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RESOLUTION A.714(17)  
adopted on 6 November 1991

CODE OF SAFE PRACTICE FOR CARGO STOWAGE AND SECURING

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety,

RECALLING ALSO resolution A.489(XII) on safe stowage and securing of cargo units and other entities in ships other than cellular containerships and MSC/Circ.385 of January 1985 containing the provisions to be included in a cargo securing manual to be carried on board ships,

RECALLING FURTHER resolution A.533(13) on elements to be taken into account when considering the safe stowage and securing of cargo units and vehicles in ships,

CONSIDERING the revised IMO/ILO Guidelines for packing cargo in freight containers or vehicles,

CONSIDERING ALSO resolution A.581(14) on guidelines for securing arrangements for the transport of road vehicles on ro-ro ships,

BEARING IN MIND that a number of serious accidents have occurred as a result of inadequate securing arrangements on board and deficient stowage and securing of cargoes in vehicles and containers, and that only proper stowage and securing of cargo on adequately designed and properly equipped ships can prevent the occurrence of such accidents in the future,

RECOGNIZING the need to improve the stowage and securing of cargoes shown by experience to create specific hazards to the safety of ships, and the stowage and securing of road vehicles transported on board ro-ro ships,

RECOGNIZING FURTHER that such improvement could be achieved by the establishment of a composite code of safe practice for cargo stowage and securing on board ships, including packing or loading cargo in road vehicles and freight containers,

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BELIEVING that the application of such a code of safe practice would enhance maritime safety,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its fifty-eighth session,

1. ADOPTS the Code of Safe Practice for Cargo Stowage and Securing set out in the annex to the present resolution;
2. URGES Governments to implement this Code at the earliest possible opportunity;
3. REQUESTS the Maritime Safety Committee to keep this Code under review and to amend it, as necessary;
4. REVOKES resolution A.288(VIII).

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CODE OF SAFE PRACTICE FOR CARGO STOWAGE AND SECURING

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## CODE OF SAFE PRACTICE FOR CARGO STOWAGE AND SECURING

### FOREWORD

The proper stowage and securing of cargoes is of the utmost importance for the safety of life at sea. Improper stowage and securing of cargoes has resulted in numerous serious ship casualties and caused injury and loss of life, not only at sea but also during loading and discharge.

In order to deal with the problems and hazards arising from improper stowage and securing of certain cargoes on ships, the International Maritime Organization has issued guidelines in the form of either Assembly resolutions or circulars adopted by the Maritime Safety Committee; these are listed hereunder\*:

- Safe stowage and securing of cargo units and other entities in ships other than cellular container ships, resolution A.489(XII)
- Provisions to be included in the Cargo Securing Manual to be carried on board ships, MSC/Circ.385
- Elements to be taken into account when considering the safe stowage and securing of cargo units and vehicles in ships, resolution A.533(13)
- Guidelines for securing arrangements for the transport of road vehicles on ro-ro ships, resolution A.581(14)
- IMO/ILO guidelines for packing cargo in freight containers or vehicles
- Hazards associated with the entry into enclosed spaces, MSC/Circ.487

The accelerations acting on a ship in a seaway result from a combination of longitudinal, vertical and predominantly transverse motions. The forces created by these accelerations give rise to the majority of securing problems.

The hazards arising from these forces should be dealt with by taking measures both to ensure proper stowage and securing of cargoes on board and to reduce the amplitude and frequency of ship motions.

The purpose of this Code is to provide an international standard to promote the safe stowage and securing of cargoes by:

- drawing the attention of shipowners and ship operators to the need to ensure that the ship is suitable for its intended purpose;

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\* The relevant resolutions, circulars and guidelines will be included as an appendix in the consolidated publication of the Assembly resolution and the Code.

- providing advice to ensure that the ship is equipped with proper cargo securing means;
- providing general advice concerning the proper stowage and securing of cargoes to minimize the risks to the ship and personnel;
- providing specific advice on those cargoes which are known to create difficulties and hazards with regard to their stowage and securing;
- advising on actions which may be taken in heavy sea conditions; and
- advising on actions which may be taken to remedy the effects of cargo shifting.

In providing such advice, it should be borne in mind that the master is responsible for the safe conduct of the voyage and the safety of the ship, its crew and its cargo.

#### GENERAL PRINCIPLES

All cargoes should be stowed and secured in such a way that the ship and persons on board are not put at risk.

The safe stowage and securing of cargoes depend on proper planning, execution and supervision.

Personnel commissioned to tasks of cargo stowage and securing should be properly qualified and experienced.

Personnel planning and supervising the stowage and securing of cargo should have a sound practical knowledge of the application and content of the Cargo Securing Manual, if provided.

In all cases, improper stowage and securing of cargo will be potentially hazardous to the securing of other cargoes and to the ship itself.

Decisions taken for measures of stowage and securing cargo should be based on the most severe weather conditions which may be expected by experience for the intended voyage.

Ship-handling decisions taken by the master, especially in bad weather conditions, should take into account the type and stowage position of the cargo and the securing arrangements.

#### CHAPTER 1 - GENERAL

##### 1.1 Application

This Code applies to cargoes carried on board ships (other than solid and liquid bulk cargoes and timber stowed on deck) and, in particular, to those cargoes whose stowage and securing have proved in practice to create difficulties.

## 1.2 Definitions of the terms used

For the purposes of this Code:

Cargo unit:

- means a vehicle, container, flat, pallet, portable tank, packaged unit, or any other entity, etc., and loading equipment, or any part thereof, which belongs to the ship but is not fixed to the ship as defined in Assembly resolution A.489(XII).

Intermediate bulk container (IBC):

- means a rigid, semi-rigid or flexible portable bulk container packaging of a capacity of not more than 3 m<sup>3</sup> (3,000 litres), designed for mechanical handling and tested for its satisfactory resistance to handling and transport stresses.

Portable tank:

- means a tank which is not permanently secured on board a ship, and has a capacity of more than 450 litres and a shell fitted with external stabilizing members and items of service equipment and structural equipment necessary for the transport of gases, liquids or solids.

Road tank-vehicle:

- means a vehicle with wheels and fitted with a tank or tanks intended for the transport of gases, liquids or solids by both road and sea modes of transport, the tank or tanks of which are rigidly and permanently attached to the vehicle during all normal operations of loading, transport and discharge and are neither filled nor emptied on board.

Road vehicle:

- means a commercial vehicle, semi-trailer, road train, articulated road train or a combination of vehicles, as defined in Assembly resolution A.581(14).

Roll-trailer:

- means a low vehicle for the carriage of cargo with one or more wheel axles on the rear and a support on the front end, which is towed or pushed in the port to and from its stowage on board the ship by a special tow-vehicle.

Ro-ro ship:

- means a ship which has one or more decks either closed or open, not normally subdivided in any way and generally running the entire length of the ship, carrying goods which are loaded and unloaded normally in a horizontal manner.

Unit load:

- means that a number of packages are either:
  - .1 placed or stacked, and secured by strapping, shrink-wrapping or other suitable means, on to a load board such as a pallet; or
  - .2 placed in a protective outer packaging such as a pallet box; or
  - .3 permanently secured together in a sling.

### 1.3 Forces

1.3.1 Forces, which have to be absorbed by suitable arrangements for stowage and securing to prevent cargo shifting, are generally composed of components acting relative to the axes of the ship:

- longitudinal;
- transversal; and
- vertical.

Remark: For the purpose of stowage and securing cargo, longitudinal and transvers forces are considered predominant.

1.3.2 Transverse forces alone, or the resultant of transverse, longitudinal and vertical forces, normally increase with the height of the stow and the longitudinal distance of the stow from the ship's center of motion in a seaway. The most severe forces can be expected in the furthest forward, the furthest aft and the highest stowage position on each side of the ship.

1.3.3 The transverse forces exerted increase directly with the metacentric height of the ship. An undue metacentric height may be caused by:

- improper design of the ship;
- unsuitable cargo distribution; and
- unsuitable bunker and ballast distribution.

1.3.4 Cargo should be so distributed that the ship has a metacentric height in excess of the required minimum and, whenever practicable, within an acceptable upper limit to minimize the forces acting on the cargo.

1.3.5 In addition to the forces referred to above, cargo carried on deck may be subjected to forces arising from the effects of wind and green seas.

1.3.6 Improper shiphandling (course or speed) may create adverse forces acting on the ship and the cargo.

1.3.7 The magnitude of the forces may be estimated by using the appropriate calculation methods as contained in the Cargo Securing Manual, if provided.

1.3.8 Although the operation of anti-roll devices may improve the behaviour of the ship in a seaway, the effect of such devices should not be taken into account when planning the stowage and securing of cargoes.

#### 1.4 Behaviour of cargoes

1.4.1 Some cargoes have a tendency to deform or to compact themselves during the voyage, which will result in a slackening of their securing gear.

1.4.2 Cargoes with low friction coefficients, when stowed without proper friction-increasing devices such as dunnage, soft boards, rubber mats, etc., are difficult to secure unless tightly stowed across the ship.

#### 1.5 Criteria for estimating the risk of cargo shifting

1.5.1 When estimating the risk of cargo shifting, the following should be considered:

- dimensional and physical properties of the cargo;
- location of the cargo and its stowage on board;
- suitability of the ship for the particular cargo;
- suitability of the securing arrangements for the particular cargo;
- expected seasonal weather and sea conditions;
- expected ship behaviour during the intended voyage;
- stability of the ship;
- geographical area of the voyage; and
- duration of the voyage.

1.5.2 These criteria should be taken into account when selecting suitable stowage and securing methods and whenever reviewing the forces to be absorbed by the securing equipment.

1.5.3 Bearing in mind the above criteria, the master should accept the cargo on board his ship only if he is satisfied that it can be safely transported.

#### 1.6 Cargo Securing Manual

1.6.1 Ships carrying cargo units and other entities covered in this Code and as outlined in resolution A.489(XII) (appendix) should carry a Cargo Securing Manual as detailed in MSC/Circ.385.

1.6.2 The cargo securing arrangements detailed in the ship's Cargo Securing Manual, if provided, should be based on the forces expected to affect the cargo carried by the ship, calculated in accordance with a method accepted by the Administration or approved by a classification society acceptable to the Administration.

#### 1.7 Equipment

The ship's cargo securing equipment should be:

- available in sufficient quantity;
- suitable for its intended purpose, taking into account the recommendations of the Cargo Securing Manual, if provided;
- of adequate strength;
- easy to use; and
- well maintained.



### 1.8 Special cargo transport units

The shipowner and the ship operator should, where necessary, make use of relevant expertise when considering the shipment of a cargo with unusual characteristics which may require special attention to be given to its location on board vis-à-vis the structural strength of the ship, its stowage and securing, and the weather conditions which may be expected during the intended voyage.

### 1.9 Cargo information

1.9.1 Before accepting a cargo for shipment, the shipowner or ship operator should obtain all necessary information about the cargo and ensure that:

- the different commodities to be carried are compatible with each other or suitably separated;
- the cargo is suitable for the ship;
- the ship is suitable for the cargo; and
- the cargo can be safely stowed and secured on board the ship and transported under all expected conditions during the intended voyage.

1.9.2 The master should be provided with adequate information regarding the cargo to be carried so that its stowage may be properly planned for handling and transport.

## CHAPTER 2 - PRINCIPLES OF SAFE STOWAGE AND SECURING OF CARGOES

### 2.1 Suitability of cargo for transport

Cargo carried in containers, road vehicles, shipborne barges, railway wagons and other cargo transport units should be packed and secured within these units so as to prevent, throughout the voyage, damage or hazard to the ship, to the persons on board and to the marine environment.

### 2.2 Cargo distribution

2.2.1 It is of utmost importance that the master takes great care in planning and supervising the stowage and securing of cargoes in order to prevent cargo sliding, tipping, racking, collapsing, etc.

2.2.2 The cargo should be distributed so as to ensure that the stability of the ship throughout the entire voyage remains within acceptable limits so that the hazards of excessive accelerations are reduced as far as practicable.

2.2.3 Cargo distribution should be such that the structural strength of the ship is not adversely affected.

### 2.3 Cargo securing arrangements

2.3.1 Particular care should be taken to distribute forces as evenly as practicable between the cargo securing devices. If this is not feasible, the arrangements should be upgraded accordingly.

2.3.2 If, due to the complex structure of a securing arrangement or other circumstances, the person in charge is unable to assess the suitability of the arrangement from experience and knowledge of good seamanship, the arrangement should be verified by using an acceptable calculation method.

#### 2.4 Residual strength after wear and tear

Cargo securing arrangements and equipment should have sufficient residual strength to allow for normal wear and tear during their lifetime.

#### 2.5 Friction forces

Where friction between the cargo and the ship's deck or structure or between cargo transport units is insufficient to avoid the risk of sliding, suitable material such as soft boards or dunnage should be used to increase friction.

#### 2.6 Shipboard supervision

2.6.1 The principal means of preventing the improper stowage and securing of cargoes is through proper supervision of the loading operation and inspections of the stow.

2.6.2 As far as practicable, cargo spaces should be regularly inspected throughout the voyage to ensure that the cargo, vehicles and cargo transport units remain safely secured.

#### 2.7 Entering enclosed spaces

The atmosphere in any enclosed space may be incapable of supporting human life through lack of oxygen or it may contain flammable or toxic gases. The master should ensure that it is safe to enter any enclosed space.

#### 2.8 General elements to be considered by the master

Having evaluated the risk of cargo-shifting, taking into account the criteria set out in 1.5, the master should ensure, prior to loading of any cargo, cargo transport unit or vehicle that:

- .1 the deck area for their stowage is, as far as practicable, clean, dry and free from oil and grease;
- .2 the cargo, cargo transport unit or vehicle, appears to be in suitable condition for transport, and can be effectively secured;
- .3 all necessary cargo securing equipment is on board and in good working condition; and
- .4 cargo in or on cargo transport units and vehicles is, to the extent practicable, properly stowed and secured on to the unit or vehicle.

#### 2.9 Cargo stowage and securing declaration

2.9.1 Where there is reason to suspect that a container or vehicle into which dangerous goods have been packed or loaded is not in compliance with the provisions of section 12 or 17, as appropriate, of the General Introduction to the IMDG Code, or where a container packing certificate/vehicle packing declaration is not available, the unit should not be accepted for shipment.

2.9.2 Where practicable and feasible, road vehicles should be provided with a cargo stowage and securing declaration, stating that the cargo on the road vehicle has been properly stowed and secured for the intended sea voyage, taking into account the IMO/ILO guidelines for packing cargo in freight containers or vehicles. An example of such a declaration is given hereunder. The vehicle packing declaration, recommended by the IMDG Code (see 2.9.1), may be acceptable for this purpose.

Example

Cargo stowage and securing declaration

Vehicle No. ....  
Place of loading .....  
Date of loading .....  
Commodity(ies) .....

I hereby declare that the cargo on the above-mentioned vehicle has been properly stowed and secured for transport by sea, by taking into account the IMO/ILO Guidelines for Packing Cargo in Freight Containers or Vehicles.

Name of Signatory .....  
Status .....  
Place ..... Date .....  
Signature on behalf of the packer .....

Remarks: .....  
.....  
.....  
.....  
.....

## CHAPTER 3 - STANDARDIZED STOWAGE AND SECURING SYSTEMS

### 3.1 Recommendations

Ships intended for the carriage of cargoes in a standardized stowage and securing system (e.g. containers, railway wagons, shipborne barges, etc.) should be:

- .1 so designed and equipped that the standardized cargoes concerned can be safely stowed and secured on board under all conditions expected during the intended voyage;
- .2 of a design and so equipped as to be accepted by the Administration or approved by a classification society acceptable to the Administration; and
- .3 provided with adequate information, for use by the master, on the arrangements provided for the safe stowage and securing of the specific cargoes for which the ship is designed or adapted.

## CHAPTER 4 - SEMI-STANDARDIZED STOWAGE AND SECURING

### 4.1 Securing arrangements

4.1.1 Ships intended for the carriage of certain specific cargoes such as road vehicles, systemized cargo carrying roll-trailers and automobiles on ro-ro ships, etc., should be provided with securing points spaced sufficiently close to each other for the intended operation of the ship and in accordance with section 4 of the guidelines for securing arrangements for the transport of road vehicles on ro-ro ships (resolution A.581(14)).

4.1.2 Road vehicles intended for transport by sea should be provided with arrangements for their safe stowage and securing, as detailed in section 5 of the annex to resolution A.581(14).

4.1.3 Roll-trailers carrying systemized cargo should be provided with arrangements for the safe stowage and securing of the vehicle and its cargo. Special consideration should be given to the height of the stow, the compactness of the stow and the effects of a high centre of gravity of the cargo.

### 4.2 Stowage and securing of vehicles

4.2.1 Vehicles, including roll-trailers not provided with adequate securing arrangements, should be stowed and secured in accordance with chapter 5 of this Code.

4.2.2 Ro-ro ships which do not comply with the requirements of section 4 of the annex to resolution A.581(14) or are not provided with equivalent stowage and securing means providing for an equivalent degree of safety during transport by sea should be dealt with in accordance with chapter 5 of this Code.

4.2.3 Vehicles should be stowed and secured in accordance with sections 6 and 7 of the annex to resolution A.581(14). Special consideration should be given to the stowage and securing of roll-trailers carrying systemized cargo, road tank-vehicles and portable tanks on wheels, taking into account the effects of a tank's high centre of gravity and free surface.

#### 4.3 Acceptance of road vehicles for transport by sea on ro-ro ships

4.3.1 The master should not accept a road vehicle for transport on board his ship unless satisfied that the road vehicle is apparently suitable for the intended voyage and is provided with at least the securing points specified in section 5 of the annex to resolution A.581(14).

4.3.2 In exceptional circumstances, where there is some doubt that the recommendations of 4.3.1 can or need to be fulfilled, the master may accept the vehicle for shipment, after taking into account the condition of the vehicle and the expected nature of the intended voyage.

### CHAPTER 5 - NON-STANDARDIZED STOWAGE AND SECURING

#### 5.1 Recommendations

5.1.1 This chapter and the annexes provide advice of a general nature for the stowage and securing of cargoes not covered by chapters 3 and 4 of this Code and particularly specific advice for the stowage and securing of cargoes which have proved to be difficult to stow and secure on board ships.

5.1.2 The list of cargoes given in 5.3 should not be regarded as exhaustive, as there may be other cargoes which could create hazards if not properly stowed and secured.

#### 5.2 Equivalent stowage and securing

The guidance given in the annexes provides for certain safeguards against the problems inherent in the cargoes covered. Alternative methods of stowage and securing may afford the same degree of safety. It is imperative that any alternative method chosen should provide a level of securing safety at least equivalent to that described in the resolutions, circulars and guidelines listed in the foreword to this Code.

#### 5.3 Cargoes which have proved to be a potential source of danger

Such cargoes include:

- .1 containers when carried on deck of ships which are not specially designed and fitted for the purpose of carrying containers (annex 1);
- .2 portable tanks (tank-containers) (annex 2);



- .3 portable receptacles (annex 3);
- .4 special wheel-based (rolling) cargoes (annex 4);
- .5 heavy cargo items such as locomotives, transformers, etc. (annex 5);
- .6 coiled sheet steel (annex 6);
- .7 heavy metal products (annex 7);
- .8 anchor chains (annex 8);
- .9 metal scrap in bulk (annex 9);
- .10 flexible intermediate bulk containers (FIBCs) (annex 10);
- .11 logs in under-deck stow (annex 11); and
- .12 unit loads (annex 12).

## CHAPTER 6 - ACTIONS WHICH MAY BE TAKEN IN HEAVY WEATHER

### 6.1 General

The purpose of this chapter is not to usurp the responsibilities of the master, but rather to offer some advice on how stresses induced by excessive accelerations caused by bad weather conditions could be avoided.

### 6.2 Excessive accelerations

Measures to avoid excessive accelerations are:

- .1 alteration of course or speed or a combination of both;
- .2 heaving to;
- .3 early avoidance of areas of adverse weather and sea conditions; and
- .4 timely ballasting or deballasting to improve the behaviour of the ship, taking into account the actual stability conditions (see also 7.2).

### 6.3 Voyage planning

One way of reducing excessive accelerations is for the master, as far as possible and practicable, to plan the voyage of the ship carefully so as to avoid areas with severe weather and sea conditions. The master should always consult the latest available weather information.

## CHAPTER 7 - ACTIONS WHICH MAY BE TAKEN ONCE CARGO HAS SHIFTED

### 7.1 The following actions may be considered:

- .1 alterations of course to reduce accelerations;
- .2 reductions of speed to reduce accelerations and vibration;
- .3 monitoring the integrity of the ship;
- .4 restowing or resecuring the cargo and, where possible, increasing the friction; and
- .5 diversion of route in order to seek shelter or improved weather and sea conditions.

7.2 Tank ballasting or deballasting operations should be considered only if the ship has adequate stability.

ANNEX 1

SAFE STOWAGE AND SECURING OF CONTAINERS ON DECK OF SHIPS  
WHICH ARE NOT SPECIALLY DESIGNED AND FITTED  
FOR THE PURPOSE OF CARRYING CONTAINERS

1 Stowage

1.1 Containers carried on deck or on hatches of such ships should preferably be stowed in the fore-and-aft direction.

1.2 Containers should not extend over the ship's sides. Adequate supports should be provided when containers overhang hatches or deck structures.

1.3 Containers should be stowed and secured so as to permit safe access for personnel in the necessary operation of the ship.

1.4 Containers should at no time overstress the deck or hatches on which they are stowed.

1.5 Bottom-tier containers, when not resting on stacking devices, should be stowed on timber of sufficient thickness, arranged in such a way as to transfer the stack load evenly on to the structure of the stowage area.

1.6 When stacking containers, use should be made of locking devices, cones, or similar stacking aids, as appropriate, between them.

1.7 When stowing containers on deck or hatches, the position and strength of the securing points should be taken into consideration.

2 Securing

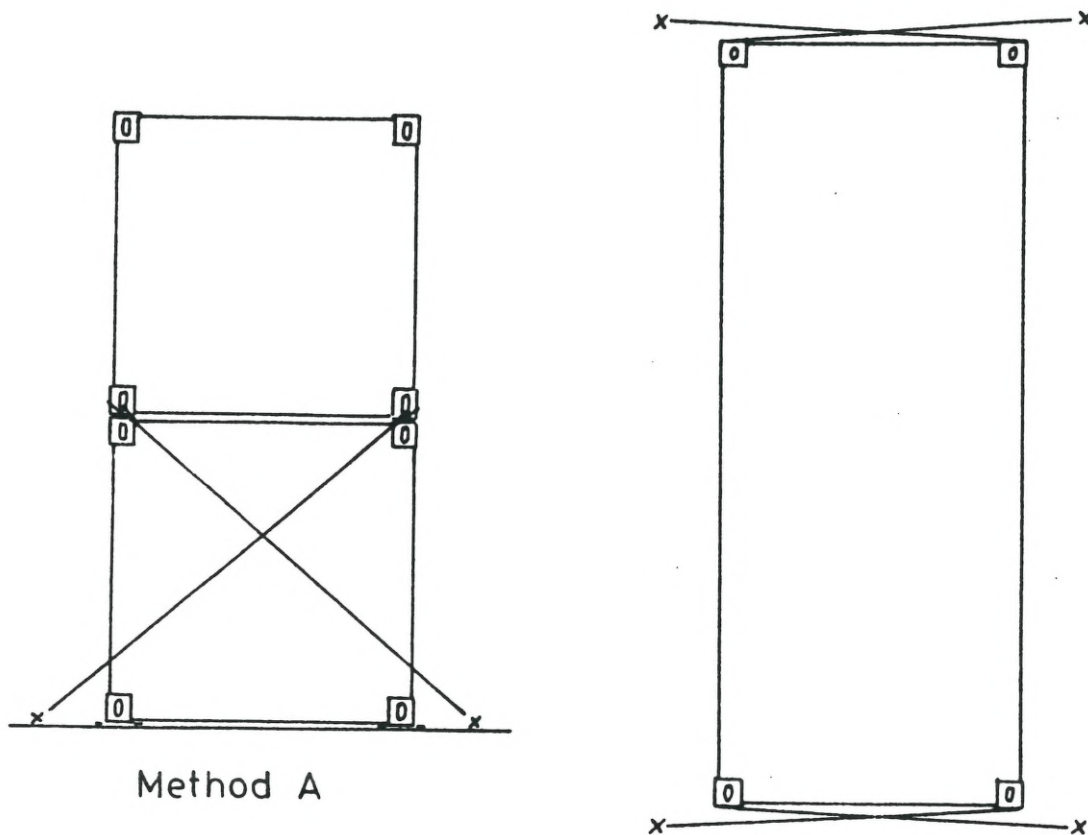
2.1 All containers should be effectively secured in such a way as to protect them from sliding and tipping. Hatch covers carrying containers should be adequately secured to the ship.

2.2 Containers should be secured using one of the three methods recommended in figure 1 or methods equivalent thereto.

2.3 Lashings should preferably consist of wire ropes or chains or material with equivalent strength and elongation characteristics.

2.4 Timber shoring should not exceed 2 m in length.

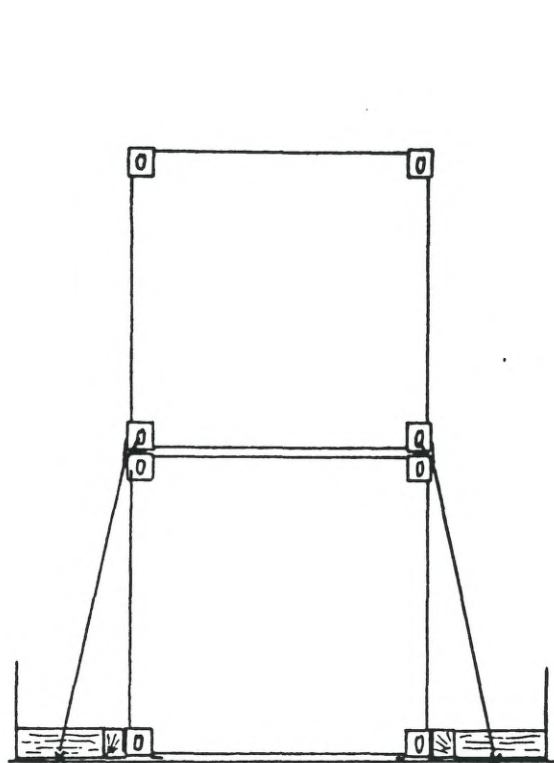
Figure 1: Recommended methods of non-standardized securing of containers



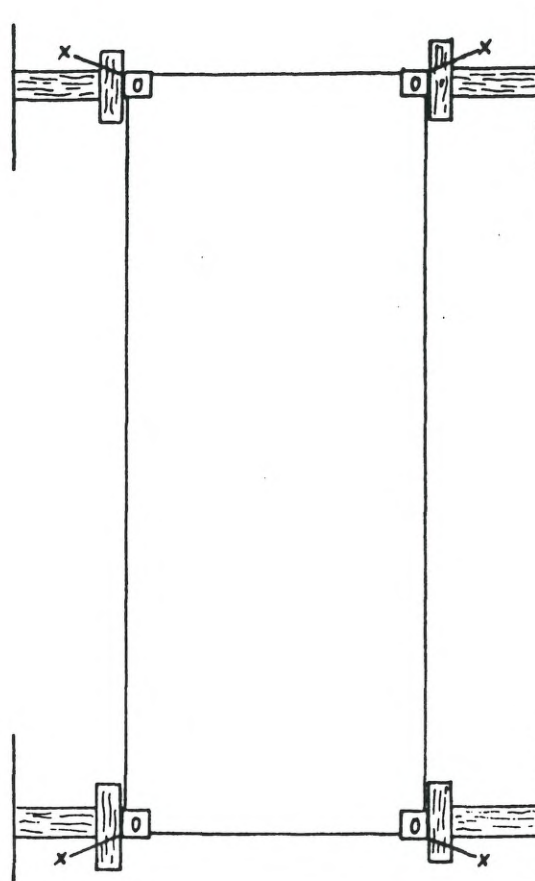
Method A: Medium weight containers: weight of top container not more than 70% of that of bottom container

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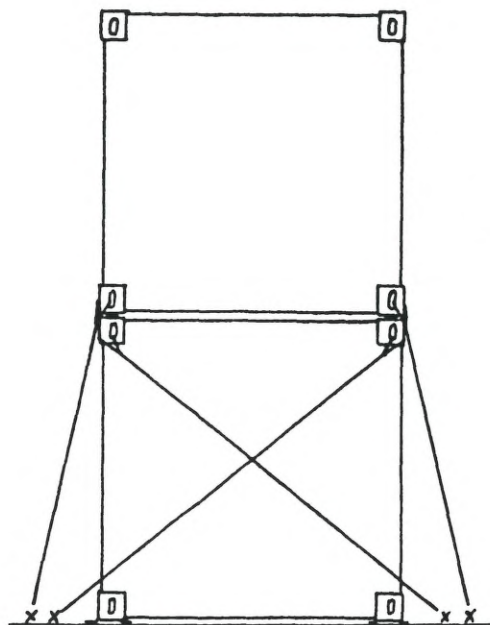


Method B

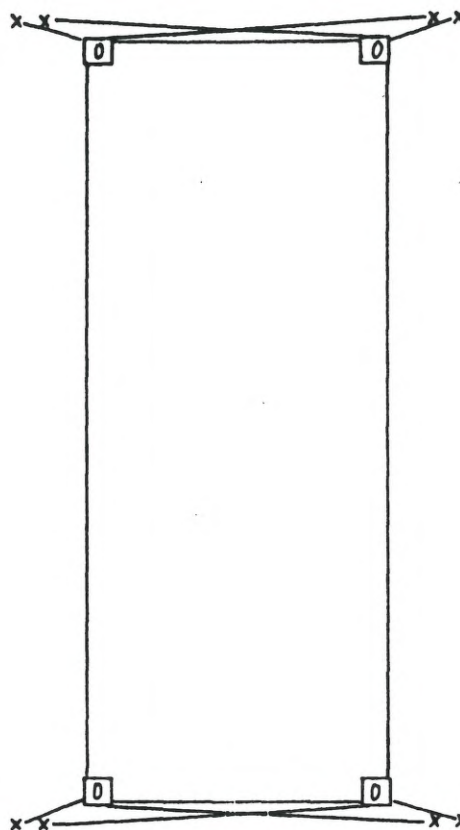


Method B: Medium weight containers: weight of top container may be more than 70% of that of bottom container





Method C



Method C: Heavy weight containers: weight of top container may be more than 70% of that of bottom container

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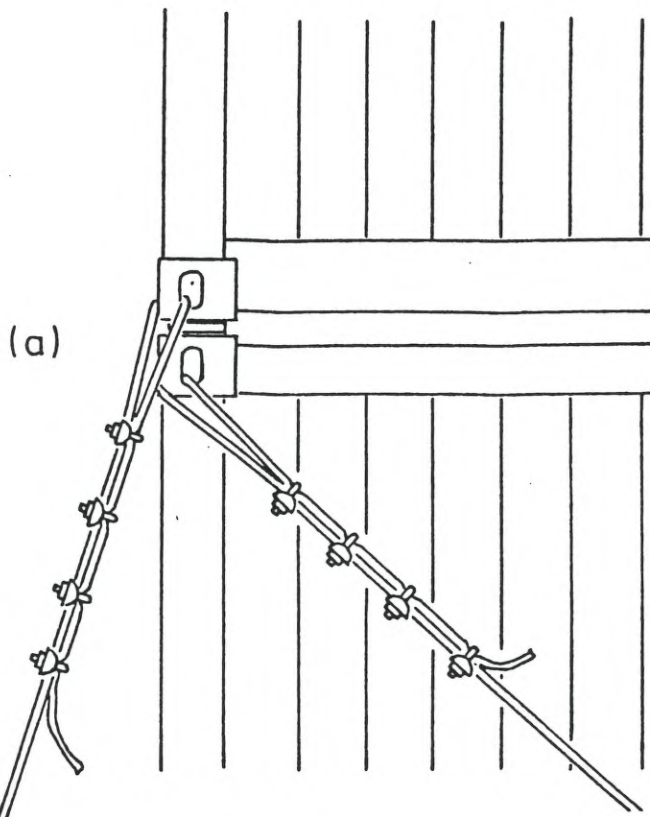
- 20 -

2.5 Wire clips should be adequately greased, and tightened so that the dead end of the wire is visibly compressed (figure 2).

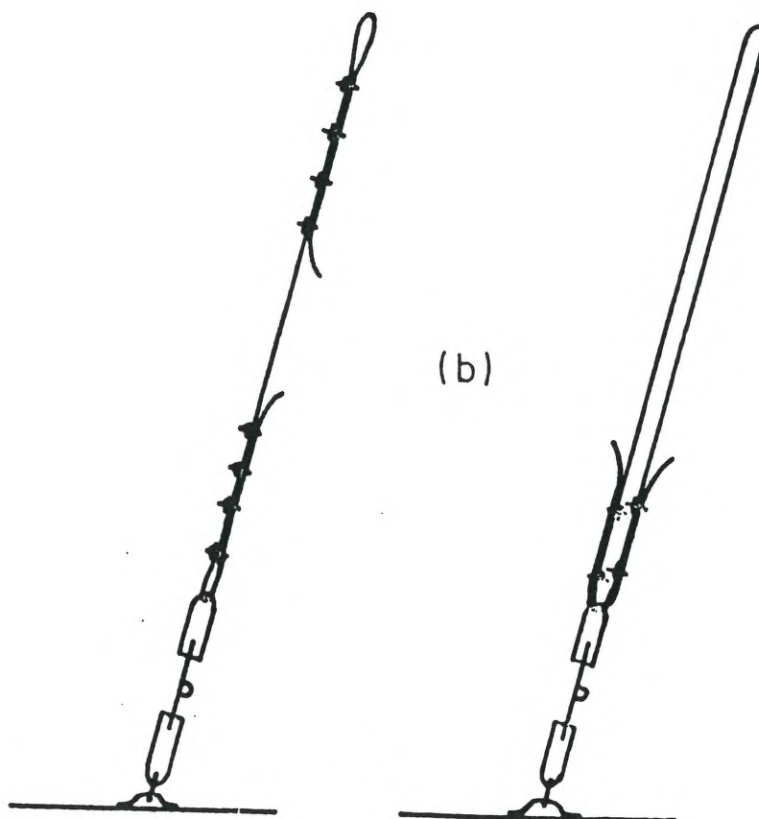
2.6 Lashings should be kept, when possible, under equal tension.

Figure 2:

Fastening of  
wire lashings  
to corner  
fittings



Alternative  
constructions  
of wire  
lashings



## ANNEX 2

### SAFE STOWAGE AND SECURING OF PORTABLE TANKS

#### 1 Introduction

1.1 The provisions of this annex apply to a portable tank, which in the context of this annex, means a tank which is not permanently secured on board the vessel and has a capacity of more than 450 litres and a shell fitted with external stabilizing members and items of service equipment and structural equipment necessary for the transport of liquids, solids or gases.

1.2 These provisions do not apply to tanks intended for the transport of liquids, solids or gases having a capacity of 450 litres or less.

Note: The capacity for portable tanks for gases is 1,000 litres or more.

#### 2 General provisions for portable tanks

2.1 Portable tanks should be capable of being loaded and discharged without the need of removal of their structural equipment and be capable of being lifted on to and off the ship when loaded.

2.2 The applicable requirements of the International Convention for Safe Containers (CSC), 1972, as amended, should be fulfilled by any tank-container which meets the definition of a container within the terms of that Convention. Additionally, the provisions of section 13 of the General Introduction to the IMDG Code should be met when the tank will be used for the transport of dangerous goods.

2.3 Portable tanks should not be offered for shipment in an ullage condition liable to produce an unacceptable hydraulic force due to surge within the tank.

2.4 Portable tanks for the transport of dangerous goods should be certified in accordance with the provisions of the IMDG Code by the competent approval authority or a body authorized by that authority.

#### 3 Portable tank arrangements

3.1 The external stabilizing members of a portable tank may consist of skids or cradles and, in addition, the tank may be secured to a platform-based container. Alternatively, a tank may be fixed within a framework of ISO or non-ISO frame dimensions.

3.2 Portable tank arrangements should include fittings for lifting and securing on board.

Note: All types of the aforementioned portable tanks may be carried on multipurpose ships but need special attention for lashing and securing on board.

#### 4 Cargo information

4.1 The master should be provided with at least the following information:

- .1 dimensions of the portable tank and commodity if non-dangerous and, if dangerous, the information required in accordance with the IMDG Code;

- .2 the gross mass of the portable tank; and
- .3 whether the portable tank is permanently secured on to a platform-based container or in a frame and whether securing points are provided.

## 5 Stowage

- 5.1 The typical distribution of accelerations of the ship should be borne in mind in deciding whether the portable tank will be stowed on or under deck.
- 5.2 Tanks should be stowed in the fore-and-aft direction on or under deck.
- 5.3 Tanks should be stowed so that they do not extend over the ship's side.
- 5.4 Tanks should be stowed so as to permit safe access for personnel in the necessary operation of the ship.
- 5.5 At no time should the tanks overstress the deck or hatches; the hatchcovers should be so secured to the ship that tipping of the entire hatchcover is prevented.

## 6 Securing against sliding and tipping

### 6.1 Non-standardized portable tanks

- 6.1.1 The securing devices on non-standardized portable tanks and on the ship should be arranged in such a way as to withstand the transverse and longitudinal forces, which may give rise to sliding and tipping. The lashing angles against sliding should not be higher than  $25^\circ$  and against tipping not lower than  $45^\circ$  to  $60^\circ$  (figure 1).

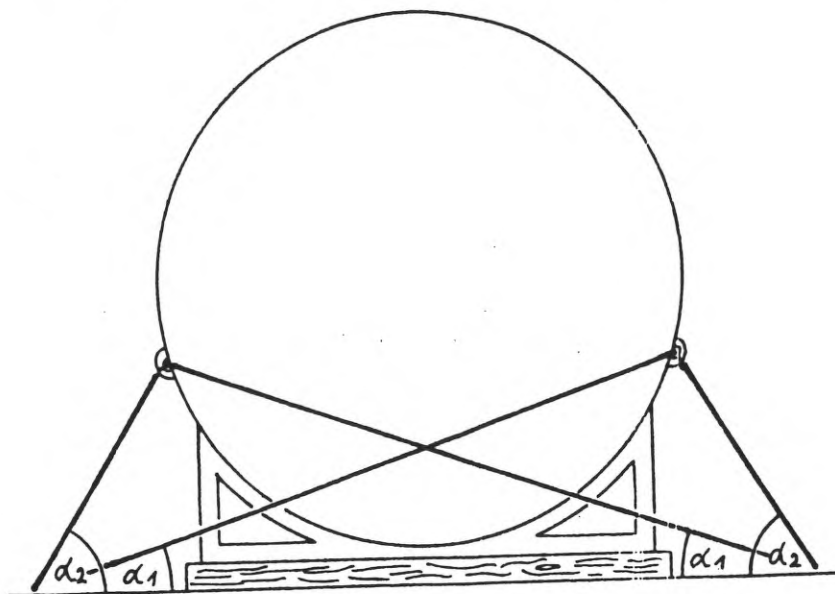


Figure 1: Securing of portable tanks with favourable lashing angles.

$\alpha_1$ : favourable angle against sliding  
 $\alpha_2$ : favourable angle against tipping



6.1.2 Whenever necessary, timber should be used between the deck surface and the bottom structure of the portable tank in order to increase friction. This does not apply to tanks on wooden units or with similar bottom material having a high coefficient of friction.

6.1.3 If stowage under deck is permitted, the stowage should be such that the portable non-standardized tank can be landed directly on its place and bedding.

6.1.4 Securing points on the tank should be of adequate strength and clearly marked.

Note: Securing points designed for road and rail-transport may not be suitable for transport by sea.

6.1.5 Lashings attached to tanks without securing points should pass around the tank and both ends of the lashing should be secured to the same side of the tank (figure 2).

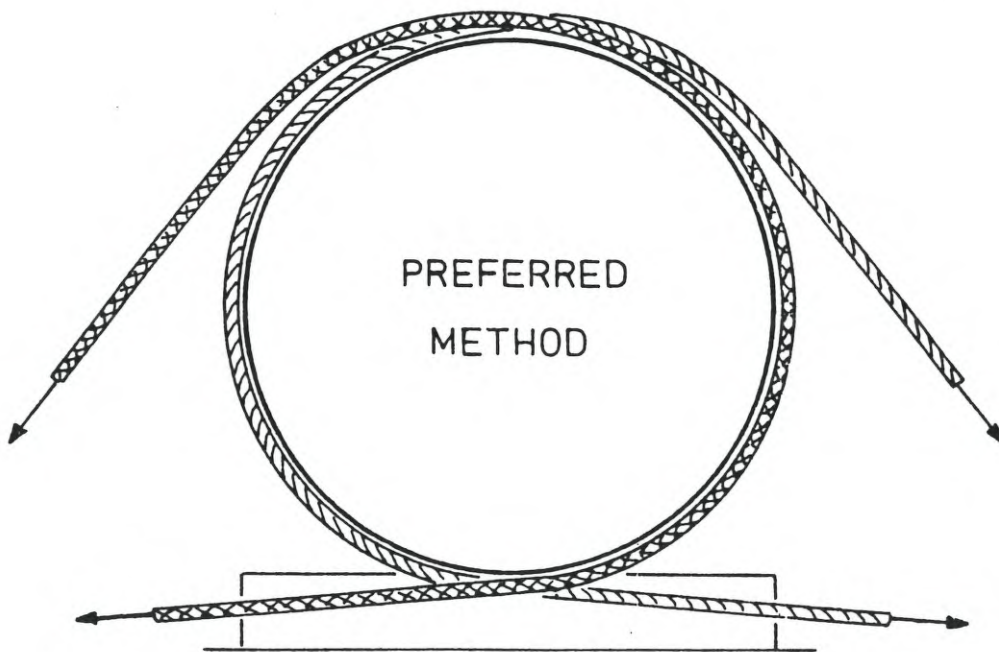


Figure 2: Securing of portable tanks having no securing points



6.1.6 Sufficient securing devices should be arranged in such a way that each device takes its share of the load with an adequate factor of safety.

6.1.7 The structural strength of the deck or hatch components should be taken into consideration when tanks are carried thereon and when locating and affixing the securing devices.

6.1.8 Portable tanks should be secured in such a manner that no load is imposed on the tank or fittings in excess of those for which they have been designed.

6.2 Standardized portable tanks (tank-containers)

6.2.1 Standardized portable tanks with ISO frame dimensions should be secured according to the system of lashing with which the ship is equipped, taking into consideration the height of the tank above the deck and the ullage in the tank.

7 Maintenance of securing arrangements

7.1 The integrity of the securing arrangements should be maintained throughout the voyage.

7.2 Particular attention should be paid to the need for tight lashings, grips and clips to prevent weakening through chafing.

7.3 Lashings should be regularly checked and retightened.

ANNEX 3

SAFE STOWAGE AND SECURING OF PORTABLE RECEPTACLES\*

1 Introduction

1.1 A portable receptacle, in the context of these guidelines, means a receptacle not being a portable tank, which is not permanently secured on board the ship and has a capacity of 1,000 litres or less and has different dimensions in length, width, height and shape and which is used for the transport of gases or liquids.

2 Portable receptacles can be divided into:

- .1 cylinders of different dimensions without securing points and having a capacity not exceeding 150 litres;
- .2 receptacles of different dimensions with the exception of cylinders in conformity with 2.1 having a capacity of not less than 100 litres and not more than 1,000 litres and whether or not fitted with hoisting devices of sufficient strength; and
- .3 assemblies, known as "frames", of cylinders in conformity with 2.1, the cylinders being interconnected by a manifold within the frame and held firmly together by metal fittings. The frames are equipped with securing and handling devices of sufficient strength (e.g. cylindrical receptacles are equipped with rolling hoops and receptacles are secured on skids).

3 Cargo information

3.1 The master should be provided with at least the following information:

- .1 dimensions of the receptacle and commodity if non-dangerous and, if dangerous, the information as required in accordance with the IMDG Code;
- .2 gross mass of the receptacles; and
- .3 whether or not the receptacles are equipped with hoisting devices of sufficient strength.

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\* Where in this annex the term "receptacle" is used, it is meant to include both receptacles and cylinders.

#### 4 Stowage

4.1 The typical distribution of accelerations of the ship should be borne in mind in deciding whether the receptacles should be stowed on or under deck.

4.2 The receptacles should preferably be stowed in the fore-and-aft direction on or under deck.

4.3 Receptacles should be dunnaged to prevent their resting directly on a steel deck. They should be stowed and chocked as necessary to prevent movement unless mounted in a frame as a unit. Receptacles for liquefied gases should be stowed in an upright position.

4.4 When the receptacles are stowed in an upright position, they should be stowed in a block, cribbed or boxed in with suitable and sound timber. The box or crib should be dunnaged underneath to provide clearance from a steel deck. The receptacles in a box or crib should be braced to prevent movement. The box or crib should be securely chocked and lashed to prevent movement in any direction.

#### 5 Securing against sliding and shifting

##### 5.1 Cylinders

Cylinders should be stowed fore-and-aft on athwartships dunnage. Where practicable, the stow should be secured by using two or more wires, laid athwartships prior to loading, and passed around the stow to securing points on opposite sides. The wires are tightened to make a compact stow by using appropriate tightening devices. During loading, wedges may be necessary to prevent cylinders rolling.

##### 5.2 Cylinders in containers

Cylinders should, whenever practicable, be stowed upright with their valves on top and with their protective caps firmly in place. Cylinders should be adequately secured, so as to withstand the rigours of the intended voyage, by means of steel strapping or equivalent means led to lashing points on the container floor. When cylinders cannot be stowed upright in a closed container, they should be carried in an open top or a platform-based container.

##### 5.3 Receptacles

Securing of receptacles stowed on or under deck should be as follows:

- .1 lashings should be positioned as shown in figure 1;
- .2 where possible, the hoisting devices on receptacles should be used to lash them; and
- .3 at regular times the lashings should be checked and retightened.

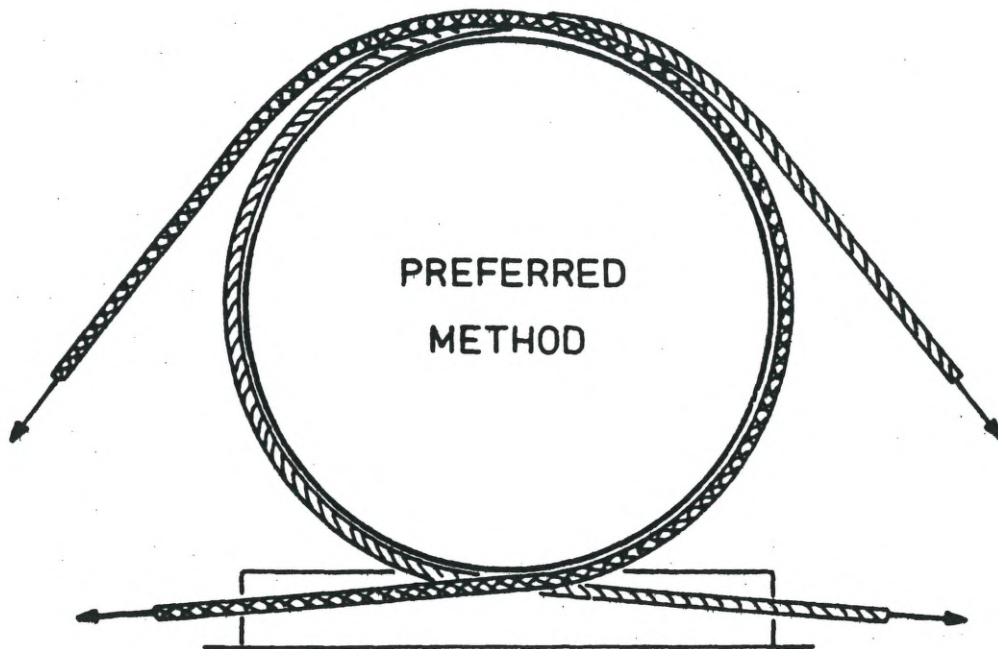


Figure 1: Securing of receptacles having no securing points

ANNEX 4

SAFE STOWAGE AND SECURING OF WHEEL-BASED (ROLLING) CARGOES

1 Introduction

Wheel-based cargoes, in the context of these guidelines, are all cargoes which are provided with wheels or tracks, including those which are used for the stowage and transport of other cargoes, except trailers and road-trains (covered by chapter 4 of this Code), but including buses, military vehicles with or without tracks, tractors, earth-moving equipment, roll-trailers, etc.

2 General recommendations

2.1 The cargo spaces in which wheel-based cargo is to be stowed should be dry, clean and free from grease and oil.

2.2 Wheel-based cargoes should be provided with adequate and clearly marked securing points or other equivalent means of sufficient strength to which lashings may be applied.

2.3 Wheel-based cargoes which are not provided with securing points should have those places, where lashings may be applied, clearly marked.

2.4 Wheel-based cargoes, which are not provided with rubber wheels or tracks with friction-increasing lower surface, should always be stowed on wooden dunnage or other friction-increasing material such as soft boards, rubber mats, etc.

2.5 When in stowage position, the brakes of a wheel-based unit, if so equipped, should be set.

2.6 Wheel-based cargoes should be secured to the ship by lashings made of material having strength and elongation characteristics at least equivalent to steel chain or wire.

2.7 Where possible, wheel-based cargoes, carried as part cargo, should be stowed close to the ship's side or in stowage positions which are provided with sufficient securing points of sufficient strength, or be block-stowed from side to side of the cargo space.

2.8 To prevent any lateral shifting of wheel-based cargoes not provided with adequate securing points, such cargoes should, where practicable, be stowed close to the ship's side and close to each other, or be blocked off by other suitable cargo units such as loaded containers, etc.

2.9 To prevent the shifting of wheel-based cargoes, it is, where practicable, preferable to stow those cargoes in a fore-and-aft direction rather than athwartships. If wheel-based cargoes are inevitably stowed athwartships, additional securing of sufficient strength may be necessary.

**2.10 The wheels of wheel-based cargoes should be blocked to prevent shifting.**

**2.11 Cargoes stowed on wheel-based units should be adequately secured to stowage platforms or, where provided with suitable means, to its sides. Any movable external components attached to a wheel-based unit, such as derricks, arms or turrets should be adequately locked or secured in position.**



ANNEX 5

SAFE STOWAGE AND SECURING OF HEAVY CARGO ITEMS  
SUCH AS LOCOMOTIVES, TRANSFORMERS, ETC.

1 Cargo information

The master should be provided with sufficient information on any heavy cargo offered for shipment so that he can properly plan its stowage and securing; the information should at least include the following:

- .1 gross mass;
- .2 principal dimensions with drawings or pictorial descriptions, if possible;
- .3 location of the centre of gravity;
- .4 bedding areas and particular bedding precautions if applicable;
- .5 lifting points or slinging positions; and
- .6 securing points, where provided, including details of their strength.

2 Location of stowage

2.1 When considering the location for stowing a heavy cargo item, the typical distribution of accelerations on the ship should be kept in mind:

- .1 lower accelerations occur in the midship sections and below the weather deck; and
- .2 higher accelerations occur in the end sections and above the weather deck.

2.2 When heavy items are to be stowed on deck, the expected "weather side" of the particular voyage should be taken into account if possible.

2.3 Heavy items should preferably be stowed in the fore-and-aft direction.

3 Distribution of weight

The weight of the item should be distributed in such a way as to avoid undue stress on the ship's structure. Particularly with the carriage of heavy items on decks or hatch covers, suitable beams of timber or steel of adequate strength should be used to transfer the weight of the item on to the ship's structure.

#### 4 Securing against sliding and tipping

4.1 Whenever possible, timber should be used between the stowage surface and the bottom of the unit in order to increase friction. This does not apply to items on wooden cradles or on rubber tyres or with similar bottom material having a high coefficient of friction.

4.2 The securing devices should be arranged in a way to withstand transverse and longitudinal forces which may give rise to sliding or tipping.

4.3 The optimum lashing angle against sliding is about  $25^\circ$ , while the optimum lashing angle against tipping is generally found between  $45^\circ$  and  $60^\circ$  (figure 1).

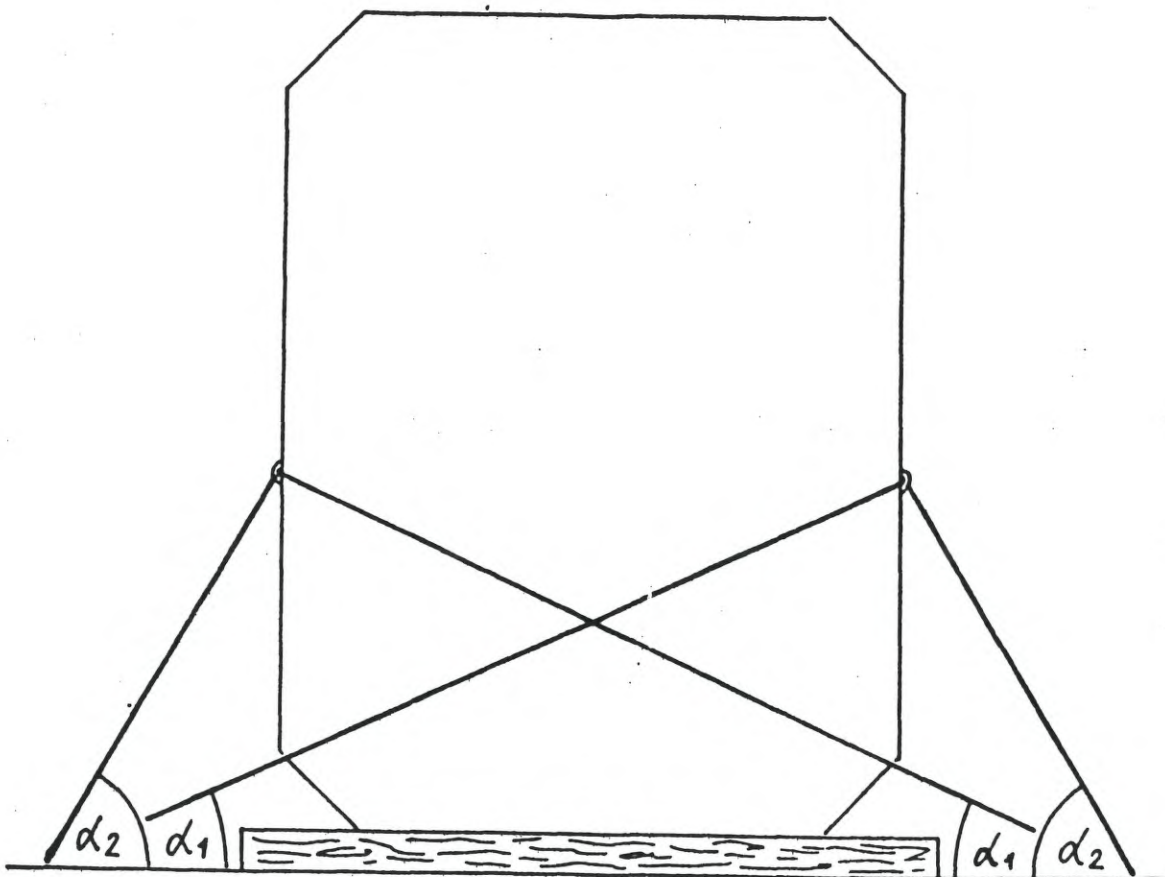


Figure 1: Principles of securing heavy items against sliding and tipping

$\alpha_1$ : favourable lashing angle against sliding

$\alpha_2$ : favourable lashing angle against tipping

4.4 If a heavy cargo item has been dragged into position on greased skid boards or other means to reduce friction, the number of lashings used to prevent sliding should be increased accordingly.

4.5 If, owing to circumstances, lashings can be set at large angles only, sliding must be prevented by timber shoring, welded fittings or other appropriate means. Any welding should be carried out in accordance with accepted hot work procedures.

5 Securing against heavy seas on deck

Whilst it is recognized that securing cargo items against heavy seas on deck is difficult, all efforts should be made to secure such items and their supports to withstand such impact and special means of securing may have to be considered.

6 Heavy cargo items projecting over the ship's side

Items projecting over the ship's side should be additionally secured by lashings acting in longitudinal and vertical directions.

7 Attachment of lashings to heavy cargo items

7.1 If lashings are to be attached to securing points on the item, these securing points should be of adequate strength and clearly marked. It should be borne in mind that securing points designed for road or rail transport may not be suitable for securing the items on board ship.

7.2 Lashings attached to items without securing points should pass around the item, or a rigid part thereof, and both ends of the lashing should be secured to the same side of the unit (figure 2).

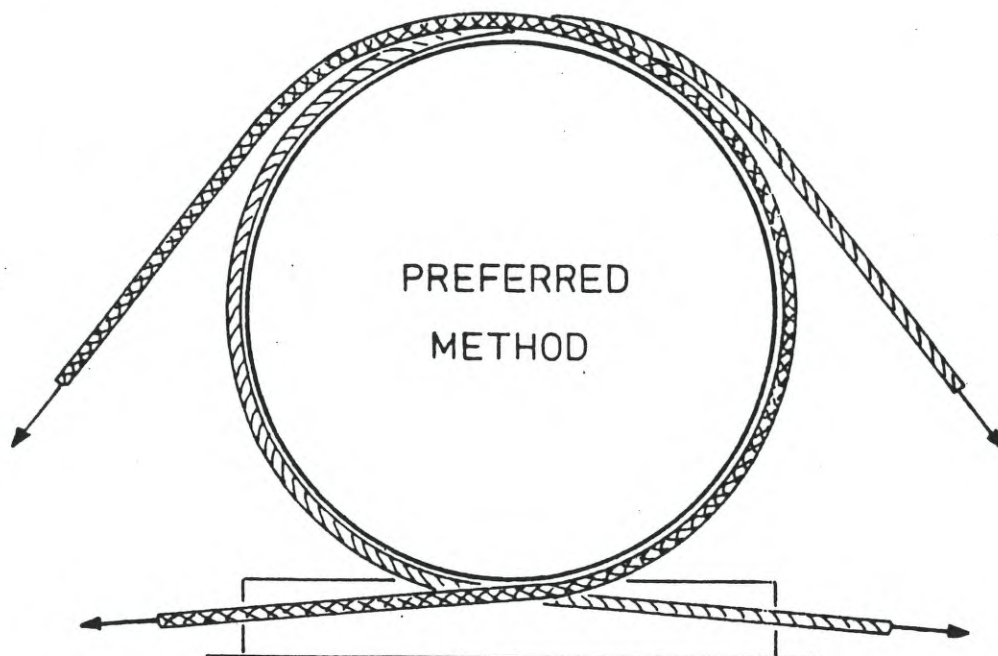


Figure 2: Principle of securing heavy items having no suitable securing points



**8     Composition and application of securing devices**

8.1   Securing devices should be assembled so that each component is of equal strength.

8.2   Connecting elements and tightening devices should be used in the correct way. Consideration should be given to any reduction of the strength of the lashings during the voyage through corrosion, fatigue or mechanical deterioration and should be compensated by using stronger securing material.

8.3   Particular attention should be paid to the correct use of wire, grips and clips. The saddle portion of the clip should be applied to the live load segment and the U-bolt to the dead or shortened end segment.

8.4   Securing devices should be arranged in such a way that each device takes its share of load according to its strength.

8.5   Mixed securing arrangements of devices with different strength and elongation characteristics should be avoided.

**9     Maintenance of securing arrangements**

9.1   The integrity of the securing arrangements should be maintained throughout the voyage.

9.2   Particular attention should be paid to the need for tight lashings, grips and clips and to prevent weakening through chafing. Timber cradles, beddings and shorings should be checked.

9.3   Greasing the thread of clips and turnbuckles increase their holding capacity and prevent corrosion.

**10    Securing calculation**

10.1   Where necessary, the securing arrangements for heavy cargo items should be verified by an appropriate calculation.

## ANNEX 6

### SAFE STOWAGE AND SECURING OF COILED SHEET STEEL

#### 1 General

1.1 This annex deals only with coiled sheet steel stowed on the round. Vertical stowage is not dealt with because this type of stowage does not create any special securing problems.

1.2 Normally, coils of sheet steel have a gross mass in excess of 10 tonnes each.

#### 2 Coils

2.1 Coils should be given bottom stow and, whenever possible, be stowed in regular tiers from side to side of the ship.

2.2 Coils should be stowed on dunnage laid athwartships. Coils should be stowed with their axes in the fore-and-aft direction. Each coil should be stowed against its neighbour. Wedges should be used as stoppers when necessary during loading and discharging to prevent shifting (figures 1 and 2).

2.3 The final coil in each row should normally rest on the two adjacent coils. The mass of this coil will lock the other coils in the row.

2.4 If it is necessary to load a second tier over the first, then the coils should be stowed in between the coils of the first tier (figure 2).

2.5 Any void space between coils in the topmost tier should be adequately secured (figure 3).

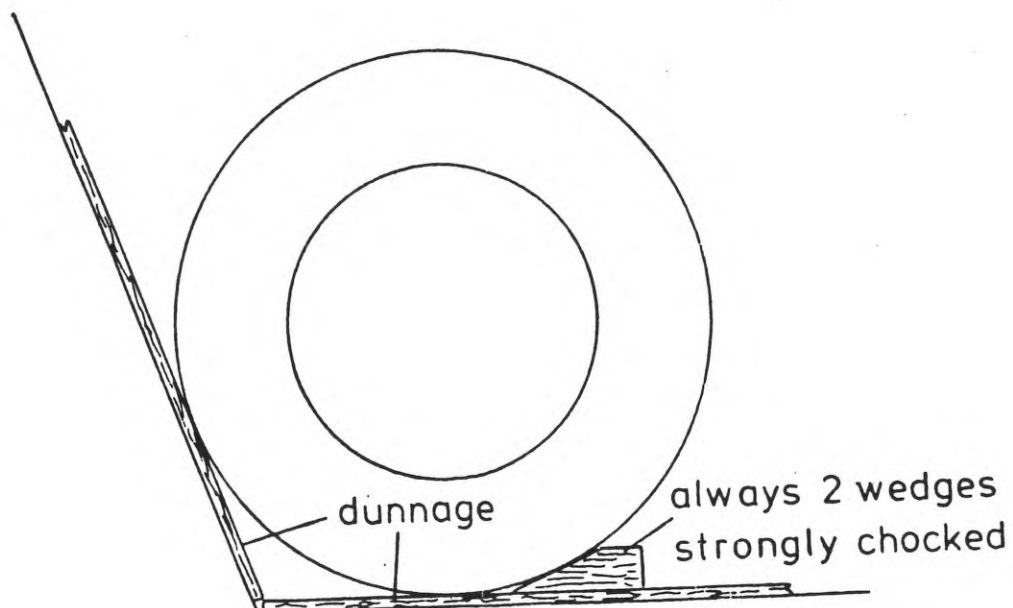


Figure 1: Principle of dunnaging and wedging coils

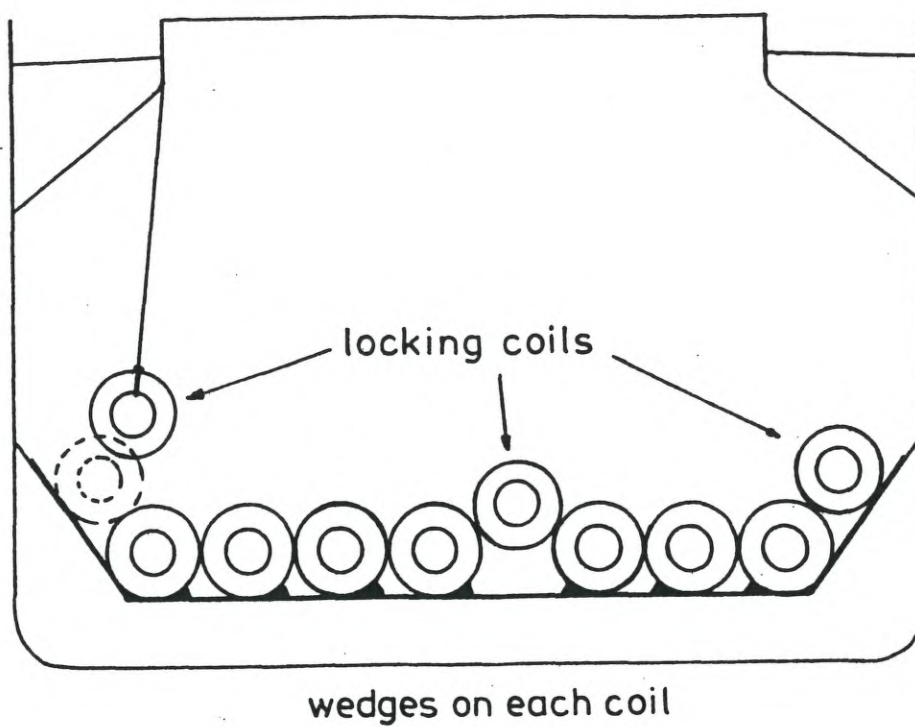


Figure 2: Inserting of locking coils

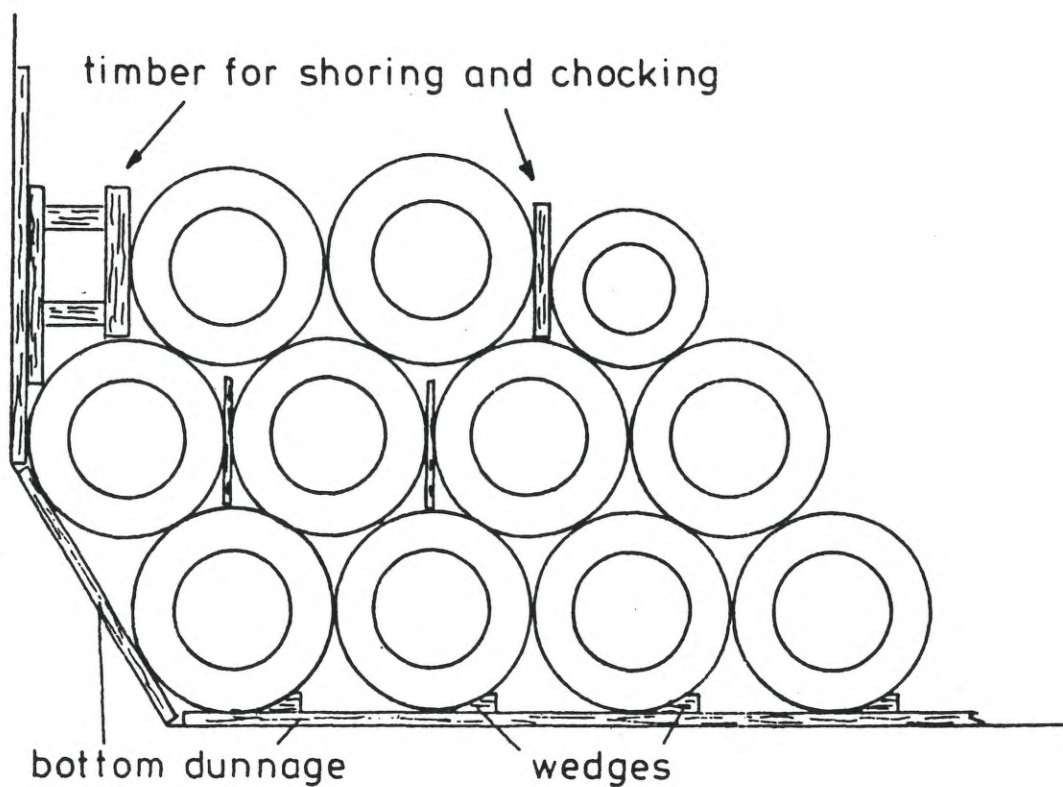


Figure 3: Shoring and chocking in voids between coils



### 3 Lashings

3.1 The objective is to form one large, immovable block of coils in the hold by lashing them together. In general, strip coils in three end rows in the top tier should be lashed. To prevent fore-and-aft shifting in the top tier of bare-wound coils group-lashing should not be applied due to their fragile nature, the end row of a top tier should be secured by dunnage and wires, which are to be tightened from side to side and by additional wires to the bulkhead. When coils are fully loaded over the entire bottom space and are well shored, no lashings are required except for locking coils (figures 4, 5, and 6).

3.2 The lashings can be of a conventional type using wire or any equivalent means.

3.3 Conventional lashings should consist of wires having sufficient tensile strength. The first tier should be chocked. It should be possible to retighten the lashings during the voyage (figures 5 and 6).

3.4 Wire lashings should be protected against damage from sharp edges.

3.5 If there are few coils, or a single coil only, they should be adequately secured to the ship, by placing them in cradles, by wedging, or by shoring and then lashing to prevent transverse and longitudinal movement.

3.6 Coils carried in containers, railway wagons and road vehicles should be stowed in cradles or specially made beds and should be prevented from moving by adequate securing.

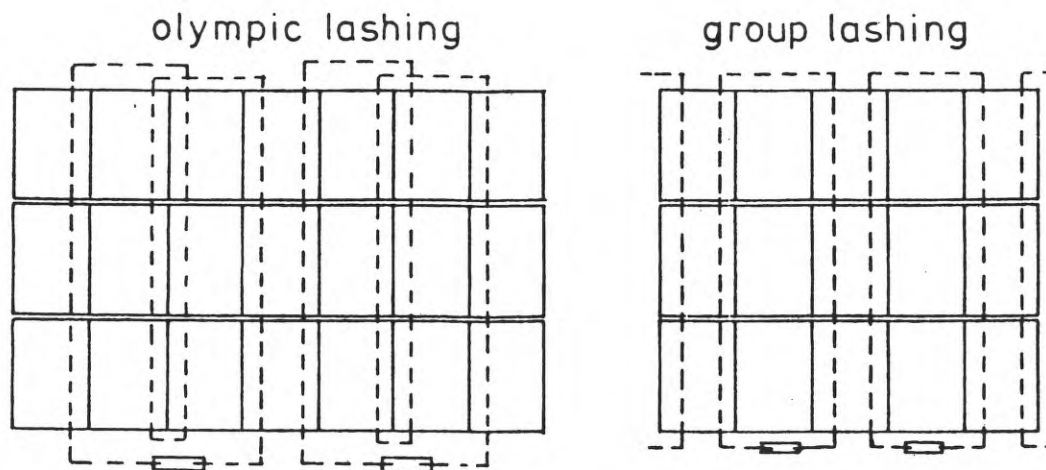


Figure 4: Securing of top tier against fore-and-aft shifting  
(view from top)

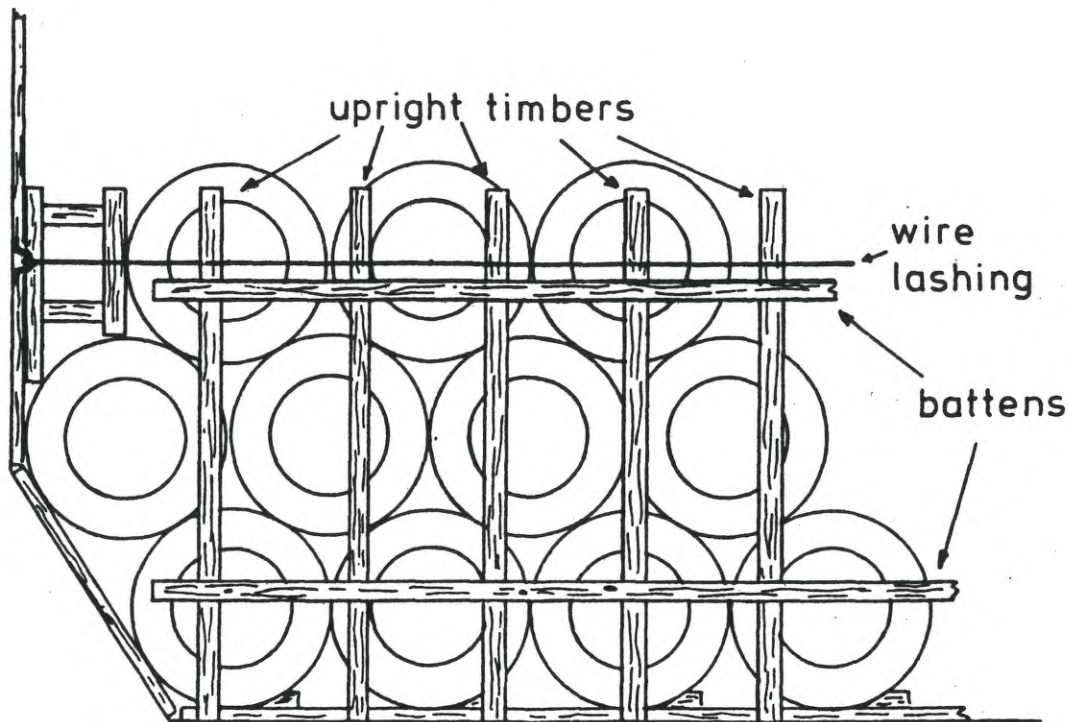


Figure 5: Securing of end row in top tier against fore-and-aft shifting

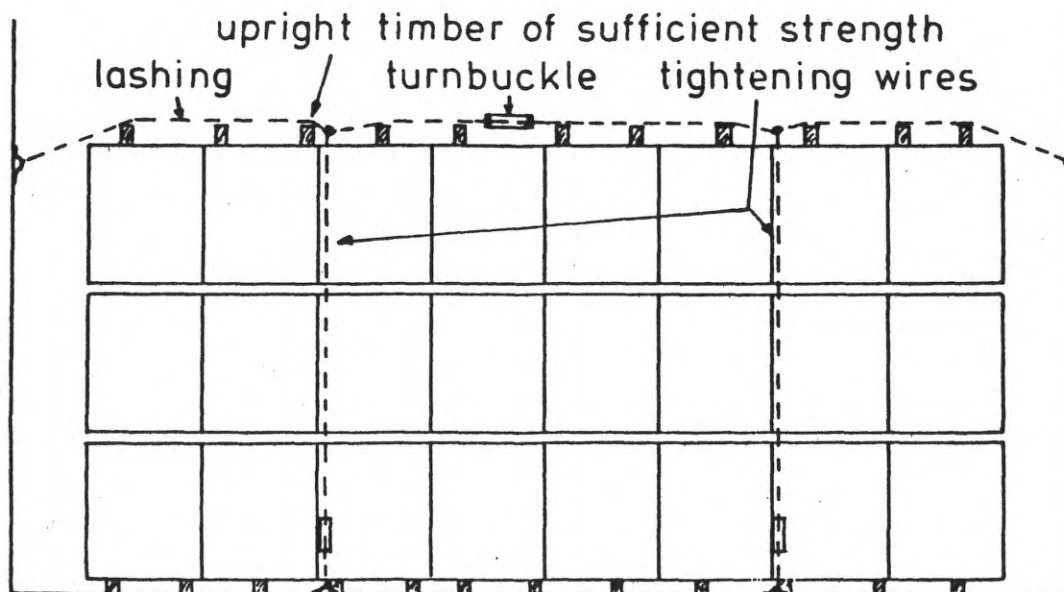


Figure 6: Securing of end row in top tier against fore-and-aft shifting  
(view from top)

ANNEX 7

SAFE STOWAGE AND SECURING OF HEAVY METAL PRODUCTS

1 General

1.1 Heavy metal products in the context of this Code include any heavy item made of metal, such as bars, pipes, rods, plates, wire coils, etc.

1.2 The transport of heavy metal products by sea exposes the ship to the following principal hazards:

- .1 overstressing of the ship's structure if the permissible hull stress or permissible deck loading is exceeded;
- .2 overstressing of the ship's structure as a result of a short roll period caused by excessive metacentric height; and
- .3 cargo shifting because of inadequate securing resulting in a loss of stability or damage to the hull or both.

2 Recommendations

2.1 The cargo spaces in which heavy metal products are to be stowed should be clean, dry and free from grease and oil.

2.2 The cargo should be so distributed as to avoid undue hull stress.

2.3 The permissible deck and tank top loading should not be exceeded.

2.4 The following measures should be taken when stowing and securing heavy metal products:

- .1 cargo items should be stowed compactly from one side of the ship to the other leaving no voids between them and using timber blocks between items if necessary;
- .2 cargo should be stowed level whenever possible and practicable;
- .3 the surface of the cargo should be secured; and
- .4 the shoring should be made of strong, non-splintering wood and adequately sized to withstand the acceleration forces. One shoring should be applied to every frame of the ship but at intervals of not less than one metre.

2.5 In the case of thin plates and small parcels, alternate fore-and-aft and athwartships stowage has proved satisfactory. The friction should be increased by using sufficient dry dunnage or other material between the different layers.

2.6 Pipes, rails, rolled sections, billets, etc., should be stowed in the fore-and-aft direction to avoid damage to the sides of the ship if the cargo shifts.

2.7 The cargo, and especially the topmost layer, can be secured by:

- .1 having other cargo stowed on top of it; or
- .2 lashing by wire, chocking off or similar means.

2.8 Whenever heavy metal products are not stowed from side to side of the ship, special care should be taken to secure such stowages adequately.

2.9 Whenever the surface of the cargo is to be secured, the lashings should be independent of each other, exert vertical pressure on the surface of the cargo, and be so positioned that no part of the cargo is unsecured.

### 3 Wire coils

3.1 Wire coils should be stowed flat so that each coil rests against an adjacent coil. The coils in successive tiers should be stowed so that each coil overlaps the coils below.

3.2 Wire coils should be tightly stowed together and substantial securing arrangements should be used. Where voids between coils are unavoidable or where there are voids at the sides or ends of the cargo space, the stow should be adequately secured.

3.3 When securing wire coils stowed on their sides in several layers like barrels, it is essential to remember that, unless the top layer is secured, the coils lying in the stow can be forced out of the stow by the coils below on account of the ship's motions.



## ANNEX 8

### SAFE STOWAGE AND SECURING OF ANCHOR CHAINS

#### 1 General

1.1 Anchor chains for ships and offshore structures are usually carried in bundles or in continuous lengths.

1.2 Provided certain safety measures are followed prior to, during, and after stowage, anchor chains may be lowered directly on to the place of stowage in bundles without further handling or stowed longitudinally either along the ship's entire cargo space or part thereof.

1.3 If the cargo plans given in the ship's documentation contain no specific requirements, the cargo should be distributed over the lower hold and 'tween-decks in such a way that stability values thus obtained will guarantee adequate stability.

#### 2 Recommendations

2.1 Cargo spaces in which chains are stowed should be clean and free from oil and grease.

2.2 Chains should only be stowed on surfaces which are permanently covered either by wooden ceiling or by sufficient layers of dunnage or other suitable friction-increasing materials. Chains should never be stowed directly on metal surfaces.

#### 3 Stowage and securing of chains in bundles

3.1 Chains in bundles, which are lifted directly on to their place of stowage without further handling, should be left with their lifting wires attached and should preferably be provided with additional wires around the bundles for lashing purposes.

3.2 It is not necessary to separate layers of chain with friction-increasing material such as dunnage because chain bundles will grip each other. The top layer of chain bundles should be secured to both sides of the ship by suitable lashings. Bundles may be lashed independently or in a group, using the lifting wires.

#### 4 Stowage and securing of chains which are stowed longitudinally

4.1 Stowage of each layer of chain should, whenever possible and practicable, commence and terminate close to the ship's side. Care should be taken to achieve a tight stow.

4.2 It is not necessary to separate layers of chain with friction-increasing material, such as dunnage because chain layers will grip each other.

4.3 Bearing in mind the expected weather and sea conditions, the length and nature of the voyage and the nature of the cargo to be stowed on top of the chain, the top layer of each stow should be secured by lashings of adequate strength crossing the stow at suitable intervals and thus holding down the entire stow.



## ANNEX 9

### SAFE STOWAGE AND SECURING OF METAL SCRAP IN BULK

#### 1 Introduction

1.1 This annex deals with the stowage of metal scrap which is difficult to stow compactly because of its size, shape and mass, but does not apply to metal scrap such as metal borings, shavings or turnings, the carriage of which is addressed by the Code of Safe Practice for Solid Bulk Cargoes.

1.2 The hazards involved in transporting metal scrap include:

- .1 shifting of the stow which in turn can cause a list;
- .2 shifting of individual heavy pieces which can rupture the side plating below the waterline and give rise to serious flooding;
- .3 excessive loading on tank tops or 'tween-decks; and
- .4 violent rolling caused by excessive metacentric height.

#### 2 Recommendations

2.1 Before loading, the lower battens of the spar ceiling should be protected by substantial dunnage to reduce damage and to prevent heavy and sharp pieces of scrap coming in contact with the ship's side plating. Air and sounding pipes, and bilge and ballast lines protected only by wooden boards, should be similarly protected.

2.2 When loading, care should be taken to ensure that the first loads are not dropped from a height which could damage the tank tops.

2.3 If light and heavy scrap is to be stowed in the same cargo space, the heavy scrap should be loaded first. Scrap should never be stowed on top of metal turnings, or similar forms of waste metal.

2.4 Scrap should be compactly and evenly stowed with no voids or unsupported faces of loosely held scrap.

2.5 Heavy pieces of scrap, which could cause damage to the side plating or end bulkheads if they were to move, should be overstowed or secured by suitable lashings. The use of shoring is unlikely to be effective because of the nature of the scrap.

2.6 Care should be taken to avoid excessive loading on tank tops and decks.

## ANNEX 10

### SAFE STOWAGE AND SECURING OF FLEXIBLE INTERMEDIATE BULK CONTAINERS (FIBCs)

#### 1 Introduction

1.1 A flexible intermediate bulk container (FIBC), in the context of these guidelines, means a flexible portable packaging to be used for the transport of solids with a capacity of not more than 3 m<sup>3</sup> (3,000 litres) designed for mechanical handling and tested for its satisfactory resistance to transport and transport stresses in a one-way type or multi-purpose design.

#### 2 Cargo information

The master should at least be provided with the following information:

- .1 the total number of FIBCs and the commodity to be loaded;
- .2 the dimensions of the FIBCs;
- .3 the total gross mass of the FIBCs;
- .4 one-way type or multi-purpose design; and
- .5 the kind of hoisting (one hook or more hooks to be used).

#### 3 Recommendations

3.1 The ideal ship for the carriage of FIBCs is one with wide hatches so that the FIBCs can be landed directly in the stowage positions without the need for shifting.

3.2 The cargo spaces should, where practicable, be rectangular in shape and free of obstructions.

3.3 The stowage space should be clean, dry and free from oil and nails.

3.4 When FIBCs have to be stowed in deep hatch wings, easy access and sufficient manoeuvring space for suitably adapted fork-lift trucks should be available.

3.5 When FIBCs are stowed in the hatchway only, the space in the wings and the forward and aft end of the cargo space should be loaded with other suitable cargo or blocked off in such a way that the FIBCs are adequately supported.

#### 4 Stowage

4.1 The typical distribution of the accelerations of the ship should be kept in mind when FIBCs are loaded.

4.2 The width of the ship divided by the width of the FIBC will give the number of FIBCs which can be stowed athwartships and the void space left. If there will be a void space, the stowage of the FIBCs should start from both sides to the centre, so that any void space will be in the centre of the hatchway.



4.3 FIBCs should be stowed as close as possible against each other and any void space should be chocked off.

4.4 The next layers should be stowed in a similar way so that the FIBCs fully cover the FIBCs underneath. If in this layer a void space is left, it should also be chocked off in the centre of the hatchway.

4.5 When there is sufficient room in the hatchway on top of the layers underneath to stow another layer, it should be established whether the coamings can be used as bulkheads. If not, measures should be taken to prevent the FIBCs shifting to the open space in the wings. Otherwise, the FIBCs should be stowed from one coaming to another. In both cases any void space should be in the centre and should be chocked off.

4.6 Chocking off is necessary in all cases to prevent shifting of the FIBCs to either side and to prevent a list of the ship developing in rough weather (figure 1).

## 5 Securing

5.1 In cases where only a part of a 'tween-deck or lower hold is used for the stowage of FIBCs, measures should be taken to prevent the FIBCs from shifting. These measures should include sufficient gratings or plywood sheets placed against the FIBCs and the use of wire lashings from side to side to secure the FIBC cargo.

5.2 The wire lashings and plywood sheets used for securing should be regularly checked, in particular before and after rough weather, and retightened if necessary.

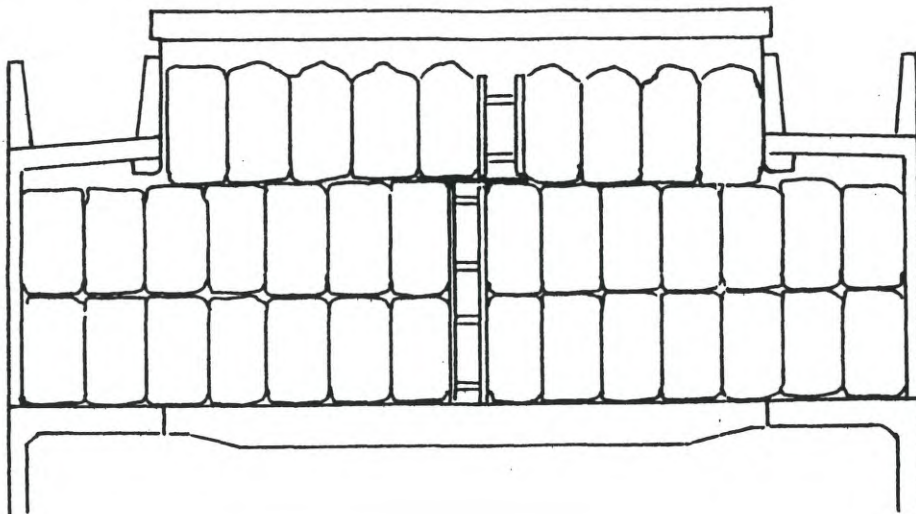


Figure 1: Stowage of FIBCs with chocked void spaces in the centre of the stowage area

## ANNEX 11

### GENERAL GUIDELINES FOR THE UNDER-DECK STOWAGE OF LOGS

#### 1 Introduction

The purpose of this annex is to recommend safe practices for the under-deck stowage of logs and other operational safety measures designed to ensure the safe transport of such cargoes.

#### 2 Prior to loading

- .1 each cargo space configuration (length, breadth and depth), the cubic bale capacity of the respective cargo spaces, the various lengths of logs to be loaded, the cubic volume (log average), and the capacity of the gear to be used to load the logs should be determined;
- .2 using the above information, a pre-stow plan should be developed to allow the maximum utilization of the available space; the better the under-deck stowage, the more cargo can safely be carried on deck;
- .3 the cargo spaces and related equipment should be examined to determine whether the condition of structural members, framework and equipment could affect the safe carriage of the log cargo. Any damage discovered during such an examination should be repaired in an appropriate manner;
- .4 the bilge suction screens should be examined to ensure they are clean, effective and properly maintained to prevent the admission of debris into the bilge piping system;
- .5 the bilge wells should be free of extraneous material such as wood bark and wood splinters;
- .6 the capacity of the bilge pumping system should be ascertained. A properly maintained and operating system is crucial for the safety of the ship. A portable dewatering pump of sufficient capacity and lift will provide additional insurance against a clogged bilge line;
- .7 side sparring, pipe guards, etc., designed to protect internal hull members should be in place; and
- .8 the master should ensure that the opening and closing of any high ballast dump valves are properly recorded in the ship's log. Given that such high ballast tanks are necessary to facilitate loading and bearing in mind regulation 22(1) of the International Convention on Load Lines, 1966, which requires a screw-down valve fitted in gravity overboard drain lines, the master should ensure that the dump valves are properly monitored to preclude the accidental readmission of water into these tanks. Leaving these tanks open to the sea, could lead to an apparently inexplicable list, a shift of deck cargo, and potential capsizes.



3 During loading operations

- .1 each lift of logs should be hoisted aboard the ship in close proximity to the ship to minimize any potential swinging of the lift;
- .2 the possibility of damage to the ship and the safety of those who work in the cargo spaces should be considered. The logs should not be swinging when lowered into the space. The hatch coaming should be used, as necessary, to eliminate any swinging of the logs by gently resting the load against the inside of the coaming, or on it, prior to lowering;
- .3 the logs should be stowed compactly, thereby eliminating as many voids as is practicable. The amount and the vertical centre of gravity of the logs stowed under deck will govern the amount of cargo that can be safely stowed on deck. In considering this principle, the heaviest logs should be loaded first into the cargo spaces;
- .4 logs should generally be stowed compactly in a fore and aft direction, with the longer lengths towards the forward and aft areas of the space. If there is a void in the space between the fore and aft lengths, it should be filled with logs stowed athwartships so as to fill in the void across the breadth of the spaces as completely as the length of the logs permits;
- .5 where the logs in the spaces can only be stowed fore and aft in one length, any remaining void forward or aft should be filled with logs stowed athwartships so as to fill in the void across the breadth of the space as completely as the length of the logs permits;
- .6 athwartship voids should be filled tier by tier as loading progresses;
- .7 butt ends of the logs should be alternately reversed to achieve a more level stowage, except where excess sheer on the inner bottom is encountered;
- .8 extreme pyramiding of logs should be avoided to the greatest extent possible. If the breadth of the space is greater than the breadth of the hatch opening, pyramiding may be avoided by sliding fore and aft loaded logs into the ends of the port and starboard sides of the space. This sliding of logs into the ends of the port and starboard sides of the space should commence early in the loading process (after reaching a height of approximately 2 m above the inner bottom) and should continue throughout the loading process;
- .9 it may be necessary to use loose tackle to manoeuvre heavy logs into the under-deck areas clear of the hatchways. Blocks, purchases and other loose tackle should be attached to suitably reinforced fixtures such as eyebolts or padeyes provided for this purpose. However, if this procedure is followed, care should be taken to avoid overloading the gear;



- .10 a careful watch by ship's personnel should be maintained throughout the loading to ensure no structural damage occurs. Any damage which affects the seaworthiness of the ship should be repaired;
- .11 when the logs are stowed to a height of about 1 m below the forward or aft athwartship hatch coaming, the size of the lift of logs should be reduced to facilitate stowing of the remaining area; and
- .12 logs in the hatch coaming area should be stowed as compactly as possible to maximum capacity.

4 After loading, the ship should be thoroughly examined to ascertain its structural condition. Bilges should be sounded to verify the ship's watertight integrity.

5 During the voyage

- .1 the ship's heeling angle and rolling period should be checked, in a seaway, on a regular basis;
- .2 wedges, wastes, hammers and portable pump, if provided, should be stored in an easily accessible place; and
- .3 the master or a responsible officer should ensure that it is safe to enter an enclosed cargo space by:
  - .3.1 ensuring that the space has been thoroughly ventilated by natural or mechanical means;
  - .3.2 testing the atmosphere of the space at different levels for oxygen deficiency and harmful vapour where suitable instruments are available; and
  - .3.3 requiring self-contained breathing apparatus to be worn by all persons entering the space where there is any doubt as to the adequacy of ventilation or testing before entry.

## ANNEX 12

### SAFE STOWAGE AND SECURING OF UNIT LOADS

#### 1 Introduction

Unit load for the purposes of this annex means that a number of packages are either:

- .1 placed or stacked, and secured by strapping, shrink-wrapping or other suitable means, on a load board such as a pallet; or
- .2 placed in a protective outer packaging such as a pallet box; or
- .3 permanently secured together in a sling.

Note: A single large package such as a portable tank or receptacle, intermediate bulk container or freight container is excluded from the recommendations of this annex.

#### 2 Cargo information

The master should be provided with at least the following information:

- .1 the total number of unit loads and commodity to be loaded;
- .2 the type of strapping or wrapping used;
- .3 the dimensions of a unit load in metres; and
- .4 the gross mass of a unit load in kilogrammes.

#### 3 Recommendations

3.1 The cargo spaces of the ship in which unit loads will be stowed should be clean, dry and free from oil and grease.

3.2 The decks, including the tank top, should be flush all over.

3.3 The cargo spaces should preferably be of a rectangular shape, horizontally and vertically. Cargo spaces of another shape in forward holds or in 'tweendecks should be transformed into a rectangular shape both athwartships and longitudinally by the use of suitable timber (figure 1).

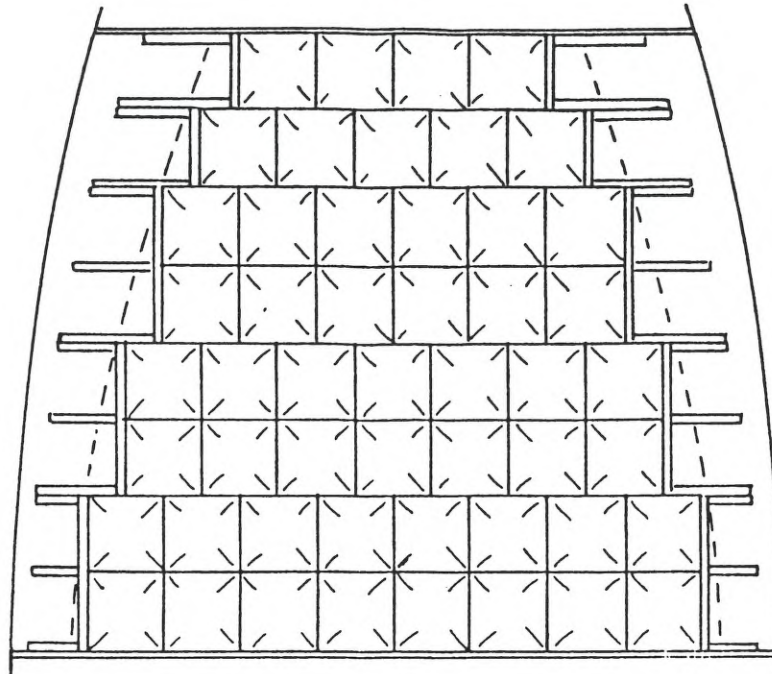


Figure 1: Stowage and chocking of unit loads in a tapered stowage area  
(view from top)

#### 4 Stowage

4.1 The unit loads should be stowed in such a way that securing, if needed, can be performed on all sides of the stow.

4.2 The unit loads should be stowed without any void space between the loads and the ship's sides to prevent the unit loads from racking.

4.3 When unit loads have to be stowed on top of each other, attention should be paid to the strength of pallets and the shape and the condition of the unit loads.

4.4 Precautions should be taken when unit loads are mechanically handled to avoid damaging the unit loads.

#### 5 Securing

Block stowage should be ensured and no void space be left between the unit loads.

#### 6 Securing when stowed athwartships

6.1 When unit loads are stowed in a lower hold or in a 'tween-deck against a bulkhead from side to side, gratings or plywood sheets should be positioned vertically against the stack of the unit loads. Wire lashings should be fitted from side to side keeping the gratings or plywood sheets tight against the stow.

6.2 Additionally, lashing wires can be fitted at different spacing from the bulkhead over the stow to the horizontally placed wire lashings in order to further tighten the stow.

#### 7 Stowage in a wing of a cargo space and free at two sides

When unit loads are stowed in the forward or after end of a cargo space and the possibility of shifting in two directions exists, gratings or plywood sheets should be positioned vertically to the stack faces of the unit loads of the non-secured sides of the stow. Wire lashings should be taken around the stow from the wings to the bulkhead. Where the wires can damage the unit loads (particularly on the corners of the stow), gratings or plywood sheets should be positioned in such a way that no damage can occur on corners.

#### 8 Stowage free at three sides

When unit loads are stowed against the ship's sides in such a way that shifting is possible from three sides, gratings or plywood sheets should be positioned vertically against the stack faces of the unit loads. Special attention should be paid to the corners of the stow to prevent damage to the unit loads by the wire lashings. Wire lashing at different heights should tighten the stow together with the gratings or plywood sheets at the sides (figure 2).

9 General

9.1 Instead of gratings or plywood sheets, other possibilities are the use of aluminium stanchions or battens of sufficient strength.

9.2 During the voyage the wire lashings should be regularly inspected and slack wires should be retightened if necessary. In particular, after rough weather, wire lashings should be checked and retightened if necessary.

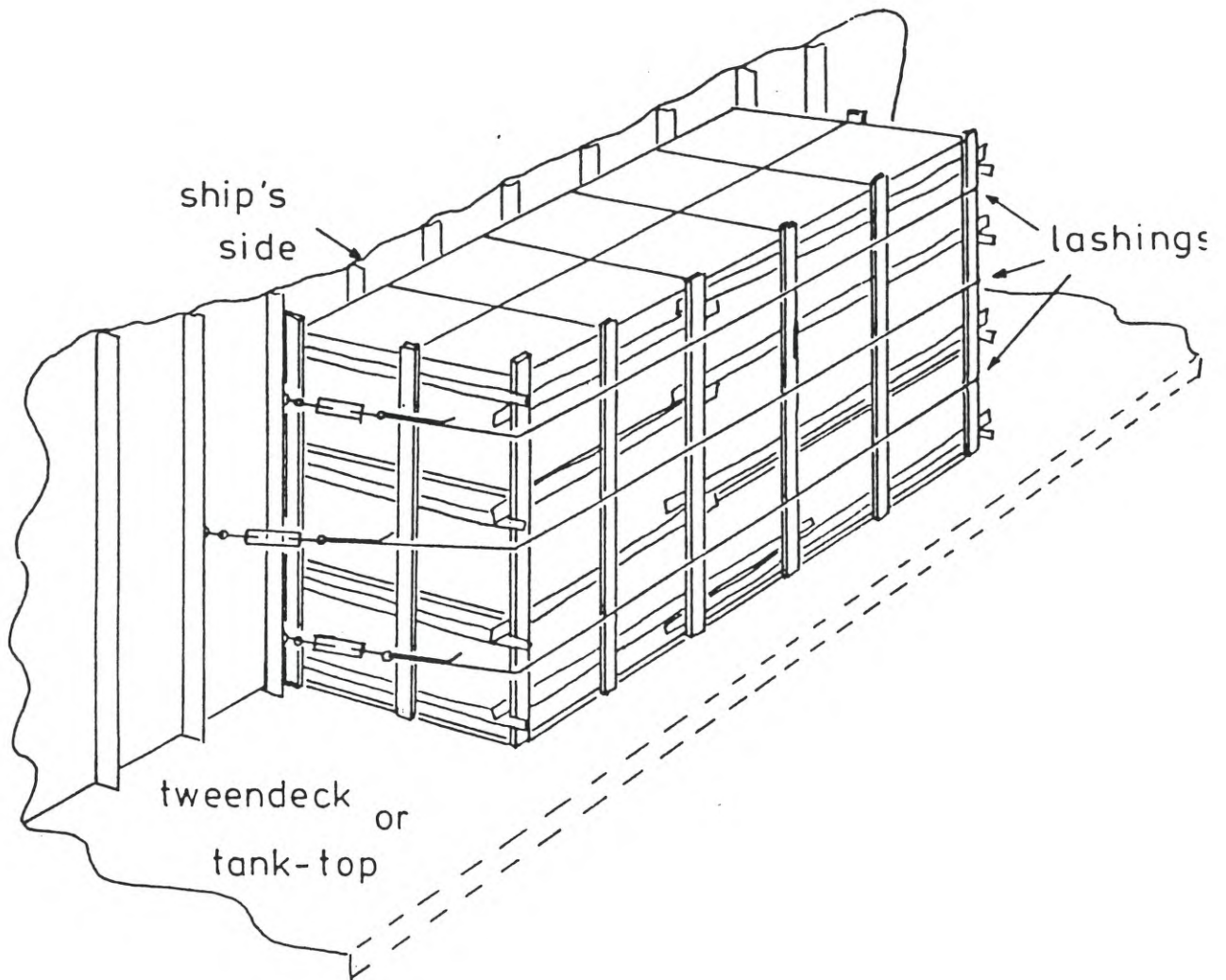


Figure 2: Securing of units stowed at the ship's side



