to aquatic environment, temperature-controlled substances, radioactive materials, these may require appropriate procedures depending in the nature of the goods. For instance, explosives (class 1) should only be permitted to enter into the port area for direct transport to or from the ship. Organic peroxides (class 5.2), self-reactive or energetic substance (class 4.1) or infectious substances (class 6.2) should be kept for a short period of time in port areas. (The recommendations on the Safe Transportation of Dangerous Goods and Related Activities in Port Areas, 1992, p13)

5.8.2 Port Facilities

The utilization of new facilities or the upgrading of existing facilities, the geographic location of ports, the land, the nautical approach, infrastructure and superstructure, should all take into account the cumulative risk of all hazardous installations and substances in the vicinity of ports. For instance, the population density in the area under consideration and the vulnerability of the population, require that ships keep in the appropriate areas, so as to prevent a more serious the incident. The arrangement of warehouses and terminal areas should be considered and specified as:

- Separated areas for the storage of dangerous goods, including fumigation areas, wastes contaminated with dangerous goods, and specifically for damaged dangerous goods.
- Necessary facilities needed such as separate ventilation, covered roof, magazines, drainage, fire-resistant walls, etc.
- Reception facilities for particular types and quality of wastes, chemical wastes, or petroleum product wastes, bilge water wastes, ballast and slop contaminated with dangerous goods.
- Stacking areas for containers/road parking areas/rail sidings
- Repairs and cleaning facilities should be situated well away from any area where dangerous goods are handled. Also, cleaning facilities should be designed and constructed so as accommodate environmental concerns.

5.8.3 Operational procedures

Operational procedures should be regulated, including a check list during ship operations. For dangerous goods which remain in the port area, the responsible berth operator has to deposit all transport related cargo documents in a special file, separately for each shed or storage area. In the case of an emergency, these files have to be handed over to the Fire Brigade unless they have been deposited at places previously assigned.

Also, the ship's master has to keep a record of all dangerous goods on board and their location on the ship, and he is obliged to submit all available information about the dangerous goods on board to the port of calls or MARAD upon request. In addition, pilots should have the skill and knowledge regarding the handling of dangerous goods in order to safely conduct their navigation, including providing assistance to all relevant MARAD office and ports, regarding the ship's movement in port areas. For instance, participation in the ship reporting procedures, cooperation with the VTS officers or shore officers as well as the ship's master. Procedures for operations, ship

loading, discharging, ship berthing and storage of dangerous goods should be shown by record of documentation.

5.8.4 Documentation

Advance notice has to be provided before dangerous goods can be committed to transit, handling or temporary storage within port areas. The notice should be submitted in writing, by fax or telex or by means of electronic data transfer into the port computer system (24 hours before arrival of the dangerous goods in port areas is recommend).

In addition, information should be available and accurate, such as correct proper names, quality of handling, responsible shippers, etc. If the voyage is less than 24 hours, and notice cannot be given by the agent of the ship, the Ports and MARAD have to be notified by fax prior to the ship entering Thailand terrestrial waters.

The notice has to contain the following details:

- Content, number and weight of packages, the correct technical name or proper name, the UN number, IMDG Code class and where applicable, the flash point
- The name of the ship, its ETA and time expected to berth.
- When arriving by land transport, the registration number of the transport vehicle or container or portable tank, date and time of arrival, the shed or stacking area where the goods are to be handled, and the name of the ship that the cargo is to be loaded onto.
- When the dangerous goods are packed into a container, the container numbers, the place that the container will remain in the port area, and the name of the ship that container will be loaded onto.
- The declaration of packaging, marking, placarding and labelling, in accordance with the IMDG Code

5.8.5 Information flow

The network of information should be established, so as to cover all relevant information on the properties of dangerous goods, including classification, labeling and handling of documentation. It may involve the setting up of IDG-MP Centers (Information of Dangerous Goods on Maritime transport and related activities within Port areas). The center should provide information on dangerous goods in general, emergency services, documentation linked to research findings, details of the location of sophisticated equipment to be used in serious accidents, type of port permitted to handling particular dangerous goods, etc.

Computerized systems are useful regarding classified chemicals, regulations, movements of goods, non-conformity reporting, registry of approved vehicles, etc. Computers also provide the opportunity for improved accident reporting and coordination with other systems.

An additional value is that computerized records could be a source of statistics which help in identifying critical weaknesses in the system, and which are causing an unnecessarily large number of accidents, the data may also be used in land-use planning.

5.9 Formulate a contingency plan of action which will meet the safety and reliable requirements

The contingency plan needs to address the emergency response capabilities related to the transport of dangerous goods. Regarding guidance on application of APELL (Awareness and Preparedness for Emergency at Local Level) in port

recommendations, the Thai's emergency response should be divided into 4 stages as following area of risk, the installation of equipment, the substance handled and areas of responsibility.

The following figure shows the institutions and personnel responsible for a possible contingency plan applicable to a port where there are several administrative organization authorities.

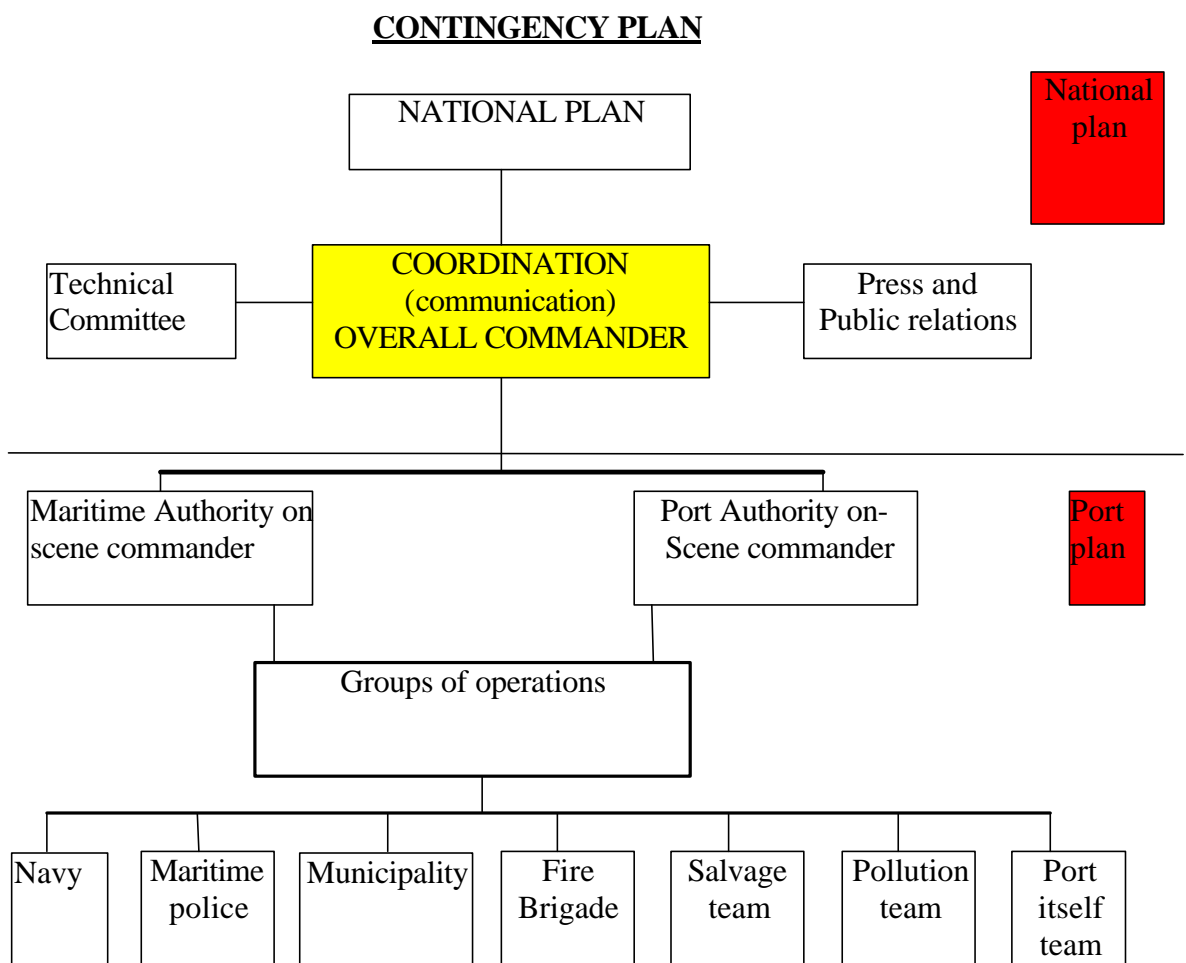


Figure 5.4: The coordination of contingency plan

Source: Compiled Pardo, 1998

5.10 Allocation of funds, and institution of research and human resourcing

5.10.1 Human resources

As mentioned above, national training should define the nature and size of the education and training systems required commensurate with their responsibilities. Foreign expertise or consultant advice should be sought in order to improve and plan for overall relevant transport of dangerous goods.

5.10.2 Institute research

The government should establish the specific institute research or training center for the maritime transport of dangerous goods, in order to integrate safety and enhance the efficient transport of dangerous goods. Institutes may provide research in testing, packaging, and port training, or research into the efficient management of dangerous goods such as cargo handling, warehouse storage and testing of receptacles. In addition, the institute could provide consultation services to the chemical industry regarding future trends in international regulations.

5.10.3 Allocation of funds

Due to short term planning, the government should subsidize institute research and staff budgets. For instance, build up the institute research, improve the training on specific courses. It may request expertise from an international organization in order to prepare the long term plan.

Chapter 6

Conclusion

The aim of the proposals set at chapter 5 is to provide assistance to the central government and ports in the process of establishing a more effective system for the safe transport of dangerous goods. The approach taken is to create a greater awareness of internationally developed and accepted recommendations. These recommendations are also focussed on the steps required to be taken in reviewing existing legislation and regulation prior to the formulation and implementation of new, and more appropriate, integrated rules and regulations.

At the core of the proposals are recommendations for the formation of a limited number of committees and their respective roles. The Committees are seen as essential elements in the process, as it is vital that the various ministries and agencies work in close collaboration if the strengthened legislation and regulations are to provide a clear and constructive framework for the safer transport of dangerous goods.

The process of developing an effective national ports system for the handling of dangerous goods is highly dependent on the organisation and structure regarding the central administration. The recommended steps and actions mentioned should therefore be used as a check list for planning. Each recommendation should be carefully analyzed by the persons responsible for the work at the national level, and adapted to the specific conditions.

With regard to the storage of dangerous goods, each port needs to be sure as to the appropriate requirement for each type of dangerous goods. Therefore the port should verify its guidelines against UN and IMO recommendations in the respect.

The location of the port is a crucial factor in so far as the handling and storage of various types of goods are concerned. It should be as far from the vicinity of populated areas as practical handling considerations allow. Considerations also needs to be given to determining other limitations in the handling of cargo including whether they should be moved ashore, or remain onboard, especially class 1:explosives, class 6.2: infectious substances and class 7: radioactive materials.

The type of emergency equipment to be fitted also needs to be considered in order to keep control in the event of an accident depending on type the of dangerous goods. Basically equipment such as fire fighting, foam systems, gas detectors, intrinsically safe lighting, showers, portable pumps, hoses and protective clothing should be installed.

Emergency response personnel should be well training in the use of this equipment and should be aware of the dangers involved. Necessary information on the cargo should be readily available.

Furthermore, consideration needs to be given to the problems associated with the various procedures, such as the safety transport process and storage and handling, in order to improve the control of dangerous goods in the port area. In addition, an evaluation of these problems should be integrated and solved together in order to optimize efficiency.

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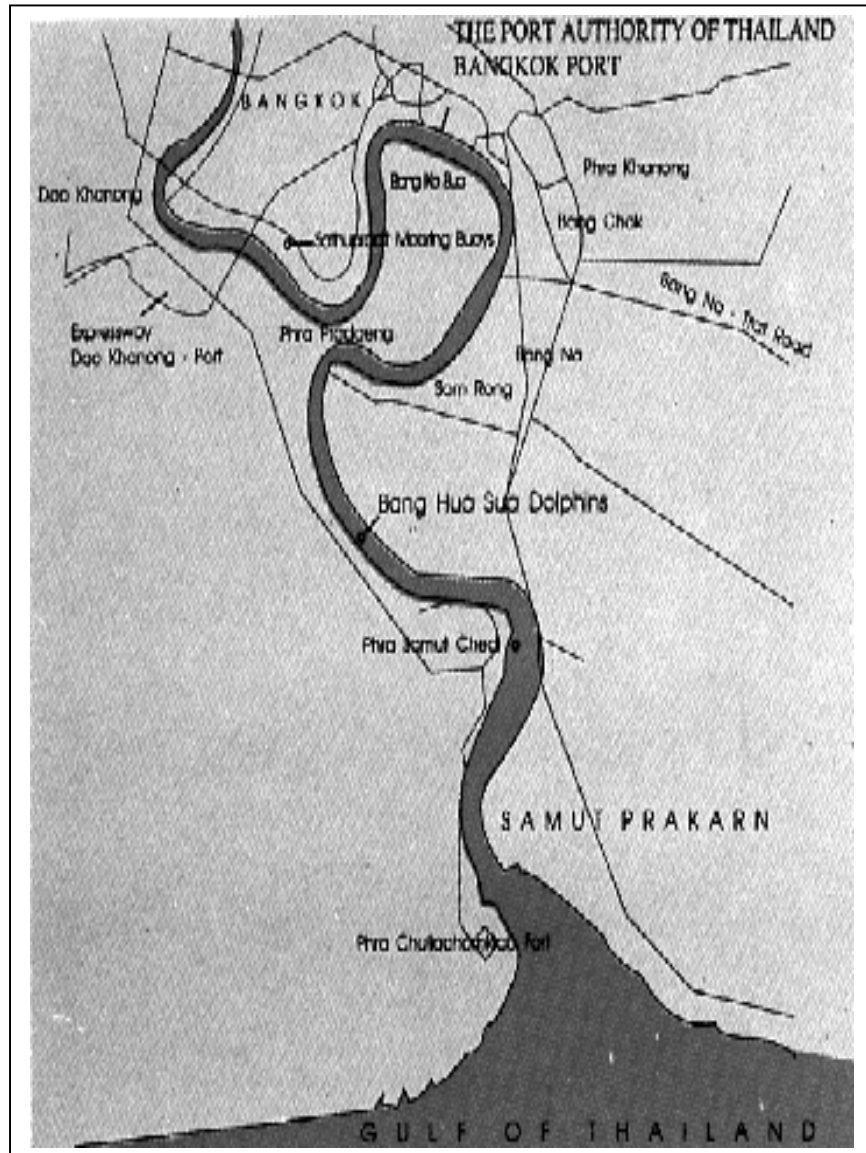
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APPENDIX 1

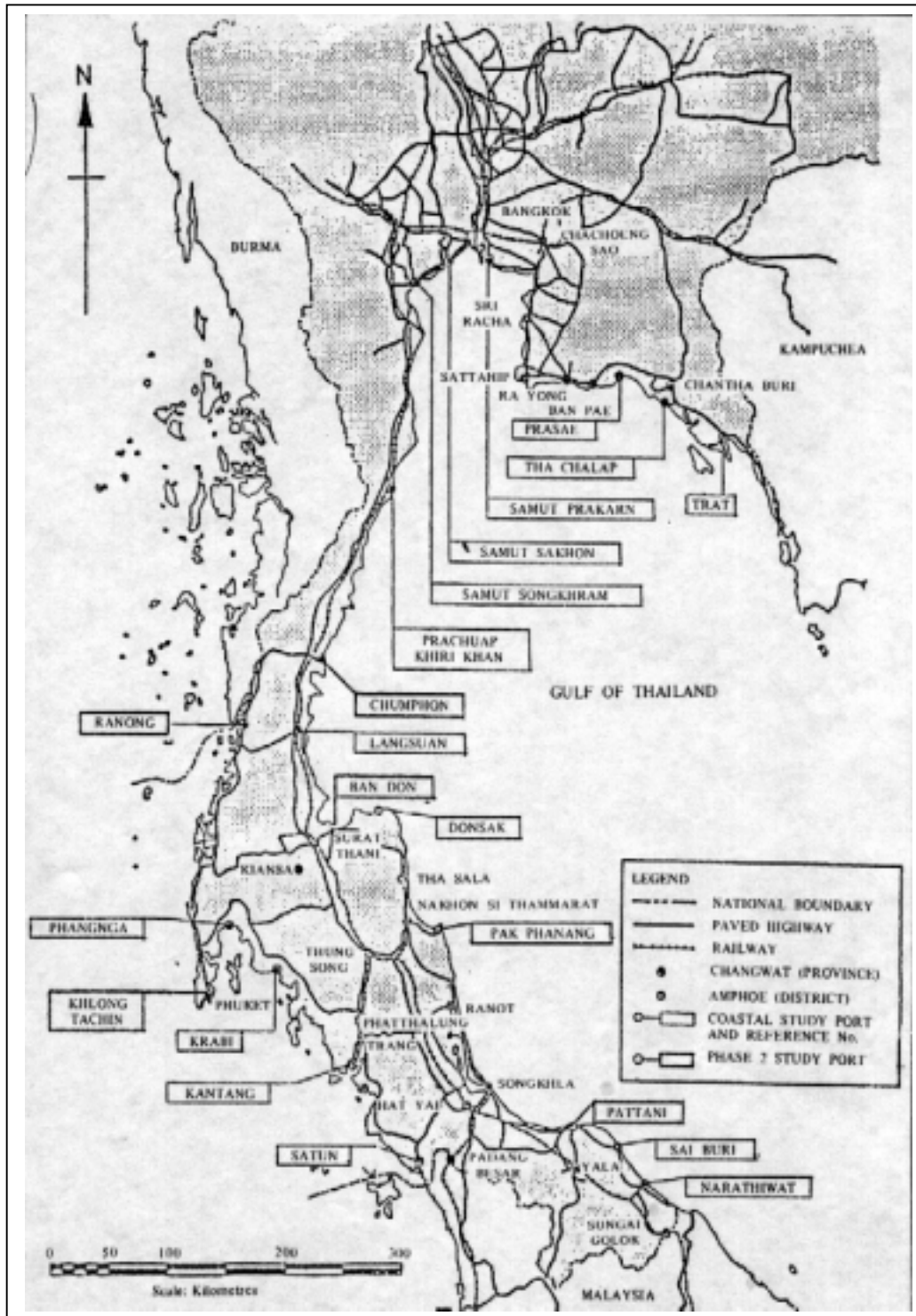
The location of Bangkok Port Authority



Source: The Port Authority of Thailand, 1998, page20

APPENDIX 2

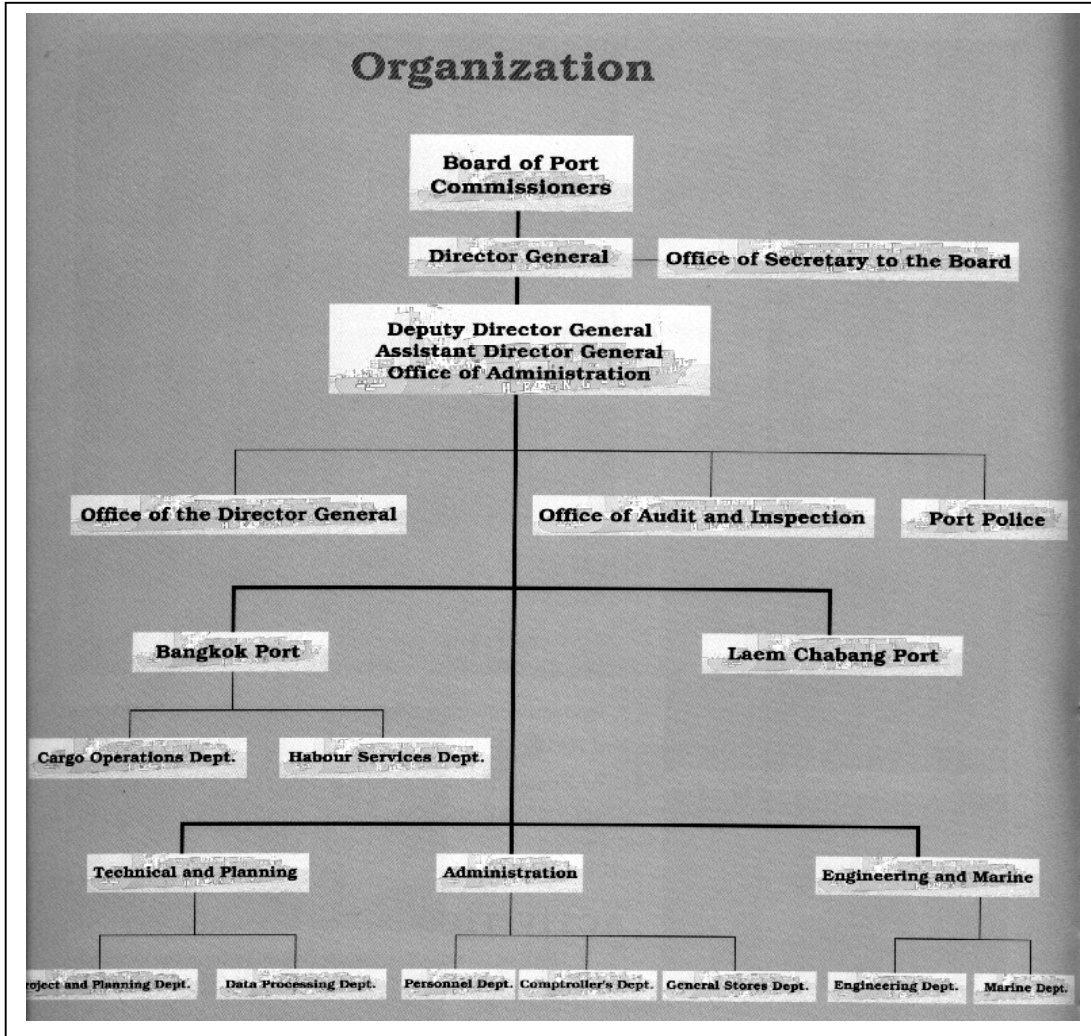
The geographical location of Thai ports



Source: Coastal Ports and Transportation Infrastructure, ESCAP, 1989

APPENDIX 3

The organisation of the Port Authority of Thailand



Source: The Port Authority of Thailand, 1998, page14

APPENDIX 4
The dangerous goods declaration form

APPENDIX 5

Classification of dangerous goods

Class 1 - Explosives (for detailed divisions see under class 1)

Class 2 - Gases: compressed, liquefied or dissolved under pressure for stowage and segregation purposes, class 2 is divided further according to the hazards presented by gases during transport, namely:

Class 2.1 - Flammable gases

Class 2.2 - Non-flammable gases

Class 2.3 - Poisonous gases

Class 3 - Flammable liquids

Class 3.1 - Low flashpoint group

Class 3.2 - Intermediate flashpoint group

Class 3.3 - High flashpoint group

Class 4 - Flammable solids or substances

Class 4.1 - Flammable solids

Class 4.2 - Substances liable to spontaneous combustion

Class 4.3 - Substances which, in contact with water, emit flammable gases.

Class 5 - Oxidizing substances (agents) and organic peroxides

Class 5.1 - Oxidizing substances (agents)

Class 5.2 - Organic peroxides

Class 6 - Toxic and infectious substances

Class 6.1 - Toxic substances

Class 6.2 - Infectious substances

Class 7 - Radioactive materials

Class 8 - Corrosives

Class 9 - Miscellaneous dangerous substances, that is any other substance which Experience has shown, or may show, to be of such a dangerous character that the provisions of this part shall apply to it.

Source: IMDG Code

**SHIP TO SHIP TRANSFER
(before cargo transfer)**

Discharging Ship's Name:..... Receiving Ship's name:.....
 Date and TimeCommenced:..... Completed:.....
 Quantify and Grade of Transfer:.....Position/Berth.....

	Discharging Ship Checked	Receiving Ship Checked	Remarks
1. Is the gangway in position and secures(where applicable)? 2. Has communication system been established with other ship? 3. Have emergency signals and shutdown procedures been agreed? 4. Has bridge watch been establish? Has anchor watch been establish (where applicable)? 5. Has efficient deck watch been establish with particular attention to moorings, fender and manifold observation? 6. Is there an efficient engineroom watch, and are main engines on standby 7. Has initial loading rate been agreed with other ship? 8. Has maximum loading rate been agreed with other ship? 9. Has topping-off rate been agreed with other ship? 10. Are scuppers effectively plugged and drip trays in position under the manifold connection? 11. Have hoses been tested after connection? 12. Are hoses suspended effectively? 13. Are sea and overboard discharge valves of cargo system tightly closed and sealed? 14. Are tools located at manifold ready for raoid disconnection? 15. Are window type air conditioning(where fitted) disconnected? 16. Are conditioning intakes which may permit the entry of cargo vapour closed? 17. Are fire axes in position fore and aft? 18. Are all unused manifold connections closed and blanked? 19. Is firefighting and anti-pollution equipmnet checked and ready for use? 20. Is inert gas system (where fitted) operating? 21. Is radio station closed down and are aerial earthed (grouded) where necessary? 22. Has other ship been advised that Check List 4 Complted in the affirmative?			Rate...t/h Rate...t/h Rate...t/h

FOR DISCHARGING SHIP	FOR RECEIVING SHIP
NAME:	NAME:.....
RANK:	NAME:.....
SIGNATURE.....	SIGNATURE:.....
DATE AND TIME.....	DATE ANDTIME:

Source: Dangerous Cargo ships, maritime Terminal and Facilities and bunkering Regulations, 1996, Malta

SHIP/ShORE SAFETY

Ship's Name:..... Port:
 Quantify and Grade of Transfer:..... Position/Berth:
 Date and Time Commenced:..... Completed:
 Remark.....

Instruction for completion

The safety of operations requires that all question should be answered affirmative..✓ if an affirmative answer is not possible, the reason should be given and agreement reached upon appropriated precaution to be taken between the ship and the terminal. Where any question is not considered to be applicable a note to that effect should be inserted in the remarks column.

- The presence of this system in the column 'ship' and 'terminal' indicates that checks shall be carried out by the party concerned.

The presence of this letter **A** and **P** in the column 'Code' indicates the following:

A- the monitor procedures and agreement shall be writing and signed by both party.

P- in this case of a negative answer the operation shall not be carried out without the permission of the Port of ship call.

	Ship	Terminal	Code	Remarks
1. Is the ship securely moored?				
2. Are emergency towing wired correctly positions?				
3. Is there safe access between ship and shore?				
4. Is the ship ready to move under its own power?			P	
5. Is there an effective deck watch in attendance on board and adequate supervision on the terminal and on the ship?				
6. Is the agreed ship/shore communication system operative?			A	
7. Have the procedures for cargo, bunker and ballast handling been agreed?			A	
8. Has the emergency shut down procedure been agreed?			A	
9. Are fire hoses and fire fighting equipment on Board and ashore positioned and ready for immediate use?				
10. Are cargo and bunker hose/arms in good condition and properly rigged and, where appropriated, certificates checked?				
11. Are scuppers effectively plugged and drip trays in position, both on board and ashore?				
12. Are unused cargo and bunker connections including				
13. Are sea and overboard discharge valves, when not in use, closed and lashed? Are all cargo and bunker tank lids closed?				
14. Is the agreed tank venting system being used?				

	Ship	Terminal	Code	Remarks
15. Are hand torches of an approved type?				
16. Are portable VHF/UHF transceivers of approved type?				
17. Are the ship's main radio transmitter aerials earthed and radars switched off?			P	
18. Are electric cabled to portable electrical equipment disconnected from power?				
19. Are all external doors and ports in the amidships accommodation closed?			A	
20. Are all external doors and ports in the after accommodation leading onto or overlooking the tank deck closed?			A	
21. Are air conditioning intakes which may permit the entry of cargo vapor closed?			A	
22. Are window-type air condition units disconnected?				
23. Are smoking requirement being observed?				
24. Are the requirements for the use of gallery and other cooking appliances being observed?				
25. Are naked light requirements being observed?				
26. Is there provision for an emergency escape possibility?				
27. Are sufficient personnel on board and ashore to deal with emergency?				
28. Are adequate insulating means in place to deal in the ship/shore connection?				
29. Have measures been taken to ensure sufficient pump room ventilation?				
Are tank cleaning operations planned during the ship's stay alongside the shore installation?				
If so, have MARAD and terminal been informed?				

* Delete Yes or No as appropriate.

Declaration

We have checked, where appropriate jointly, the items on this checklist, and have satisfied ourselves that the entries we have made are correct to the best of our knowledge, and arrangements have been made to carry out repetitive checks as necessary.

FOR SHIP	FOR TERMINAL
Name:	Name:
Rank:	Rank:
Signature:	Signature:
Date/Time:	Date/Time:

Source: Dangerous Cargo ships, maritime Terminal and Facilities and bunkering Regulations, 1996, Malta

PRE-TRANSFER BUNKER BROWSER SAFETY

Name of Company:..... Vessel taking Bunkers:
 License Plate: Engine I.C:
 Driver's Name: Date of Transshipment:
 Time of Transshipment: Place of Transshipment:

Bunker Browser	Safety Check list															
	Yes or No															
1. How much bunker oil be transhipped: Fuel.....m/tons actualcbm Gas oil.... m/tons actualcbm Lub oil.m/tons actualcbm Waste oil..... m/tons actualcbm 2. What are the means of communication between the truck and the vessel taking bunkers: 3. Who is responsible for communications with vessel taking bunkers: Name:..... Position: 4. Who is in charge of supervising the operation and taking immediate action in case of multifunction: Name:..... Position: (A) Is there an emergency stop facility: Yes/No. Where..... (B) Is there the emergency stopping procedure been discussed and agreed with the vessel taking bunkers Yes/No. 5. Agreed maximum pumping rates and line pressure: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Grade:</td> <td style="width: 35%;">pumping rate</td> <td style="width: 50%;">line pressure</td> </tr> <tr> <td></td> <td style="text-align: center;">in tons/hrs:</td> <td style="text-align: center;">in psi/bar*:</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> <tr> <td>.....</td> <td>.....</td> <td>.....</td> </tr> </table>	Grade:	pumping rate	line pressure		in tons/hrs:	in psi/bar*:	1. Is the agreed ship/truck communication system operative? 2. Has the emergency shut down procedure been agreed? 3. Are fire extinguishers on the truck ready for immediate use? 4. Are cargo and bunker hoses in connection and properly rigged and where appropriate certificates checked? 5. Are drip tray in position to be effective on the truck? 6. Are all cargo and bunker tank lids closed? 7. Are hand torches of an approved typed? 8. Are smoking requirement being observed? 9. Are naked light requirement being observed? 10. Is the ship's safety check list complete? Truck Driver's name: Certificate No.: Issued date:..... Expiere date: Date/time:..... Signature: Remark:
Grade:	pumping rate	line pressure														
	in tons/hrs:	in psi/bar*:														
.....														
.....														
.....														
I conform that I shall not exceed above volumes pumping rates and line pressure* and that I and/or my crew will remain on duty close to the hose connection in order to oversee the safe bunker operation and to be able to respond to an emergency throughout the delivery.																

Source: Dangerous Cargo ships, maritime Terminal and Facilities and bunkering Regulations, 1996, Malta