The Training Material on “Dangerous Goods Handling (All modes)” has been produced under Project Sustainable Human Resource Development in Logistic Services for ASEAN Member States with the support from Japan-ASEAN Integration Fund (JAIF). Copyright Association of Southeast Asian Nations (ASEAN) 2014. All rights reserved.
Dangerous Goods Handling

International Maritime Dangerous Goods Code (IMDG Code)

Mr. Chalermsak Karnchanawarin
Objectives:

- This chapter will cover the basic understanding on the applicable transport regulation by Sea (International Maritime Dangerous Goods Code : IMDG Code).
- The History, Principles and Layout of IMDG Code will be explained.
- It covers Basic Hazard Classification and Hazard Communication under IMDG Code.
- The core element of the IMDG Code will be explained on how to read the information in Dangerous Goods List (DGL).
IMDG Code

Objectives:

- The **Training Requirements** under IMDG Code will be explained.
- The example of how to **use IMDG Code** will also be demonstrated.
IMDG Code

Presentation Outline

- International Legal Framework
- IMDG Code
- Principles and Layout of IMDG Code
- IMDG Code Classification System
  - The 9 Classes of Dangerous Goods
  - UN Number & Proper Shipping Names
  - Hazard Labels
- Understanding the Dangerous Goods List (DGL)
- Training Requirements
- Using IMDG Code
The International Legal Framework

The International Maritime Organization (IMO) is a United Nations specialized agency which has developed international legislation dealing with two key issues for the maritime industry:

- The safety of life at sea
- Prevention of pollution from ships

The IMO has developed two international conventions to address these two issues:

- The SOLAS Convention (covering safety of life at sea)
- The MARPOL Convention (covering pollution prevention)
The International Legal Framework

To supplement the principles laid down in the SOLAS and MARPOL Conventions, the IMO developed the International Maritime Dangerous Goods (IMDG) Code

- The IMDG Code contains detailed technical specifications to enable dangerous goods to be transported safely by sea
- The IMDG Code became mandatory in international law on 1st January 2004

The objective of IMDG Code is to:-

- Enhance the safe transport of dangerous goods
- Protect the marine environment
- Facilitate the free unrestricted movement of dangerous goods
IMDG Code

International Maritime Dangerous Goods Code

“Amendment 36-12”
Issued year: 2013
Principles of IMDG Code

- groups dangerous goods together based on the hazards they present in transport (classification);

- contains the dangerous goods in packagings/tanks which are of appropriate strength and which will prevent the goods escaping (proper packaging);

- uses hazard warning labels and other identifying marks to identify dangerous goods in transport (communication);

- requires standard documentation to be provided when dangerous goods are being transported (documentation);
Principles of IMDG Code

- lays down principles for ensuring that those dangerous goods which will react dangerously together are kept apart (segregation);

- lays down principles for where to place dangerous goods on board ship to ensure safe transport (stowage);

- provides emergency response advice for dangerous goods involved in a fire or spillage on board ship (emergency response).
Principles of IMDG Code

Updating IMDG Code
The IMDG Code is an international regulation which is continuously evolving and is updated every two years to take account of:

- new dangerous goods which have to be included;
- new technology and new methods of working with/handling dangerous goods
- safety concerns which arise as a result of human experience.
- each version of the Code is given an Amendment Number to signify how many times it has been updated. This number appears at the bottom of each page together with the year of amendment.
- current Amendment 36-12 must be used.
Principles of IMDG Code

- Each Amendment is valid for up to three years.
- There are alternating years for implementation.
- In January of the **yellow years**, a new Amendment is published and can be used immediately, subject to the timing of National Competent Authority adoption.
- During the **yellow years**, the preceding Amendment can also be used, so it is a transition year.
- In the **green years**, only the current Amendment may be used.
Layout of IMDG Code

- The code is composed of 7 parts
- The code is presented in two books, volume 1 and volume 2
- It is necessary to use both books to obtain the required information when shipping dangerous goods by sea.
- The code also contains a supplement
Layout of IMDG Code

Volume 1 (Part 1-2, 4-7 of the Code) contains the following:

- **Part 1**: General provisions, definitions and training
- **Part 2**: Classification
- **Part 4**: Packing and Tank Provision
- **Part 5**: Consignment Procedures
- **Part 6**: Construction and Testing of Packaging, Intermediate Bulk Containers (IBCs), Large Packaging, Portable Tanks, Multiple-Element Gas Containers (MEGC’S) and Road Tank Vehicles
- **Part 7**: Requirements Concerning Transport Operations
Layout of IMDG Code

Volume 2 (Part 3 and the Appendices) contains the following:

- **Part 3**: Dangerous Goods List (DGL) and Limited Quantities Exceptions
- The DGL is the central core of the IMDG Code and presents information on the transport requirements for all dangerous goods in a coded form [Insert graphic].
- **Appendix A**: List of Generic and N.O.S. Proper Shipping Names
- **Appendix B**: Glossary of terms
- **Alphabetical Index**
Layout of IMDG Code

The Supplement contains the following texts related to the Code:

- Emergency Response Procedures for Ships Carrying Dangerous Goods;
- Medical First Aid Guide (MFAG);
- Reporting Procedures;
- IMO/ILO/ECE Guidelines for Packing Cargo Transport Units;
- Safe Use of Pesticides in Ships;
IMDG Code Classification System

The purpose of the IMDG Code’s classification system is:
- to distinguish between goods which are considered to be dangerous for transport and those which are not
- to identify the dangers which are presented by dangerous goods in transport
- to ensure that the correct measures are taken to enable these goods to be transported safely without risk to persons or property (both within the port and on the ship).

Dangerous goods are classified into one of 9 classes which all have differing properties. The way in which different classes of dangerous goods are handled in transport will depend upon these properties and the hazards presented and effects
- the type of packing that can be used
- what classes of dangerous goods can be transported together in freight containers,
- where the goods can be stored within the port and on the ship
The 9 Classes of Dangerous Goods

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable liquids
- Class 4: Flammable solids
- Class 5: Oxidizing substances and organic peroxides
- Class 6: Toxic and infectious substances
- Class 7: Radioactive material
- Class 8: Corrosive substances
- Class 9: Miscellaneous dangerous substances and articles

These 9 hazard classes have been established internationally by a United Nations (UN) committee to ensure that all modes of transport (road, rail, air and sea) classify dangerous goods in the same way.
UN Number & Proper Shipping Names

Within each of the 9 hazard classes dangerous goods are uniquely identified by two pieces of information:

- A four-digit number known as the UN Number which is preceded by the letters UN.
- The corresponding Proper Shipping Name (PSN).

For example, kerosene is identified in the IMDG Code by its UN Number UN 1223 and the PSN Kerosene.

Together the UN Number and PSN uniquely identify dangerous goods to:

- enable rapid and precise identification during transport to ensure the correct handling, stowage, segregation etc, and
- in the event of an emergency, ensure that the correct procedures are followed.
Hazard Labels

Each of the hazard classes are also identified by labels:
Understanding the Dangerous Goods List (DGL)

- The DGL is presented across 2 pages of the IMDG Code and is divided into 18 columns for each individual dangerous good listed.

- Much of the information contained in the DGL is coded to make it easier to present in a table.

- The DGL is arranged in UN Number order; column 1 and column 18 contains the UN Number.

- To look up an entry, you just need the UN Number.

- However, dangerous goods can also be searched using the PSN.

- Therefore, if you do not have the UN Number but have the PSN, you can find its associated UN Number by looking at the alphabetical index at the back of Volume 2.
Understanding the Dangerous Goods List (DGL)

Column 1 – UN Number

Column 2 – Proper Shipping Name (PSN)
Contains the Proper Shipping Names in upper case characters which may be followed by additional descriptive text in lower-case characters.

Column 3 – Class or Division
Contains the class and, in the case of class 1, the division and compatibility group.

Column 4 – Subsidiary Risk(s)
Contains the class number(s) of any subsidiary risk(s). This column also identifies if dangerous goods are marine pollutants by showing the letter ‘P’.
Understanding the Dangerous Goods List (DGL)

Column 5 – Packing Group
Contains the packing group number (i.e. I, II or III) where assigned to the substance or article.

Column 6 – Special Provisions
Contains a number referring to any special provision(s) indicated in chapter 3.3.

Column 7a – Limited Quantities
Provides the maximum quantity per inner packaging.

Column 7b – Excepted Quantities
Provides a code which can be referenced to determine the maximum quantity per inner and outer packaging.
Understanding the Dangerous Goods List (DGL)

**Column 8 – Packing Instructions**
Contains packing instructions for the transport of substances and articles.

**Column 9 – Special Packing Provisions**
Contains special packing provisions.

**Column 10 – IBC Packing Instructions**
Contains IBC instructions which indicate the type of IBC that can be used for the transport.

**Column 11 – IBC Special Provisions**
Refers to special packing provisions applicable to the use of packing instructions bearing the code ‘IBC’ in 4.1.4.2.
Understanding the Dangerous Goods List (DGL)

Column 12 – IMO Tank Instructions
This column is no longer used but used to apply to IMO portable tanks and road tank vehicles.

Column 13 – UN Tank and Bulk Container Instructions
Contains T codes (see 4.2.5.2.6) applicable to the transport of dangerous goods in portable tanks and road tank vehicles.

Column 14 – Tank Special Provisions
Contains TP notes (see 4.2.5.3) applicable to the transport of dangerous goods in portable tanks and road tank vehicles.
Understanding the **Dangerous Goods List (DGL)**

**Column 15 – EmS**

**Column 16 – Stowage and Segregation**
Contains the stowage and segregation provisions as prescribed in part 7.

**Column 17 – Properties and Observations**
Contains properties and observations on the dangerous goods listed.

**Column 18 – UN Number**
Contains the United Nations Number for ease of reference across both pages of the printed book.
Training Requirements

In the 2002 edition of the IMDG Code, training was introduced for the first time.

The IMO Member Governments recognized that the safe transport of dangerous goods by sea is dependent upon the appreciation, by all persons involved, of the risks involved and on a detailed understanding of the IMDG Code requirements.

The training requirements became mandatory with Amendment 34-08.
Training Requirements

These training requirements highlight the need for all shore-based personnel involved in the shipment of dangerous goods to receive training commensurate with their responsibilities. The IMDG Code defines shore-based personnel as those who:

- Classify dangerous goods and identify PSNs
- Pack dangerous goods
- Mark, label or placard dangerous goods
- Load/unload CTUS
- Prepare transport documents for dangerous goods
- Offer dangerous goods for transport
- Accept dangerous goods for transport
- Handle dangerous goods in transport
Training Requirements

These training requirements highlight the need for all shore-based personnel involved in the shipment of dangerous goods to receive training commensurate with their responsibilities. The IMDG Code defines shore-based personnel as those who:

- Prepare dangerous goods loading/stowage plans
- Load/unload dangerous goods into/from ships
- Carry dangerous goods in transport
- Enforce, survey or inspect for compliance with applicable rules and regulations
Using IMDG Code – Acetone / UN 1090

For placarding and marking of cargo transport units see 5.3 of the IMDG Code.
Using IMDG Code – Packing Instructions

### Packing Instructions (Liquids)

<table>
<thead>
<tr>
<th>Combination packings</th>
<th>Maximum capacity/net mass (see 4.1.3.6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass 10 L</td>
<td>Packing group I</td>
</tr>
<tr>
<td>Plastic 30 L</td>
<td>75 kg</td>
</tr>
<tr>
<td>Metal 40 L</td>
<td>75 kg</td>
</tr>
</tbody>
</table>

#### Inner packings

- **Drums**
  - Steel (1A1, 1A2)
  - Aluminum (1B1, 1B2)
  - Other metal (1N1, 1N2)
  - Plywood (1H1, 1H2)
  - Fibre (1G)

- **Bottles**
  - Steel (1A1)
  - Aluminum (1B1)
  - Other metal (1N1)
  - Natural wood (6C1, 6C2)
  - Plywood (1D1)
  - Reinforced wood (1F)
  - Fibreboard (1H1)
  - Expanded plastic (1H1)
  - Solid plastic (1K1)

- **Jerrycans**
  - Steel (3A1, 3A2)
  - Aluminum (3B1, 3B2)
  - Plastic (3H1, 3H2)

#### Outer packings

- **Drums**
  - Steel, non-removable head (1A1)
  - Steel, removable head (1A2)
  - Aluminum, non-removable head (1B1)
  - Aluminum, removable head (1B2)
  - Other metal, non-removable head (1N1)
  - Other metal, removable head (1N2)
  - Plastic, non-removable head (1H1)
  - Plastic, removable head (1H2)

- **Jerrycans**
  - Steel, non-removable head (3A1)
  - Steel, removable head (3A2)
  - Aluminum, non-removable head (3B1)
  - Aluminum, removable head (3B2)
  - Plastic, non-removable head (3H1)
  - Plastic, removable head (3H2)

#### Composite packings

- **Plastic receptacles in steel or aluminium drum (4H1A, 4H1B)**
  - 250L
  - 50L
  - 50L

- **Plastic receptacles in fibre, plastic or plywood drum (4H2, 4H3, 4H4)**
  - 220L
  - 250L
  - 50L

- **Plastic receptacles in steel or aluminum box or box: plastic receptacle in wood, plywood or solid plastic box (4H2, 4H3, 6H1, 6H2, 6H3, 6H4, 6H5, 6H6, 6H7, 6H8 or 6H9)**
  - 60L
  - 60L
  - 60L

- **Glass receptacles in steel, aluminum, fibre, plywood, solid plastic or expanded plastics drum (4P1A, 4P1B, 4P1S, 6P1, 6P2, 6P3, 6P4 or 6P5)** or in a steel, aluminum, wood or fibreboard box or in a cardboard drum (4P1A, 4P1B, 6P1, 6P2, 6P3, 6P4 or 6P5)
  - 60L
  - 60L

---

* Not permitted for class 5, packing group I.
Using IMDG Code – IBC & Tanks Instructions

IBC02 PACKING INSTRUCTION

The following IBCs are authorized, provided the general provisions of 4.1.1, 4.1.2 and 4.1.3 are met:

1. Metal (311A, 311B and 311N);
2. Rigid plastics (311H1 and 311H2);
3. Composite (311H21).

T4 PORTABLE TANK INSTRUCTION

The general provisions of 6.7.2 shall be met.

- Minimum test pressure: 2.65 bar
- Minimum shell thickness (reference steel): 5 mm for tanks up to 1.60 m in diameter and for larger tanks carrying solids of packing group II or III; 6 mm otherwise.
- Pressure-relief provisions: Normal.
- Bottom opening provisions: 3 shut-off devices required.
- Alternatives permitted: T5, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22

Special packing provisions

TP1: The degree of filling prescribed in 4.2.1.9.2 shall not be exceeded.
Sustainable Human Resource Development in logistics services for ASEAN Member States


Chapter 4-1: IMDG Code

Dangerous Goods Handling

193. The degree of filling prescribed in 4.2.1.4.3 shall not be exceeded.
194. The degree of filling prescribed in 4.2.1.4.3 shall not be exceeded.
195. The maximum degree of filling (in %) for solids transported above their melting points and for elevated temperature liquids shall be determined in accordance with 4.2.1.9.3.
196. The degree of filling shall not exceed 90% or, alternatively, any other value approved by the competent authority (see 4.2.1.16.2).
197. The degree of filling prescribed in 4.2.3.6 shall be met.
198. To prevent the tank bursting in any event, including fire, equipment, it shall be provided with pressure-relief devices which are adequate in relation to the capacity of the tank and to the nature of the substance transported. The device shall also be compatible with the substance.
199. Air shall be eliminated from the vapour space by nitrogen or other means.
200. The test pressure for the portable tank may be reduced to 1.5 bar when the flashpoint of the substance transported is greater than 30°C.
201. A substance under this description shall only be transported in a portable tank under an approval granted by the competent authority.
202. A lead lining, not less than 5 mm thick, which shall be tested annually, or another suitable lining material approved by the competent authority is required.
203. [Reserved]
204. [Reserved]
205. [Reserved]
206. Self-contained breathing apparatus shall be provided when this substance is transported, unless no self-contained breathing apparatus, as required by SOLAS regulation II/2(19) (23-2/04), is on board.
207. [Reserved]
208. [Reserved]
209. The tank shall be filled with a special device to prevent under-pressure and excess pressure during normal transport conditions. This device shall be approved by the competent authority. Pressure-relief provisions are as indicated in 4.2.3.8.3 to prevent crystallization of the product in the pressure-relief valve.
210. Only inorganic non-combustible materials shall be used for thermal insulation of the tank.
211. Temperature shall be maintained between 30°C and 40°C. Portable tanks containing solidified methanesulfonic acid shall not be reheated during transport.
212. The calculated shell thickness shall be increased by 3 mm. Shell thickness shall be verified ultrasonically at intervals midway between periodic hydraulic tests.
213. This substance shall only be transported in insulated tanks under a nitrogen blanket.
214. The shell thickness shall be not less than form. Tanks shall be hydraulically tested and internally inspected at intervals not exceeding 2.5 years.
215. Lubricant for joints or other devices shall be inorganic-compatable.
216. Transport permitted under special conditions prescribed by the competent authorities.
217. The portable tank may be filled with a device located in the vapour space of the shell to prevent the build-up of excess pressure due to the slow decomposition of the substance transported. The device shall also prevent an unacceptable amount of leakage of liquid in the case of over-turning or entry of foreign matter into the tank. The device shall be approved by the competent authority or its authorized body.
218. Subphar trisilic 99.95% pure and above may be transported in tanks without an inhibitor provided that it is maintained at a temperature equal to or above 32.5°C.
219. When transported under heated conditions, the heating device shall be fitted outside the shell. For LN 31%, this provision only applies when the substance reacts dangerously with water.
220. A portable tank having a minimum test pressure of 4 bar may be used if it is shown that a test pressure of 4 bar or less is acceptable according to the test pressure definition in 6.7.2.1.
## Dangerous Goods Handling

### Chapter 4-1: IMDG Code

#### Using IMDG Code – Fire Schedule

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cargo on fire on deck</strong></td>
<td>- Create water spray from as many hoses as possible.</td>
</tr>
<tr>
<td><strong>Cargo on fire under deck</strong></td>
<td>- Stop ventilation and close hatches.</td>
</tr>
<tr>
<td><strong>Cargo exposed to fire</strong></td>
<td>- If practicable, remove or jettison packages which are likely to be involved in the fire. Otherwise, keep cool for several hours using water.</td>
</tr>
<tr>
<td><strong>Special cases:</strong></td>
<td>- UN 1162, UN 1250, UN 1290, UN 1717, UN 2905: Cargoes will create hydrochloric acid in contact with water; stay away from effluent.</td>
</tr>
</tbody>
</table>

**NON-WATER-REACTIVE FLAMMABLE LIQUIDS**

Cargoes in tanks exposed to heat may explode suddenly in or after a fire situation by a Boiling Liquid-Expanding Vapour Explosion (BLEVE). Keep tanks cool with copious quantities of water. Fight fire from a protected position from as far away as possible. Stop leaks or close open valve if practicable. Flames may be invisible.
Using IMDG Code – Spillage Schedule

<table>
<thead>
<tr>
<th>SPILLAGE SCHEDULE Delta</th>
<th>S - D</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAMMABLE LIQUIDS</td>
<td></td>
</tr>
<tr>
<td>General comments</td>
<td>Wear suitable protective clothing and self-contained breathing apparatus. Avoid all sources of ignition (e.g. naked lights, un protected light bulbs, electric hand tools, friction). Stop leak if practicable. Avoid contact, even when wearing protective clothing. Spillage may evolve flammable vapours. Contaminated clothing must be washed off with water and then removed.</td>
</tr>
<tr>
<td>Spillage on deck</td>
<td>Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.</td>
</tr>
<tr>
<td>Cargo Transport Units (large spillage)</td>
<td>Keep bridge and living quarters up wind. Wash overboard with copious quantities of water. Do not direct water jet straight onto the spillage. Keep clear of effluent. Clean the area thoroughly.</td>
</tr>
<tr>
<td>Spillage under deck</td>
<td>Shut off all possible sources of ignition in the space. Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If the atmosphere cannot be checked, do not enter. Let vapours evaporate, keep clear. Provide good ventilation of the space. Use water-spray on effluent in hold to avoid ignition of flammable vapours. Wash down to the bottom of the hold. Pump overboard.</td>
</tr>
<tr>
<td>Cargo Transport Units (large spillage)</td>
<td>Keep bridge and living quarters up wind. Protect crew and living quarters against corrosive or toxic vapours by using water-spray to drive vapours away. Do not enter space. Keep clear. Radio for expert ADVICE. After hazard evaluation by experts, you may proceed. Provide adequate ventilation. Do not enter space without self-contained breathing apparatus. Check atmosphere before entering (toxicity and explosion hazard). If atmosphere can not be checked, do not enter. Let vapour evaporate, keep clear. Where a ventilation system is used, particular attention should be taken in order to prevent toxic vapours or fumes entering occupied areas of the vessel, e.g. living quarters, machinery spaces, working areas. Provide good ventilation of the space. Use water-spray on effluent in the space to avoid ignition of flammable vapours. Wash down to the bottom of the hold. Use copious quantities of water. Pump overboard.</td>
</tr>
<tr>
<td>Special cases:</td>
<td></td>
</tr>
<tr>
<td>Marine Pollutant Mark</td>
<td></td>
</tr>
<tr>
<td>UN 2749</td>
<td>Report incident according to MARPOL reporting requirements. Self-ignition of spill material is possible.</td>
</tr>
<tr>
<td>UN 3359</td>
<td>This is a cargo transport unit under fumigation. When opened it will be ventilated. However, experience has shown that toxic fumigants will stay within packaging material and in non-ventilated areas. Obtain information about the fumigation agent.</td>
</tr>
</tbody>
</table>

Dangerous Goods Handling  Chapter 4-1: IMDG Code
Sustainable Human Resource Development in logistics services for ASEAN Member States

Using IMDG Code – Stowage & Segregation

Stowage Requirements

- On or under deck.
  - When under deck, in a mechanically ventilated space, and where approved by the Administration.
  - When on deck shall be stowed at least 2.4m (container ships) or 3m (other cases) from any potential source of ignition.

Class and Subrisk Segregation

- None required
- Away from
- Separated from
- Separated by a complete compartment or hold from
- Separated longitudinally by an intervening complete compartment or hold from

For segregation between explosives, see 7.2.7.1

See also column 16 for requirements concerning segregation groups
Using IMDG Code – Load Validation

![Image of a Hazcheck Workstation screen showing IMDG Code information]

Load does not comply - see validation
Using IMDG Code – Load Validation

Stowage: VALID  Segregation: INVALID
(see Conflicts)
Information supplied: MISSING or INVALID
(Packing: MISSING
(see below)

UN 1263 and UN 2031 Segregation required between these classes.
UN 1993 and UN 2031 Segregation required between these classes.
UN 1247 and UN 2031 Segregation required between these classes.

MISSING OR INCORRECT INFORMATION: UN 1263
Flashpoint is required

PACKING INFORMATION has not been entered: UN 1263

MISSING OR INCORRECT INFORMATION: UN 1993
Flashpoint is required
Technical name required
Using IMDG Code – Load Validation
Dangerous Goods Handling   Chapter 4-1: IMDG Code
Dangerous Goods Handling

International Maritime Dangerous Goods Code (IMDG Code)

Mr. Chalermsak Karnchanawarin