
Inżynieria Bezpieczeństwa Obiektów Antropogenicznych

INSPECTION OF CONTAINERS OF THE EXPLOSIVES MATERIALS IN THE MARITIME TRANSPORT

Kontrola kontenerów z materiałami wybuchowymi w transporcie morskim

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Abstract

The article presents selected issues related to safety transport of dangerous goods with detailed inspection services. Avoiding potential health risks associated with the transport of dangerous goods or hazardous substances is a top priority for all those involved. Companies using road, rail or water transport for the purposes of further processing or utilizing these substances have a responsibility to ensure safe packaging, secure logistics concepts, traffic guidance and quality control strategies that reduce the threat to public safety.

A large number of provisions must be complied with regarding the safe transport of dangerous goods, permit and authorization procedures, follow inspection dates, and monitor the efficient performance of transport operations

Key words: security, transport, dangerous goods, inspection, containers.

Streszczenie

W artykule przedstawiono wybrane zagadnienia związane z zapewnieniem bezpiecznego transportu towarów niebezpiecznych za pomocą szczegółowych usług inspekcyjnych. Unikanie potencjalnych zagrożeń dla zdrowia związanych z transportem towarów niebezpiecznych lub substancji niebezpiecznych jest priorytetem dla wszystkich zainteresowanych. Firmy korzystające z transportu drogowego, kolejowego lub wodnego w celu dalszego przetwarzania lub wykorzystania tych substancji mają obowiązek zapewnić bezpieczne opakowanie, bezpieczne koncepcje logistyczne, wskazówki dotyczące ruchu i strategie kontroli jakości, które zmniejszają zagrożenie dla bezpieczeństwa publicznego. Należy przestrzegać dużej liczby przepisów dotyczących bezpiecznego transportu towarów niebezpiecznych z procedurami wydawania pozwoleń i zezwoleń, śledzić terminy kontroli, a także monitorować sprawne wykonywanie operacji transportowych.

Słowa kluczowe: bezpieczeństwo, transport, towary niebezpieczne, kontrola, kontenery.

Introduction

Avoiding potential health risks associated with the transport of dangerous goods or hazardous substances is a top priority for all those involved. In the maritime literature

and legislation expressions “dangerous cargoes and goods”, “harmful substances”, and “hazardous materials” can be seen. The variety of terminology definitions of dangerous cargo causes confusion and rises the question: „What is the difference between these words?”. According opinion author this paper there are three areas which are related to dangerous substances: production, transport and use. To make better distinctions between them, in the transport chain dangerous substances should be called „Dangerous Cargoes”.

The IMO uses in its documents both the phrase „dangerous goods” (SOLAS, IMDG Code) and „Dangerous cargoes” („Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas”).

The US authorities prefer „hazardous materials”. Therefore, there is no exact phrase which is used everywhere in the world and different words is used to describe same thing. What are dangerous cargoes? Broadly, these are cargoes that endanger lives, people, property and the marine environment (Rawson, 1994). IMO defines dangerous cargoes in the „Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas” in the following way: Means any of the following cargoes, whether packaged, carried in bulk packagings or in bulk within the scope of following regulations:

1. Petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products mentioned in annex I of MARPOL 73/78.
2. Noxious liquid substances falling into category A, B, C, D of MARPOL annex II.
3. Dangerous hazardous and harmful substances and materials including marine pollutants and wastes covered by IMDG Code.
4. Solid bulk materials possessing chemical hazards and solid bulk materials hazardous only in bulk covered by annex B of the BC Code. The same document adds more.

The term “dangerous cargoes” includes any empty uncleaned packagings which previously contained dangerous cargoes, unless the packagings have been sufficiently cleaned.... Though, the definition is wide and almost every port in every country handle some of these substances or items mentioned in Conventions.

Consignment procedures of dangerous goods is nothing but procedures for communicating hazard involved in dangerous goods while in transport. The potential hazard, specific nature of goods requiring segregation, stowage conditions etc. are communicated through marks, labels, placards and document.

A dangerous goods which is correctly classified, identified with proper shipping name and appropriately packed but not consigned as per part 5 of IMDG Code will fail to meet the objective of IMDG Code, *‘enhance the safe carriage of dangerous goods while facilitating the free unrestricted movement of such goods and prevent pollution to the environment’*. Apart from risking lives at sea and those who handle such goods, a wrongly consigned dangerous goods may also experience delays and detentions at ports. Part 5 of IMDG Code starts with the two most important aspects of consignment procedures:

1. No one must offer dangerous goods for transport unless the goods are marked, labelled, placarded and documented according to part 5 of IMDG Code, and
2. A Carrier must not accept dangerous goods unless a copy of dangerous goods declaration is provided.

Above two requirements are directly evolved from the application and regulations of SOLAS 1974, as amended, Chapter VII Part A and MARPOL, 1973/78, Annex III;

the two most important conventions of International Maritime Organisation for enhancing safety of life at sea and prevention of marine pollution.

However there are exceptions, all dangerous goods need not require labeling, placarding or document. What is required and when not required can only be determined by referring to part 5 and the individual entries in part 3, chapter 3.2. In this moment author present examples.

1. A dangerous goods declaration is not required for excepted packages of radioactive material when UN Number preceded by the letters "UN", and the name and address of the consignor and the consignee is legibly and durably marked on the package and mentioned in a transport document, which can be a bill of lading, air waybill or other similar document.
2. Nickel-metal hydride cells or batteries loaded in a container with total gross mass 100 kg or more need not be marked, labelled or placarded but a transport document issued, manifested and additionally protected from sources of heat when stowed on board vessel.

Author of this publication identifies safety requirements regarding maritime transport of dangerous goods class 1. Various modes of transport are used to hazardous materials that often include maritime transport of hazardous materials, such as explosives. Dangerous Goods' refers to items that are potentially dangerous during transportation. The above paper is based of techniques in ship operations, as well as the desirability of having more comprehensive recommendations which included dangerous goods. Dangerous goods have special transport requirements to eliminate or minimize the risk of injuring people or damaging property and the environment. The Recommendations are aligned with relevant IMO codes and the IMDG Code in particular. The above article is based on the results of safety research on maritime transport of hazardous materials, as Sworn Expert of the Polish Chamber of Maritime Commerce.

1. Marking and Labeling of packages

A package must be marked with UN Number, Proper Shipping name and technical name when assigned with special provisions 274 or 318. Example" UN 0209TRINITROTOLUENE (TNT), dry or wetted with less than 30% water, by mass (Fig.1). The letters „UN" shall be at least 12 mm high, for packagings of 30 l or 30 kg capacity or less at least 6 mm in height.



Fig. 1. A package with be marked with UN Number.

When a substance, material or article is identified as Marine Pollutant by IMDG Code or when it possesses the properties that meet the criteria of MARPOL Annex III but not identified as a Marine Pollutant by IMDG Code the same must be consigned as Marine Pollutant. Document must identify this with words MARINE POLLUTANT or MARINE POLLUTANT / ENVIRONMENTALLY HAZARDOUS. Additionally the package must bear the Marine Pollutant Mark (Fig.2) which shall be at least 100 mm × 100 mm unless the package size can only bear smaller marks.



Fig. 2. The Marine Pollutant Mark.

Exception – single packagings (Fig.3) and combination packagings where such single packagings or inner packagings of such combination packagings have a net quantity of 5 l or less for liquids; or a net mass of 5 kg or less for solids need not require a Marine Pollutant mark however the container carrying this package must display Marine Pollutant Mark one on each side and one on each end of the unit.



Fig. 3. Singles packaging Marks.

In terms of colour, symbols, numbers and general format the labels must meet the specifications mentioned in section 5.2.2.2.2 of IMDG Code.

Labels shall be in the form of a square set at an angle of 45° (diamond-shaped) with minimum dimensions of 100 mm by 100 mm (Fig.4). Shall have a line 5 mm inside the edge and running parallel with it.

The upper half of a label the line shall have the same colour as the symbol and in the lower half it shall have the same colour as the figure in the bottom corner.

Shall be displayed on a background of contrasting colour, or shall have either a dotted or solid outer boundary line.

Colour of the label is very important as the colour together with the symbols directly communicate the type of hazard involved. Those who are printing their own label may use PANTONE® formula guide for accurate colour.

Or refer to corresponding Munsell notations or *International Commission of Illumination* standards. A spectrophotometer or other instrumentation may be used to check whether the colour of printed labels match the standards.



Fig. 4. Labels shall be in the form of a square set at an angle of 45°

Durability of Marking and Labeling shall be such that this information will still be identifiable on packages surviving at least three months' immersion in the sea. British standard BS 5609 for printed pressure-sensitive, adhesive-coated labels meets this requirement. This standard tests the labels for print permanence, adhesive performance, abrasion resistance etc.

When a package is containing more than one dangerous goods it shall be marked and labelled for all the dangerous goods contained within.

2. Inspection of containers carrying dangerous goods

Member countries of International Maritime Organization conducts inspection of containers carrying dangerous goods and marine pollutants for compliance to IMDG Code and other applicable regulations. Inspection may be carried out on board ships or in port areas.

Maritime Safety Committee circular MSC.1/Circ.1442 lays down the scope of inspection and items to be inspected includes:

1. Documentation
2. International Convention for Safe Containers (CSC) Safety Approval Plate and plating in accordance the IMDG Code for portable tanks
3. Placarding and marking of CTUs
4. Marking and labelling of packages
5. Packaging (inappropriate or damaged)
6. Portable tank or road tank vehicles not covered by CSC (inappropriate or damaged);
7. Stowage/securing inside the freight containers, vehicles and other CTUs
8. Segregation of cargo
9. Approved Continuous Examination Program (ACEP) or Periodic Examination Scheme (PES) label.

Depending on types of deficiencies noted container may be put out of service, cargo may be put on hold and or penalties may be imposed, and the inspecting authority will submit the report to IMO.

Section 1.1.1.8 of IMDG Code states „When a competent authority has reasons to believe that the safety of the transport of dangerous goods is compromised as a result of serious or repeated infringements of IMDG Code by an enterprise which has its headquarters on the territory of another competent authority, it should if necessary notify that competent authority of such infringements.”

This notification will be issued whenever such infringement is noticed and is not restricted to inspections as per Maritime Safety Committee circular MSC.1/Circ.1442.

To ensure compliance to IMDG Code and other applicable rules shippers can verify compliance to items which are subjected to inspection by authorities.

Below items is not listed in chronological sequence of an actual inspection, shippers may verify compliance in any order as deemed practical.

This checklist does not preclude compliance to other required provisions of IMDG Code and National/Regional Regulations with which the shipment may require compliance:

1. Is the type of packaging permitted by packing instructions in dangerous goods list of chapter 3.2 of IMDG Code.
2. Is the packing design type approved as required by paragraph 4.1.1.3 of the IMDG Code.
3. Is the approved packing group(s) of the design type (X, Y or Z) match with the packing group of the goods (I, II or III).
4. Is the single packagings used for liquids are approved for liquids.
5. Check whether plastic drums and jerricans, plastic inner receptacles of IBC, is not exceeding the five years period of use.
6. Check the rigid IBCs that the periods of inspections as required in paragraph 4.1.2.2.1 of the IMDG Code are not exceeded.
7. Check the packages are sound and without serious damages;(Simple defects, e.g. traces of use, are insignificant under safety aspects and have no effects on the legally prescribed performance level of the package) Inspecting authority has the jurisdiction to decide what is simple defect and serious damages.

Below items to be checked for marking and labelling of packages (Fig.5)



Fig.5. Checked for marking and labelling of containers.

Depending on the type of consignment, example limited quantities or exemption from marking of marine pollutant mark as per 2.10.2.7 / 5.2.1.6.1 of IMDG Code there may be variations.

Check the individual schedule and special provisions for compliance:

1. Proper Shipping Name
2. Technical Name when required by special provisions 274 or 318
3. Hazardous Class Label

4. Subsidiary Risk Label
5. Marine Pollutant Mark
6. Orientation Mark
7. Limited Quantities Mark
8. Lithium battery Mark
9. Excepted Quantities Mark.

3. Condition of the stowage/securing inside Cargo Transport Units

Cargo which has not been properly packed and sufficiently secured in a cargo transport unit may move inside the unit when it is exposed to acceleration, e.g. by hard braking of a vehicle on the road or by heavy ship motions at sea. Moving cargo resulting from improper securing may cause accidents, damage to the cargo, to other cargo or to the cargo transport unit. In particular heavy cargo items may develop inertia forces under such traffic accelerations, which may let them break through the CTU boundaries, menacing persons, environment or property of third parties.

1. If the cargo is secured by blocking or lashing: the securing material is of appropriate strength and lashings are sufficiently tensioned.
2. Packing should comply with CTU Code, and/or appropriate national legislation.

Consequences of insufficient control of humidity. Some CTUs like containers present a closed box with a specific micro climate.

Goods shall be prevented from sliding and tipping in forward, backward and sideways directions by locking, blocking, lashing or a combination of these methods (Fig.6).



Fig.6. Goods shall be prevented from sliding and tipping in forward

If sensible goods are packed carelessly into such a closed CTU, mainly box containers for sea transport, metal parts, if not properly protected, may corrode, clean surfaces may be stained and organic materials may suffer from mould or rot or other degradation. The cargo is secured against movement towards the door (Fig.7).



Fig.7. The cargo is secured against movement towards the door.

During a long distance transport the humidity contained in the goods and in the packing material including timber used for blocking and protection may condensate on the inner boundaries of the container or on the cargo or even within the cargo.

4. Transport of Class 1 (explosive) materials in freight containers

When Class 1 (explosive) materials are stowed in a freight container, the freight container, for the purposes of this paper, may be regarded as a magazine but not as a separate compartment (Fig.8). Freight containers exceeding 6 m (20 feet) in length may not carry more than 5000 kg (11,023 pounds) net explosive weight of explosive substances, except explosive substances in Division 1.4. Freight containers used to transport Class 1 (explosive) materials for which magazine stowage type A is required must have a floor consisting of tightly fitted wooden boards, plywood or equivalent non-metallic material, and a non-metallic lining.

Class 1 (explosive) materials of different compatibility groups may not be stowed within the same freight container. On vessels, other than specially fitted container ships, freight containers containing Class 1 (explosive) materials must be stowed only in the lowest tier.

Freight containers carrying different Class 1 (explosive) materials require no segregation from each other, if the provisions of IMDG Code of this subpart allow the Class 1 (explosive) materials to be carried together in the same compartment. In all other instances, the containers must be „separated from” one another in accordance with IMDG Code. Freight containers carrying Class 1 (explosive) materials may not be handled on board a vessel with fork lift trucks unless approved by the COTP. This does not preclude the use of front-loading trucks using side-frame lifting equipment.

All transport vehicles and cargo must be properly secured. All transport vehicles used for the carriage of Class 1 (explosive) materials must be structurally serviceable. Vehicles used to transport Class 1 (explosive) materials must conform to the requirements in ADR of this subchapter.

Class 1 (explosive) materials which require special stowage must be transported in transport vehicles approved for the purpose by the Associate Administrator for Hazardous Materials Safety except that Class 1 (explosive) materials in compatibility group G or H may be carried in steel portable magazines or freight containers.



Fig. 8. Class 1 (explosive) materials are stowed in a freight container

Closed transport vehicles may be used as magazines; transport vehicles of other types may be used to transport Class 1 (explosive) materials which require ordinary stowage. Class 1 (explosive) materials of different compatibility groups may not be stowed in the same vehicle except as allowed in ADR of this subpart.

Vehicles containing different Class 1 (explosive) materials require no segregation from each other, except that these materials may be carried together under the provisions of ADR. In all other instances, the vehicles must be “separated from” one another.

Due to the rapid increase in the use of freight containers and the development of specialized container ships, in 1967 the International Maritime Organization (IMO) started a study of the safety of containerisation in sea transport. In December 1972 the International Convention for Safe Containers (CSC) was signed in Geneva. The aim of the convention was to ensure a high standard of safety for workers during handling and transportation of containers, and also to facilitate international trade by providing uniform international safety regulations. The CSC made the approval of new containers mandatory and was a welcome means of regulating the construction and safety of containers.

The convention set out procedures for the safety approval of new containers, to be enforced by the States party or organisations authorised by them.

The evidence of approval, a Safety Approval Plate, was to be recognised by all when granted by a State party, a system which would allow the containers to move with a minimum of safety control formalities.

It is of interest to note that the CSC was not introduced for the safety of the cargo carried in containers, but for the safety of the persons working around them.

All transport vehicles used for the transport of Class 1 (explosive) materials must have lashing arrangements for securing the vehicle on the ship and preventing the movement of the vehicle on its springs during the sea passage.

Where a portable magazine or closed freight container is carried on a chassis, twist locks or other suitable securing arrangements must be provided and made secure.

Structural serviceability of freight containers and vehicles carrying Class 1 (explosive) materials on ships.

A freight container may not be offered for the carriage of Class 1 (explosive) materials unless the container is structurally serviceable as evidenced by a current CSC

(International Convention for Safe Containers) approval plate and verified by a detailed visual examination as follows (Fig.9).

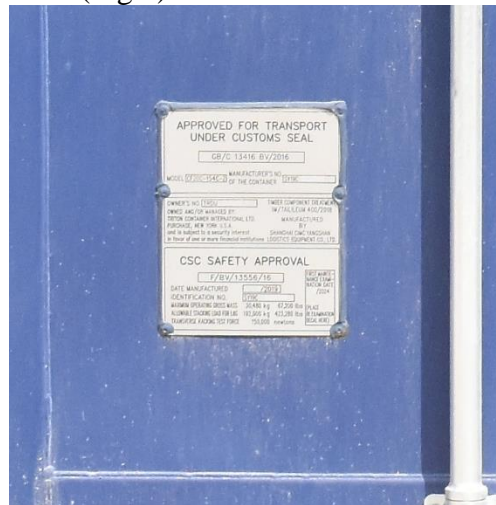


Fig. 9. Approval plate CSC (International Convention for Safe Containers)

Before a freight container or transport vehicle is packed with Class 1 (explosive) materials, it must be visually examined by the shipper to ensure it is structurally serviceable, free of any residue of previous cargo, and its interior walls and floors are free from protrusions.

Structurally serviceable means the freight container or the vehicle cannot have major defects in its structural components, such as top and bottom side rails, top and bottom end rails, door sill and header, floor cross members, corner posts, and corner fittings in a freight container. Major defects include:

1. Dents or bends in the structural members greater than 19 mm (0.75 inch) in depth, regardless of length;
2. Cracks or breaks in structural members;
3. More than one splice or an improper splice (such as a lapped splice) in top or bottom end rails or door headers;
4. More than two splices in any one top or bottom side rail;
5. Any splice in a door sill or corner post;
6. Door hinges and hardware that are seized, twisted, broken, missing, or otherwise inoperative;
7. Gaskets and seals that do not seal; or
8. For freight containers, any distortion of the overall configuration great enough to prevent proper alignment of handling equipment, mounting and securing chassis or vehicle, or insertion into ships' cells.

In addition, deterioration of any component of the freight container or vehicle, regardless of the material of construction, such as rusted-out metal in sidewalls or disintegrated fiberglass, is prohibited.

Normal wear, however, including oxidation (rust), slight dents and scratches, and other damage that does not affect serviceability or the weather-tight integrity of the units, is not prohibited. As used splice means any repair of a freight container main structural member which replaces material, except complete replacement of the member.

All shipments of Class 1 (explosive) materials except those in Division 1.4 (Class C explosive) must be accompanied by a statement, which may appear on the shipping

paper, certifying that the freight container or the vehicle is structurally serviceable as defined in paragraph (a)(2) of this section.

5. Defective containers and segregation of dangerous goods inside CTUs

No leaking, broken, or otherwise defective package containing Class 1 (explosive) materials, including packages which have been adversely affected by moisture, may be accepted for shipment.

The master or person in charge of a vessel on which there is a defective package containing Class 1 (explosive) materials must seek advice from the shipper concerning withdrawal, repair, or replacement. No repair of damaged or defective package containing Class 1 (explosive) materials may be performed on board a vessel.

No Class 1 (explosive) material, which for any reason has deteriorated or undergone a change of condition that increases the hazard attendant upon its conveyance or handling, may be moved in the port area. If any package of Class 1 (explosive) materials, or seal of a package of Class 1 (explosive) materials, appears to be damaged, that package must be set aside for examination and repair or otherwise legally disposed of as directed by the shipper. If any Class 1 (explosive) materials are spilled or released from a package, the responsible person must ensure that an appropriate emergency response is undertaken in accordance with the emergency response information required IMDG Code. The master of the vessel must report each incident involving spillage or release of Class 1 (explosive) materials as soon as practicable.

6. Inspection of Dangerous Goods Containers & Checklist to Compliance

Member countries of International Maritime Organization conducts inspection of containers carrying dangerous goods and marine pollutants for compliance to IMDG Code and other applicable regulations. Inspection may be carried out on board ships or in port areas.

A responsible person must be present at all times when the hatches of spaces containing Class 1 (explosive) materials are open. No unauthorized person may be permitted to access spaces in which Class 1 (explosive) materials are stowed. Magazines must be secured against unauthorized entry when loading has been completed, or when loading or unloading is stopped. Packages containing Class 1 (explosive) materials may not be opened on board ship.

Items to be checked for segregation when consolidating different dangerous goods:

1. The segregation table in paragraph 7.2.1.16 of the IMDG Code has been applied correctly for the hazard classes and subsidiary risks;
2. Specific segregation requirements as indicated in column 16b of the dangerous goods list have been complied with;
3. specific segregation requirements for the different compatibility groups of class 1 have been complied with;
4. segregation requirements in relation to foodstuffs have been observed.

Placarding and marking of Cargo Transport Units:

1. Freight container, trailer or portable tank: one on each side and one on each end of unit;
2. Railway wagon: at least on each side;

3. Multiple-compartment tank containing more than one dangerous substance or their residue: along each side at the positions of the relevant compartments; and
4. Any other CTU: at least on both sides and on the back of the unit.

Proper Shipping Name:

1. The Proper Shipping Name of contents shall be marked on at least both sides of:
2. Tank transport units containing dangerous goods;
3. Bulk containers containing dangerous goods; or
4. Any other CTU containing packaged dangerous goods of a single commodity for which no placard, UN Number or marine pollutant mark is required;

UN Number & Other Marks:

The UN Number for the goods and, if required, other placarding and marking such as elevated temperature, marine pollutant, limited quantity and fumigation warning sign, as provided in IMDG Code.

Documentation

1. Dangerous goods transport document;
2. Container/vehicle packing certificate;
3. Documentation for tanks used to transport dangerous goods;
4. Other information and documentation.

Items to be checked for each dangerous goods for compliance with section 5.4.1 of IMDG Code:

1. UN number preceded by the letters "UN".
2. Proper Shipping Name; Proper Shipping Names that are assigned special provision 274 in column 6 of the dangerous goods list shall be supplemented with their technical or chemical group names as described in paragraph 3.1.2.8 of the IMDG Code.
3. Primary hazard class or division of the goods.
4. Subsidiary hazard class or division number(s);
5. Packing group for the substance or article that may be preceded by "PG" if provided.
6. Other applicable information required by section 5.4.1 of the IMDG Code.
7. Proper certification or declaration required by paragraph 5.4.1.6 of the IMDG Code.
8. Is the classification of the goods is consistent with the properties of the material as described in the Material Safety Data Sheet.

Carrier must always take due diligence to protect themselves so are shippers, forwarders and consolidators. The utmost is to uphold the relevant provisions of SOLAS and MARPOL. No economy or business interest can outdo Safety, Health and Environmental Protection.

Avoiding potential health risks associated with the transport of dangerous goods or hazardous substances is a top priority for all those involved. Companies using road, rail or water transport for the purposes of further processing or utilizing these substances have a responsibility to ensure safe packaging, secure logistics concepts, traffic guidance and quality control strategies that reduce the threat to public safety.

CONCLUSION

The entry and presence of dangerous cargoes in port areas and any consequential handling should be controlled to ensure the general safety and security of the area, the containment of the cargoes, the safety of all persons in or near the port area, and the protection of the environment.

The safety of life at sea and the safety and security of a ship, its cargo and its crew in a port area are directly related to the care which is taken with dangerous cargoes prior to loading or unloading, and during their handling.

These Recommendations are confined to dangerous cargoes which are in a port area as part of the transport chain. These Recommendations do not apply to dangerous substances which are used in a port area or are for general storage in the port area, but Governments may wish to control such use and storage by national legal requirements.

Should a substance covered by either of these exclusions subsequently be shipped, these Recommendations should then be applied, even though the substance is already in the port area.

An essential pre-requisite for the safe transport and handling of dangerous cargoes is their proper identification, containment, packaging, packing, securing, marking, labelling, placarding and documentation. This applies whether the operation takes place in a port area or at premises away from a port area.

An incorrectly filled dangerous goods declaration can put lives of transport workers and ships at risk. In maritime transport the decision to place a container on a specific location on board vessel is purely taken from the information provided in Dangerous Goods Declaration. Majority of the stakeholders do not physically see the packages or containers with its labels, marks, or placards to make any decision to accept to load or where to place it viz on deck or under deck or the segregation from other containers. This sums up the prime importance of correctly filled dangerous goods declaration.

Whilst the total transport chain includes inland, port and marine elements, it is essential that every care is taken by those responsible that all relevant information is passed to those involved in the transport chain and to the final consignee. Attention should be paid to the possible differing requirements for different modes of transport.

The safe transport and handling of dangerous cargoes is based on correct and accurate application of regulations for transport and handling of such cargoes and depends on appreciation by all persons concerned of the risks involved and on the full and detailed understanding of the regulations. This can only be achieved by properly planned and carried out training and retraining of persons concerned.

The codes and guides are under continuous review and are regularly revised. It is essential that only the most up-to-date editions are used. The contents of these codes and guides have been repeated in these Recommendations only to the extent necessary.

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