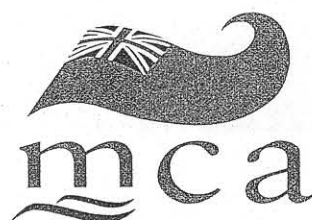
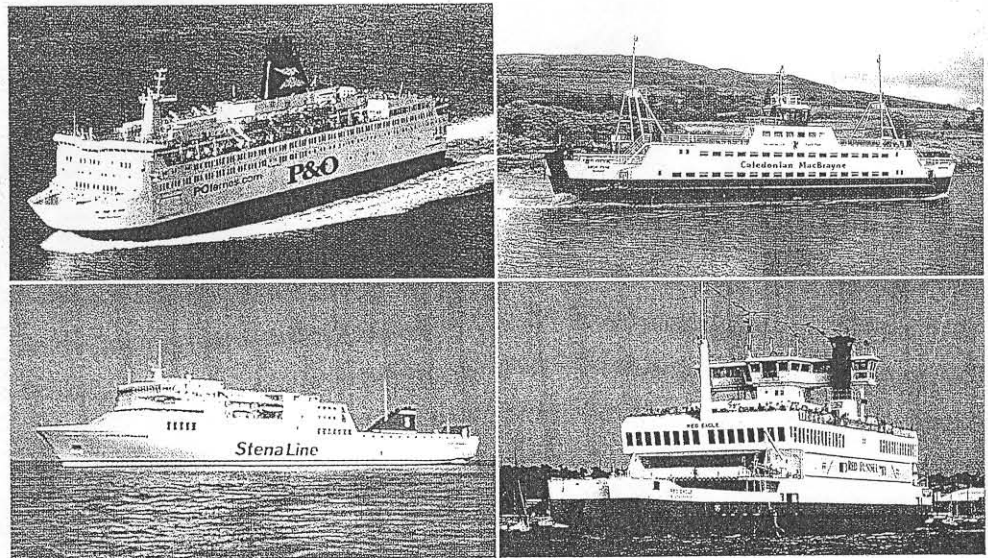


# MARITIME AND COASTGUARD AGENCY

## *Roll-on/Roll-off Ships – Stowage and Securing of Vehicles*

### *Code of Practice*



Maritime and Coastguard Agency



---

**THE CODE OF PRACTICE**  
**ROLL ON/ROLL OFF SHIPS –**  
**STOWAGE AND SECURING OF VEHICLES**

---

**MARITIME AND COASTGUARD AGENCY**

---

AN EXECUTIVE AGENCY OF THE  
DEPARTMENT FOR TRANSPORT

London: TSO



Published by TSO (The Stationery Office) and available from:

**Online**

[www.tso.co.uk/bookshop](http://www.tso.co.uk/bookshop)

**Mail, Telephone, Fax & E-mail**

TSO

PO Box 29, Norwich NR3 1GN

Telephone orders/General enquiries 0870 600 5522

Order through the Parliamentary Hotline Lo-call 0845 7 023474

Fax orders 0870 600 5533

Email [book.orders@tso.co.uk](mailto:book.orders@tso.co.uk)

Textphone 0870 240 3701

**TSO Shops**

123 Kingsway, London WC2B 6PQ

020 7242 6393 Fax 020 7242 6394

68-69 Bull Street, Birmingham B4 6AD

0121 236 9696 Fax 0121 236 9699

9-21 Princess Street, Manchester M60 8AS

0161 834 7201 Fax 0161 833 0634

16 Arthur Street, Belfast BT1 4GD

028 9023 8451 Fax 028 9023 5401

18-19 High Street, Cardiff CF10 1PT

029 2039 5548 Fax 029 2038 4347

71 Lothian Road, Edinburgh EH3 9AZ

0870 606 5566 Fax 0870 606 5588

**TSO Accredited Agents**

(See Yellow Pages)

*and through good booksellers*

Published for the Maritime and Coastguard Agency under licence from the Controller of Her Majesty's Stationery Office.

All rights reserved.

Copyright in the typographical arrangement and design is vested in the Crown. Applications for reproduction should be made in writing to the Copyright Unit, Her Majesty's Stationery Office, St Clements House, 2-16 Colegate, Norwich NR3 1BQ

First published 1991

Second Edition 1996

3rd Edition 2003

ISBN 0 11 552493 2

The Maritime and Coastguard Agency would like to thank the Chamber of Shipping Working Group for revising this Code of Practice.

The front cover photographs were supplied courtesy of:

Caledonian MacBrayne Ltd

P & O Ferries Ltd

Red Funnel Ferries Ltd

Stena Line Ferries Ltd

Printed in Great Britain on material containing 75% post consumer waste and 25% pulp

## TABLE OF CONTENTS

1	Introduction .....	1
	Relevant Legislation	
	SOLAS 1974	
	Parties Affected by this Code of Practice	
	Definitions	
2	Section 1 Principal Sources of Danger .....	4
3	Section 2 Safety of Personnel .....	5
4	Section 3 Vehicle Decks, Ramps and Lifting Appliances .....	8
5	Section 4 Vehicles – Suitability for Transport by Sea .....	10
6	Section 5 Stowage and Securing .....	12
7	Section 6 Specialised Freight Vehicles and Cargoes .....	16
8	Section 7 The Cargo Securing Manual .....	18
9	Section 8 Related Publications .....	20
	Annex 1 Vehicle Lashing Arrangements .....	22
	Annex 2 Illustrative Lashings Charts .....	25
	Annex 3 Relevant Legislation .....	30



## **1 Introduction**

- 1.1 The Health and Safety Executive, which is responsible for enforcing the Docks Regulations 1988, as amended, and other shore-based legislation, has been consulted in the preparation of this Code.
- 1.2 Experience gained in operating Ro/Ro ships has enabled the International Maritime Organisation (IMO) to develop standards to improve the safety of this type of operation. This Code, which includes the standards developed by IMO, provides guidance and information on safe procedures to be followed during Roll-on/Roll-off operations to reduce the risks to persons and ships.

## **2 Relevant Legislation**

- 2.1 Legislation dealing with safe ship operations comprises primarily of the Merchant Shipping Act 1995, and the Merchant Shipping & Fishing Vessels (Health and Safety at Work) Regulations 1997.
  - 2.1.1 Under Section 98 of the 1995 Act, the owner and master are liable in respect of a dangerously unsafe ship. This Section applies to a ship in port in the United Kingdom, or a ship registered in the United Kingdom which is in any other port. Regulation 5 of the 1997 Regulations specifies the principles by which an employer shall ensure the health and safety of workers and other persons so far as is reasonably possible. This relevant legislation is detailed in Annex 2.
  - 2.1.2 The carrying out of operations relating to the stowage and securing of vehicles on Ro/Ro ships in accordance with company procedures which are based on this Code would be regarded as proper conduct for persons operating ships and this would be taken into account in applying the relevant regulations.

### **2.2 The Docks Regulations**

- 2.2.1 The Docks Regulations deal primarily with the duties of shoreside employers and the safety of their employees. There is some overlap since, for example, the Docks Regulations also put limited duties on masters and crew. This Code, however, gives useful advice to all those involved, whether ship-based or shore-based. For shore-based employers, the code supplements guidance in the Health and Safety Commission publication "Safety in Docks". This relevant legislation is detailed in Annex 2.

### **2.3 SOLAS 1974 (As Amended)**

- 2.3.1 Chapter II – 1 Regulation 20.3 – In all ro-ro passenger ships, the master or the designated officer shall ensure that, without the express consent of the master or designated officer, no passengers are allowed access to an enclosed ro-ro deck when the ship is underway.

## **3 Parties Affected by this Code of Practice**

- 3.1 This Code is addressed to all parties associated with either the design or the operation of the ship or with the design of freight vehicles or with the presentation of vehicles for loading, including the following:

- .1 shipbuilders;
- .2 classification societies;
- .3 shipowners and ship managers;
- .4 shipmasters and ship's officers;
- .5 ship safety officials and other persons employed on ro/ro ships;
- .6 securing equipment manufacturers;
- .7 port authorities;
- .8 shippers;
- .9 forwarding agents;
- .10 road hauliers;
- .11 stevedores;
- .12 freight vehicle manufacturers;
- .13 insurers;
- .14 railway operators; and
- .15 packers of containers and freight vehicles at inland depots.

#### 4 Definitions

“Competent person” means a person possessing knowledge and experience required for the performance of thorough examinations and tests of ship's lifting plants as described in the Merchant Shipping (Hatches and Lifting Plant) Regulations 1988 (S.I. 1988 No.1639) as amended.

“Cargo Transport Unit (CTU)” means a road freight vehicle, a freight container, a road tank vehicle, a railway tank wagon or a portable tank.

“Flat-bed trailer” means a flat topped, open sided trailer or semi-trailer and includes a roll-trailer and a drawbar trailer.

“Freight vehicle” means a vehicle which is a goods vehicle, flat bed trailer, road train, articulated road train, combination of freight vehicles, or a tank vehicle.

“Maximum Securing Load (MSL)” is the allowable load capacity for a device used to secure a cargo to a ship.

“Semi-trailer” means a trailer which is designed to be coupled to a semi-trailer towing vehicle and to impose a substantial part of its total weight on the towing vehicle.

“Strength” when referring to a lashing or fitting means the maximum securing load which the lashing or fitting is designed to withstand.

“Tank vehicle” is a vehicle fitted with a tank which is rigidly and permanently attached to the vehicle during all normal operations of loading, discharging and transport and is neither fitted nor discharged on board and is driven on board by its own wheels.



“Trained person” means a person who has received training to carry out a function that has been authorised by a responsible ship’s officer.

NB. Training should consist of theoretical instruction enabling the trainee to appreciate factors affecting the safe use and condition of fixed and portable securing devices. Employers may issue certificates to personnel who have successfully completed training.

“Vehicle” means a vehicle with wheels or a track laying vehicle.

## Section 1 Principal Sources of Danger

The sources of danger which can affect the safety of roll-on/roll-off ships and of persons on them include:

- 1.1 the unsatisfactory condition or design of vehicles presented for shipment, eg an insufficient number and incorrect positioning of securing points, securing points of inadequate strength, or an ineffective braking system;
- 1.2 cargo badly stowed or inadequately secured within or on freight vehicles;
- 1.3 free surface effect in tank vehicles and tank containers which are slack;
- 1.4 poorly maintained ramps, lifts and bow and stern doors;
- 1.5 poorly maintained, inadequately illuminated or badly planned decks;
- 1.6 wet decks;
- 1.7 inadequate supervision of vehicle movements on vehicle decks and ramps;
- 1.8 the reversing of vehicles on vehicle decks and ramps;
- 1.9 failure to apply brakes correctly;
- 1.10 failure to secure vehicles;
- 1.11 insufficient or incorrectly applied lashings or the use of lashing equipment of the wrong type or of inadequate strength having regard to the mass and centre of gravity of the vehicle and the weather conditions likely to be encountered during the voyage;
- 1.12 free play in the suspension of vehicles;
- 1.13 failure to comply with the correct declaration, placarding and labelling and stowage and segregation requirements for freight vehicles carrying dangerous goods;
- 1.14 inadequate securing arrangements for specialised vehicles, eg track laying vehicles, high sided freight vehicles, earth moving plant, low loaders, freight vehicles carrying livestock and vehicles with a high centre of gravity;
- 1.15 inadequate securing arrangements leading to Ro-Ro cargo breaking loose in the vicinity of bow, stern and side doors;
- 1.16 failure to stow away and secure equipment such as trestles, unused lashings and portable ladders.

## Section 2 Protection of Personnel on Ramps and Vehicle Decks

### MATTERS MAINLY OF CONCERN TO SHIPOWNERS, SHIPMANAGERS, MASTERS AND SHIPS OFFICERS

- 2.1 The movement, stowage and securing of vehicles on vehicle decks and ramps should be supervised by a person trained in vehicle deck management assisted by at least one other trained person. In the cases where such operations are conducted by shore personnel, a responsible ship's officer should still monitor the overall vehicle deck management.
- 2.2 Before being accepted for shipment, every freight vehicle should be inspected externally by a responsible person or persons appointed by the ship owner, the ship manager and/or the master, to check that it is in a satisfactory condition for shipment (see also paragraph 6.1.2).
- 2.3 Cargo loading doors, flood barriers, ships' ramps, car platforms, retractable car-decks and similar equipment should be operated only by trained persons authorised by the Master or a responsible ship's officer. Safe systems and work instructions should be developed as a result of risk assessments to ensure that the health and safety of persons is not put at risk when the equipment is operated.
- 2.4 Safe systems of work should be provided in order to ensure that drivers do not move vehicles until directed to do so by a trained person. Where fitted and appropriate, visual and audible alarms should be utilised when reversing.
- 2.5 Passengers and drivers are not permitted to remain on vehicle decks without the express authority of the Master or designated Officer as per SOLAS Convention Chapter II – 1 Regulation 20-3. Prominent notices should be displayed in vehicle spaces and passenger accommodation to bring this restriction to the attention of passengers and drivers. In order to facilitate the ordered movement of passengers towards the end of a voyage and only if the Master considers it to be safe, passengers may be allowed access to the vehicle deck provided the ship is not more than two ship's length from its berth.
- 2.6 Ramps which are used by vehicles should not also be used for simultaneous pedestrian access unless there is suitable segregation of vehicles and pedestrians. Such segregation can be achieved by a separate walkway which may be either a pavement or protected by a suitable barrier or by temporarily halting vehicle movements to allow pedestrians safe passage.
- 2.7 Hand signals used by vehicle deck personnel during loading and unloading operations should be unambiguous and in accordance with the Code of Practice for Merchant Seaman. To avoid confusion, the signalling system should be common to other comparable signalling systems used within the port or terminal. Consideration should also be given to the need for the person in charge of cargo operations to communicate with drivers of vehicles and, in particular, the need to alert drivers quickly to any danger that may be developing. A high pitched whistle may be considered a useful tool to alert drivers, passengers and crew members of potential danger.
- 2.8 At each vehicle access point to the ship, there should be at least one lifebuoy, with self-activating light and at least one separate safety line, attached to a quoit or similar device.
- 2.9 Where practicable, permanently marked walkways should be provided for all those who require access to the vehicle decks both during cargo operations and when the ship is at sea. These walkways should also be well-illuminated if operational conditions permit (note: it may not be possible to illuminate open vehicle decks at night at sea). Consideration should be given to special measures in the vicinity of access doorways, such as raised kerbs and warning signs, to keep vehicles clear and alert drivers to the possible presence of pedestrians.

- 2.10 Vehicles should not be parked in such a way as to obstruct permanent walkways, shell doors and emergency escapes.
- 2.11 Suitable arrangements, such as prominent notices or appropriate instructions, should be made to inform persons on vehicle decks of the dangers from moving vehicles and of the need to exercise extreme caution to minimise the risk to health and safety.
- 2.12 Personnel working on vehicle decks shall wear suitable Personal Protective Equipment, including high visibility garments as determined by risk assessment. The relevant legislation is detailed in Annex 2.
- 2.13 Crew members and shore workers should exercise great care when supervising the driving, marshalling, stowing and securing of vehicles to ensure that no person is put at risk.
- 2.14 No attempt should be made to secure a vehicle until it is parked, the brakes, where applicable, have been applied and the engine has been switched off.
- 2.15 Where personnel are working in shadow areas, hand lamps and torches should be available for use.
- 2.16 Personnel engaged in the securing of vehicles should take care to avoid injury from projections on the underside of the vehicles.
- 2.17 Personnel should release lashings with care to reduce the risk of injury when tension is released.
- 2.18 Persons inspecting vehicle spaces during a voyage should exercise caution in order to avoid being injured by moving or swaying vehicles. If necessary, the ship's course should be altered to reduce movement or dangerous sway when lashings are being adjusted. The officer of the watch should always be aware when an inspection of the vehicle deck is being made.
- 2.19 To reduce the accumulation of fumes, drivers should be instructed to stop their engines as soon as practicable after embarking and not to start up prior to disembarkation until instructed to do so. Warning notices to this effect should be posted at the entrances to and within the vehicle spaces. During loading and discharging ventilation may be improved by keeping cargo doors open provided that there is adequate freeboard at these openings. When there is doubt about the freshness of the atmosphere, arrangements should be made for testing the atmosphere to ensure the maintenance of 21% oxygen with a carbon monoxide content below 50ppm in the atmosphere of the space.
- 2.20 Noise levels on vehicle decks should not exceed 85 dB(A). Persons working on vehicle decks should not be exposed to the equivalent of 85 dB(A) or greater when averaged over an 8 hour day. See paragraphs 6.4.3, 7.2.8 and Section 8 of the Code of Practice for Noise Levels in Ships (revised 1990). Hearing protection should be available for persons on vehicle decks to use when the noise level is equivalent to, or greater than, 80 dB(A), averaged over an 8 hour day. Hearing protection must be worn when the noise level is equivalent to or exceeds 85 dB(A), averaged over an 8 hour day.
- 2.21 Smoking shall not be permitted on any vehicle deck. Conspicuous "No Smoking" or "No Smoking/No Naked Lights" signs should be displayed.
- 2.22 All vehicle decks, ships' ramps and lifting appliances should be adequately lit when persons have access to them (see paragraph 3.1.3).
- 2.23 All vehicle decks, ships' ramps and lifting appliances should, so far as is reasonably practicable, be kept free of water, oil, grease or any liquid which might cause a person to slip or which might act as a lubricant to a shifting load.

- 2.24 All vehicle decks, ships' ramps and lifting appliances should be kept free of loose items such as unused lashings, stores and refuse.
- 2.25 Drums and canisters containing paint, oil or similar viscous liquids are susceptible to damage if vehicles break adrift in adverse weather. These commodities should not be stowed on the vehicle deck without adequate protection.
- 2.26 Retractable car-decks and lifting appliances should be securely locked when in the stowed position and confirmed as such by a suitably trained person.
- 2.27 The ship's mobile handling equipment, which is not fixed to the ship, should be secured in its stowage position before the ship proceeds to sea.

### **Section 3 Vehicle Decks, Ships' Ramps, Lifting Appliances and Securing Arrangements**

#### **MATTERS MAINLY OF CONCERN TO SHIPOWNERS, SHIP MANAGERS, MASTERS AND SHIPS OFFICERS**

##### **3.1 General**

- 3.1.1 Retractable car-decks, ramps and lifting appliances should be of sound construction, fitted with appropriate fencing and tested by a competent person and operated by a trained person. All lifting appliances should be properly tested and certificated.
- 3.1.2 Ramps should have a suitable slip resistant surface.
- 3.1.3 Adequate permanent lighting should be provided to illuminate vehicle decks, ramps and lifting appliances. Lights should be positioned to reduce to a minimum shadow areas caused by stowed vehicles. For loading and unloading areas and for other working areas on vehicle decks a lighting level of at least 20 lux should be provided.
- 3.1.4 Doors leading to vehicle decks should have clear signs prohibiting unauthorised entry to vehicle decks and a warning of the dangers of moving vehicles, retractable car decks, ramps and lifting appliances.
- 3.1.5 An adequate supply of equipment to deal with emergencies should be readily available for all vehicle decks eg drip trays or absorbent materials for minor liquid leakages. Suitable hoses and containers to siphon ruptured tanks should be available.
- 3.1.6 Electrical equipment should be regularly inspected to minimise the risk of electric shock, fire and explosion. Particular attention should be paid to transportable equipment and cables, eg the condition of refrigerated containers and the associated connections supplying them. Trailing cables should be run so as to minimise the risk of damage. Damaged electrical equipment and cables should be isolated until repairs or replacement can be safely carried out.

##### **3.2 Retractable car-decks and lifting appliances**

- 3.2.1 Warning notices and operating instructions of adequate size should be prominently displayed.
- 3.2.2 Persons operating retractable car-decks and lifting appliances should ensure that no person is at risk when the equipment is moving. No person should be permitted beneath moving ramps, platforms or retractable car decks.
- 3.2.3 Where the operator of a ship's ramp, retractable car-deck, or lifting equipment does not have a clear view of the equipment and its field of travel, appropriate safety devices should be incorporated or safe systems of work provided in order to ensure that persons are not at risk when the equipment is moving. Operating procedures may include the use of signallers and/or closed circuit television.
- 3.2.4 No person should be lifted by ramps, retractable car decks or lifting appliances except where this equipment has been designed or especially adapted for that purpose.

### 3.3 Securing arrangements

3.3.1 The ship should be provided with:

- .1 an adequate number of securing points of sufficient strength;
- .2 a sufficient quantity of cargo securing gear and, where appropriate, cargo trestles of sufficient strength and, where appropriate, sufficient reserve cargo securing gear; and
- .3 an approved Cargo Securing Manual.

3.3.2 In considering the number and strength of the securing points, the items of cargo securing gear and the preparation of the Cargo Securing Manual, the following criteria should be taken into account:

- .1 duration of the voyage;
- .2 geographical area of the voyage;
- .3 sea conditions which may be expected;
- .4 heel of the ship in a tight turn;
- .5 size, design and characteristics of the ship;
- .6 dynamic forces under adverse conditions;
- .7 types of vehicles to be carried;
- .8 intended stowage pattern of the vehicles; and
- .9 weight of vehicles.

### 3.4 Deck Securing Points

3.4.1 Securing points should be provided on the ship's deck for each vehicle and for each element of a combination of vehicles.

3.4.2 The longitudinal and transverse spacing of securing points should be suitable for the mix of vehicles to be carried so that, where practicable, the optimum angles specified in paragraph 5.3.8 can be achieved.

3.4.3 The maximum securing load (MSL) of each securing point for freight vehicles of more than 3.5 tonnes should be not less than 100 kN. The strength of securing points designed to accommodate more than one lashing should be not less than the summation of the strength required for each lashing calculated at 100kN per lashing.

3.4.4 On ships which do not carry freight vehicles of more than 3.5 tonnes or which only occasionally carry vehicles, the spacing and strength of securing points should be such that the vehicles can be adequately secured. The above provisions may also apply to ships with individual deck areas, not designed to have full strength fittings, such as mezzanine decks and dedicated car decks.

3.4.5 Ship's mobile cargo handling equipment not fixed to the ship should be provided with adequate securing points.

## Section 4 Vehicles – Suitability for Transport by Sea

### MATTERS MAINLY OF CONCERN TO SHIPPERS, FORWARDING AGENTS, ROAD HAULIERS AND ANY OTHER PARTY PRESENTING VEHICLES FOR SHIPMENT

#### 4.1 Suitability for Transport by Sea

Shippers, forwarding agents, road hauliers, and any other party presenting road vehicles for shipment, should appreciate that vehicles can be subjected to forces of great magnitude, particularly in the transverse direction and especially in adverse weather conditions. It is of importance that they ensure that:

- .1 vehicles are in sound structural condition for carriage by sea, free of defects which could affect their structural strength, and in good working order if they are to be driven on to or off the ship;
- .2 freight vehicles of more than 3.5 tonnes are provided with an adequate number of accessible securing points of sufficient strength which are so located as to ensure effective restraint of the freight vehicle by the lashings;
- .3 semi-trailers are of adequate strength to withstand the loadings imposed by the use of trestles or similar devices. Semi-trailers should have, within the area of the kingpin, sufficient strength and space for a trestle to be located to allow safe stowage prior to unhitching of the semi-trailer towing vehicle. The area of trestle location should be suitably marked on both sides;
- .4 supporting legs on semi-trailers which are specifically designed to support the semi-trailer during sea transport are clearly marked;
- .5 where jacks are used on a freight vehicle, the jacking up positions on the chassis are strengthened and clearly marked;
- .6 refrigerated freight vehicles of more than 3.5 tonnes, with flush insulated undersides, have jacking points especially fitted and marked to avoid damage to insulation;
- .7 freight vehicles designed to transport loads likely to have an adverse effect on their stability, such as hanging meat, have a means of neutralizing the suspension system;
- .8 vehicles are provided with an effective braking system;
- .9 freight vehicles are provided with an adequate number of accessible securing points to enable the cargo to be adequately secured to them so as to withstand the forces which may arise during the sea transport;
- .10 loads carried on or within freight vehicles or containers are secured in a manner that will prevent them from moving when they are subjected to the worst conditions likely to be encountered at sea. The Department for Transport publication, “Code of Practice, Safety of Loads on Vehicles”, obtained from any of The Stationery Office(TSO) bookshops, provides guidance as to how loads should be secured on vehicles. (See also IMO/ILO Guidelines for Packing Cargo in Freight Containers or Vehicles);
- .11 each freight vehicle is provided with documentation, to indicate its gross weight and any precautions which may have to be observed during sea transport;



- .12 all dangerous goods, including those contained within groupage loads, are fully declared; and packed and labelled in accordance with the requirements of the International Maritime Dangerous Goods (IMDG) Code;
- .13 the dangerous goods placards (large labels) required for sea transport of dangerous goods on vehicles are clearly visible on the outside of the vehicle and affixed in accordance with the IMDG Code (see paragraph 6.1.1);
- .14 the master receives adequate notice containing information about special vehicles eg track laying vehicles, high sided freight vehicles, earth moving plant, low loaders and freight vehicles carrying livestock; and
- .15 the recommendations in the relevant Marine Guidance Note (MGN 19) as amended regarding fuel in tanks are followed.

#### **4.2 Guidance on specific types of loads on freight vehicles**

- 4.2.1 Cargo carried on flat-bed trailers should be effectively secured, preferably with chains or suitable webbing fitted with tightening devices.
- 4.2.2 Empty trailers carried on semi-trailers should be adequately secured to the carriage semi-trailer.
- 4.2.3 Steel plates, girders and laminated boards will, if not properly secured, readily slide and may penetrate the sides of a freight vehicle or container. Such items require strong securing arrangements. They should be located in positions where they can do the least damage to the ship's internal structure and fittings if the securing arrangement fails.
- 4.2.4 Pipes, cylinders and similarly shaped units of cargo require special attention. One of the most successful methods of securing is the use of a pipe rack, nesting frame or cradle in association with chain lashings and tightening devices.
- 4.3 Where there is doubt that a vehicle complies with the provisions of paragraph 4.1, masters may, at his/her discretion, refuse to accept the vehicle for shipment.

## Section 5 Stowage and Securing

### MATTERS MAINLY OF CONCERN TO SHIPOWNERS, SHIPMANAGERS AND MASTERS, SHIPS OFFICERS AND STEVEDORES

#### 5.1 Stowage

- 5.1.1 Shippers' special advice or guidelines regarding handling and stowage of individual vehicles should be observed.
- 5.1.2 Vehicles should, as far as it is possible, be aligned in a fore and aft direction. Athwartship stowage should only be allowed with the express permission of the Master having taken into account the anticipated weather for the intended voyage and provided that adequate securing arrangements can be made.
- 5.1.3 Vehicles should not be stowed across water spray fire curtains or flood barrier doors where fitted.
- 5.1.4 Vehicles should be closely stowed athwartships so that, in the event of any failure in the securing arrangements or from any other cause, the transverse movement is restricted. However, sufficient distance should be provided between vehicles to permit safe access for the crew and for passengers getting into and out of vehicles and going to and from accesses serving vehicle spaces.
- 5.1.5 Safe means of access to securing arrangements, safety equipment, and operational controls should be provided and properly maintained. Stairways and escape routes from spaces below the vehicle decks should be kept clear.
- 5.1.6 Vehicles should not obstruct the operating controls of bow and stern doors, entrances to accommodation spaces, ladders, stairways, companionways, escapes, access hatches, fire fighting equipment, controls to deck scupper valves and controls to fire dampers in ventilation trunks.
- 5.1.7 Parking brakes, where provided, of each vehicle or of each element of a combination of vehicles should be applied.
- 5.1.8 Semi-trailers should not be supported on their landing legs during sea transport unless the landing legs are specially designed for that purpose and so marked (see paragraph 4.1.4).
- 5.1.9 Semi-trailers should not be supported on their landing legs during sea transportation unless the deck plating has adequate strength for the point loadings, or there are suitable arrangements to spread the load.
- 5.1.10 Uncoupled semi-trailers should be supported by trestles or similar devices placed in the immediate area of the drawplates so that the connection of the fifth-wheel to the kingpin is not restricted. Such trestles or devices should be tested and clearly marked to show their maximum permitted load, which must not be exceeded.
- 5.1.11 Depending on the area of operation, the predominant weather conditions and the characteristics of the ship, freight vehicles should be stowed so that the chassis are kept as static as possible by not allowing free play in the suspension. This can be done by securing the vehicle to the deck as tightly as the lashing tensioning device will permit or by jacking up the freight vehicle chassis prior to securing. Since compressed air suspension systems may lose air, adequate arrangements should be made to prevent the slackening off of lashings as a result of air leakage during the voyage. Such arrangements may include the jacking up of the vehicle or the release of air from the suspension system where this facility is provided.

## 5.2 Securing

- 5.2.1 Securing operations should be completed before the ship leaves the berth.
- 5.2.2 Persons appointed to carry out the task of securing vehicles should be trained in the use of the equipment to be used and in the most effective methods for securing different types of vehicles.
- 5.2.3 Persons supervising the securing of vehicles should be conversant with the contents of the Cargo Securing Manual.
- 5.2.4 There should be an adequate supply of cargo securing gear which is maintained in a sound working condition.
- 5.2.5 Freight vehicles of more than 3.5 tonnes should be secured in all circumstances where the expected conditions for the intended voyage are such that movement of the vehicles relative to the ship could be expected. So far as is reasonably practicable the securing arrangements should be adequate to ensure that there will be no movement from any cause which will endanger the ship.
- 5.2.6 When freight vehicles are being stowed on an inclined deck, the wheels should be chocked before lashing commences. During discharge, sufficient restraints should remain in place until the tractor unit has been connected, where appropriate.
- 5.2.7 Lashings should not be attached to or led across lamp brackets, trailer landing legs, king pins, sideguards or bumpers except those specially designed for this purpose.
- 5.2.8 When tightening lashings, care should be exercised to ensure that they are securely located to the deck and to the securing points on the vehicle.
- 5.2.9 Lashings on a vehicle should be under equal tension.
- 5.2.10 Special consideration should be given to the securing of vehicles stowed in positions where they may be exposed to large forces. The most severe forces can be expected in the furthest forward, the furthest aft and the highest stowage positions on each side of the ship. Measures should be taken to reduce the risk of longitudinal movement of vehicles in these areas resulting in contact with bow or stern doors.
- 5.2.11 During the voyage, lashings should be inspected at intervals appropriate to the length of voyage and weather conditions expected to ensure that vehicles remain safely secured.
- 5.2.12 Lashings should not be released for unloading before the ship is secured at the berth, without the Master's express permission.
- 5.2.13 When wheel chocks are used to restrain a semi-trailer they should remain in place until the semi-trailer is properly secured to the semi-trailer towing vehicle.
- 5.2.14 To avoid being damaged during loading and unloading all securing equipment should be kept clear of moving vehicles on the vehicle deck.
- 5.2.15 Inspection routines for securing equipment should be specified in the Cargo Securing Manual and require at least one inspection every six months by a trained person. Defective equipment should be taken out of service and placed where it cannot be used inadvertently. Additional information and advice concerning the inspection and testing requirements can be found in paragraph 5.5.

### 5.3 Lashing Arrangements

- 5.3.1 Lashings should have strength and elongation characteristics appropriate for the mass of the vehicle being secured.
- 5.3.2 Steel chains are commonly used for lashing freight vehicles of more than 3.5 tonnes gross vehicle mass (GVM). Webbing straps or other novel securing systems may be used instead of steel chain, provided that they have an equivalent strength and suitable elongation characteristics (see IMO MSC/Circ 812 for further details).
- 5.3.3 Chains/Straps and associated elements (eg hooks, shackles, elephants' feet and tensioning devices) should have an MSL of 100kN.
- 5.3.4 Where, exceptionally, wire ropes or other materials are used their breaking load should be at least 200 kN.
- 5.3.5 Hooks and other devices which are used for attaching a lashing to a securing point should be designed and applied in a manner which prevents them from disengaging from the aperture of the securing point if the lashing slackens during a voyage.
- 5.3.6 Lashings should be so designed and attached that, provided that there is safe access, it is possible to tighten them if they become slack.
- 5.3.7 Securing points provided on vehicles should only be used for lashing the vehicle to the ship. Only one lashing should be attached to any one aperture loop or lashing ring at each securing point.
- 5.3.8 The lashings are most effective on a vehicle when they make an angle with the deck of between 30 and 60 degrees. When these optimum angles cannot be achieved, additional lashings may be required.
- 5.3.9 Where practicable, the arrangement of lashings on both sides of a vehicle should be the same, and angled to provide some fore and aft restraint with an equal number pulling forward as are pulling aft.
- 5.3.10 Crossed lashings should, where practicable, not be used for securing freight vehicles because this disposition provides no restraint against tipping over at moderate angles of roll of the ship. With these vehicles, lashings should pass from a securing point on the vehicle to a deck securing point adjacent to the same side of the vehicle. Where there is a concern about the possibility of low coefficients of friction on vehicles such as solid wheeled trailers, additional crossed lashings may be used to restrain sliding.
- 5.3.11 Bearing in mind the characteristics of the ship, the approved Cargo Securing Manual and the conditions expected on the intended voyage, the master should decide on the number of lashings, if any, to be used on each class of vehicle having regard to any vehicles which by the nature or disposition of their load may require particular attention.

Additional factors which may be present and which should be taken into account are:

- .1 The intended stowage arrangement including the presence of bulk liquids and hazardous cargoes;
- .2 The weight and centres of gravity and the vehicles. High centres of gravity can substantially increase the lashing loads. With loads which evidently have a very high centre of gravity it may be necessary to utilise additional lashings attached at or near the top of the load;
- .3 Factors which may reduce the coefficients of friction between various bearing surfaces.

5.3.12 It is not possible to specify with certainty the maximum forces which may be exerted in the most severe conditions. If in doubt, or if very heavy weather is forecast, additional lashings should be fitted or appropriate operational measures, such as delaying sailing or altering course, taken to minimise the forces.

5.4 The standard lashing equipment used to secure vehicles in excess of 3.5 tonnes should have an MSL of 100 kN (see section 5.3.3). Lighter equipment used for lashing vehicles of less than 3.5 tonnes should be clearly marked to identify its strength where this is less than 100 kN. Wherever possible, the standard 100 kN lashing equipment should be substantially different in appearance from the lighter equipment in order to prevent confusion between the two.

## 5.5 Inspection and Maintenance Schemes

5.5.1 In the absence of other recognised standards, it is recommended that at least 20% of all portable devices should be tested within a period of 5 years. These tests should be carried out as part of a shipboard programme of inspections and tests for cargo securing devices. These tests should include testing to breaking point representative samples to determine whether the strength of the devices has deteriorated due to fatigue caused by the alternating stresses induced in them during use.

5.5.2 It is also recommended that the programme of inspection and tests, which would result in fixed devices being tested every 10 years. The likelihood that there is damage to the surrounding structure and that such damage or deformation may remain undetected following the test, should be a consideration. If it is not possible to examine both the fixed device and the surrounding structure after the test, other methods of testing should be used.

5.5.3 The tests referred to in 5.5.1 and 5.5.2 should only be carried out using the Maximum Securing Load of the device in order to avoid damage.

5.5.4 Where, due to excessive weather conditions or any other cause, it is known or suspected that the forces applied are above the MSL of the device, such devices should be removed from service at the earliest opportunity pending relevant inspections and/or tests by a competent person.

5.5.5 Inspection and maintenance of the cargo securing equipment is required to be recorded in a book kept with the Cargo Securing Manual and produced when required by the MCA. The MCA may check whether lashings and other equipment particularly those in use, have been inspected or tested within the periods specified in the approved Cargo Securing Manual.

5.5.6 Equipment should be clearly identified with stamps or other permanent markings in order that they can be clearly associated with the date of examination or test. Alternative recognised standards for identifying and servicing of equipment will be considered.

## Section 6 Specialised Vehicles and Cargoes

### MATTERS MAINLY OF CONCERN TO SHIPOWNERS, SHIPMANAGERS, MASTERS, SHIPS OFFICERS AND STEVEDORES

#### 6.1 Dangerous Goods

- 6.1.1 The carriage of dangerous goods shall meet the requirements of the Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997. These Regulations make use of the IMO publication "International Maritime Dangerous Goods (IMDG) Code".
- 6.1.2 Prior to loading, freight vehicles carrying dangerous goods should be examined externally for damage and signs of leakage or the shifting of granular contents. Any freight vehicle found to be damaged, leaking or with shifting contents should not be accepted for shipment. If a freight vehicle is found to be leaking after loading, a ship's officer should be informed and personnel kept well clear until it is ascertained that no danger to personnel exists. (See Code of Safe Working Practices for Merchant Seamen paragraph 10.7 and 32.10).
- 6.1.3 Freight vehicles carrying dangerous goods and adjacent freight vehicles should always be secured.
- 6.1.4 Tank vehicles and tank containers on flat-bed trailers, containing products declared as dangerous goods should be given special attention. Before such vehicles are taken on board, the tank nameplate and documentation should be examined to ascertain that the tank has been approved for the carriage of its contents by sea. Such proof of approval may otherwise be established through pre-voyage booking procedures.
- 6.1.5 Emergencies should be dealt with in accordance with the IMO publications "Emergency Procedures for Ships Carrying Dangerous Goods" and "Medical First Aid Guide" contained in the supplement to the IMDG Code.
- 6.1.6 Vehicles carrying dangerous goods should be properly segregated from other dangerous cargo, foodstuffs, accommodation spaces for crew or passengers and machinery openings as required by the IMDG Code, and from animals. They should be readily accessible to an emergency party and, whenever practicable, located in a position convenient to fire-fighting services.
- 6.1.7 Vehicles carried inside CTU's may be regarded as dangerous goods and applicable to the IMDG Code. If there is any doubt, the IMDG Code and/ or the Competent Authority should be consulted.

#### 6.2 Specialised Vehicles

- 6.2.1 Tank vehicles and tank containers on flat-bed trailers, containing non-hazardous products such as vegetable oil or glycerol may be vulnerable to penetration damage or damage by overturning. The contents, if released, could be a hazard to other units as they would act as an extremely efficient lubricant to a shifting load over a wide area of the deck. These vehicles should always be secured. Heated tanks require special attention.
- 6.2.2 Track laying vehicles such as bulldozers, and cranes are prone to sliding when parked on bare steel decks owing to the low degree of frictional resistance between the track and deck. Where practicable, track laying vehicles should be stowed on dunnage, soft boards or rubber mats before being secured.

- 6.2.3 Low-loader trailers with bare steel landing parts should be landed on rubber mats or dunnage.
- 6.2.4 Flat-bed trailers should receive special consideration because loaded cargo will tend to slip and slide as the ship pitches and rolls unless it is firmly secured.

6.2.5 Where the stowage of cargo in a freight vehicle results in a relatively high position of the centre of gravity, there is a danger of tipping. Whenever practicable, they should be located in positions of least movement ie on the centre line, towards amidships and on a deck near the waterline. Examples of these cargoes are:

- (a) hanging loads (such as meat or plate glass)
- (b) high freight vehicles
- (c) combine harvesters

6.2.6 The location of refrigerated freight vehicles should receive careful attention. Those fitted with diesel-driven refrigerating plants, which are required to run during the voyage, should not be located within enclosed vehicle spaces unless suitable exhaust arrangements are provided. Diesel driven refrigeration plants should be stowed away from flammable DG cargoes. When a refrigerated freight vehicle having diesel-driven refrigerating plant is located in an enclosed space, and a special exhaust system is not provided on the ship, then the diesel motor should not be run for the duration of the voyage. Those requiring the use of the ship's electrical supply during the voyage should be so stowed as to facilitate access to the supply sockets. Long trailing leads should be avoided. Before connection to the ship's supply, it should be established that the refrigeration plant is in a fit condition to operate safely throughout the voyage.

6.2.7 Freight vehicles carrying livestock require special attention to ensure that they are properly secured, adequately ventilated and stowed so that access to the animals is possible. The attention of all parties concerned is drawn to the relevant DEFRA publications. Further advice may be obtained from:

Animal Exports Section  
Animal Health – International Trade Unit  
DEFRA  
1A Page Street  
London  
SW1P

Telephone: 0207 904 6395

Email: [animalexports@defra.gsi.gov.uk](mailto:animalexports@defra.gsi.gov.uk)

6.2.8 Reporting of hazardous incidents.

Information on the Maritime Transport Confidential, Human, Incident Reporting System (CHARPS) can be found on the CHIRP web-site at <http://www.chirp.co.uk/marine/Default.htm>.

Information on the Nautical Institute's Marine Accident Reporting Scheme can be found at the following address:

MARS  
The Nautical Institute  
202 Lambeth Road  
London  
SE1 7LQ

Email: [mars@nautinst.org](mailto:mars@nautinst.org)



## Section 7 The Cargo Securing Manual

### 7.1 Preamble

- 7.1. Every ship has unique hydrostatic characteristics and sea keeping qualities. Furthermore, the quantity of cargo, the cargo itself and the stowage patterns used are unique not only for different ships but also for the same ship on different voyages.
- 7.1.2 Nevertheless, the cargo securing arrangements and gear on board ships should be designed in accordance with common criteria and the same relevant information regardless of which cargo securing gear is chosen. The securing gear should meet the minimum functional and strength criteria applicable to the ship and its cargo. The provision of an approved Cargo Securing Manual is mandatory and assists the officers on board to become fully aware of the correct application and use of securing gear, the order of forces involved and securing gear limitations. The crew and other persons employed for the securing of cargoes should be instructed in the correct application and use of the cargo securing gear on board the ship.
- 7.1.3 The information contained in the cargo securing manual may be based upon company experience and past practice, ie the use of lashing arrangements which are known to have proved successful in severe conditions.

### 7.2 General

- 7.2.1 The Cargo Securing Manual should include the following general information:
- .1 A notation that the manual is prepared to a standard which conforms to IMO Guidelines and meeting regulations of Chapter VI and VII of SOLAS as amended;
  - .2 Details of specific arrangements and securing gear provided on board the ship for the correct application to and the securing of vehicles based upon proven company experience and practice in the area of operation or transverse, longitudinal and vertical dynamic forces which may arise during adverse weather and sea conditions;
  - .3 A warning that it is important for the safety of the ship and the protection of the cargo and personnel that the securing gear is used as specified in the approved Cargo Securing Manual;
  - .4 Information on the safe working load of standardised securing gear or information on the safe working load of every specific item of cargo securing gear. The specification of safe working loads should take full account of the stresses to which the securing gear may be subjected. With regard to lashings for securing vehicles to ships' decks it is not required to apply the same factors of safety used in determining the safe working load (SWL) of lifting gear. A vehicle lashing should not be subjected in use to a load value greater than 50% of its breaking load. This value is the "effective" safe working load of a lashing;
  - .5 Procedures for the inspection and maintenance of cargo securing gear should be maintained in a satisfactory condition. Items worn to such an extent that their quality is impaired should be taken out of use. (See 5.5 – Inspection and Maintenance Schemes).



**Supplementary requirements for ro-ro ships**

- .1 The Cargo Securing Manual should contain sketches showing the layout of the fixed securing devices with identification of MSL as well as longitudinal and transverse distances between securing points. In preparing this sub-chapter, further guidance should be utilized from IMO Assembly resolutions A.533(13) and A.581(14) as appropriate.
- .2 In designing securing arrangements for cargo units on RoRo ships the following considerations relevant to their effectiveness should be taken into account
  - (i) specifications for maximum securing loads
  - (ii) forces due to the motions of the ship
  - (iii) angles of heel after damage or flooding
- .3 Where only a limited number of cargo unit types is intended to be carried on trailers on a short sea trade ro-ro ship, the number and disposition of lashings of a given strength required for various stowage positions and for variations in GM or roll period, can be provided in a simplified format. An example of this simplified information can be found in paragraph 3 of Annex 1.

**Note:** *Due to the difficulty in predicting dynamic accelerations and the complexity of dynamic calculations, the calculated forces apply to rigid and unsprung cargo. Additional lashings may be required to resist dynamic forces.*

## **Section 8 Related Publications**

### **8.1 IMO Publications**

- 8.1.1 SOLAS 1974 as amended
- 8.1.2 MARPOL 73/78 as amended
- 8.1.3 The joint IMO/ILO publications “Guidelines for Packing Cargo in Freight Containers or Vehicles”
- 8.1.4 International Maritime Dangerous Goods (IMDG) Code including the Emergency Procedures (EmS) and Medical First Aid Guide (MFAG)
- 8.1.5 IMO MSC/Circ 385 Containers and Cargoes (BC): Cargo Securing Manual
- 8.1.6 IMO MSC/Circ 581 Guidelines for securing arrangements for the transport of road vehicles on Ro-Ro ships
- 8.1.7 IMO MSC/Circ 745 Guidelines for the preparation of the Cargo Securing Manual
- 8.1.8 IMO MSC/Circ 812 Amendments to Res 581(14) and Res A.714(17)
- 8.1.9 IMO Resolution A.581(14) Guidelines for the Securing Arrangements for the Transport of Road Vehicles
- 8.1.10 The ISM Code ISBN 92-801-5123-1

### **8.2 MCA Publications**

- 8.2.1 Fire Protection Arrangements – Instructions for the Guidance of Surveyors (ISBN-0-11-552000-7)
- 8.2.2 Code of Practice for Noise Levels in Ships (ISBN 0-11-550950-X)
- 8.2.3 Code of Practice – Safety of Loads on Vehicles (ISBN 0-11-550666-7)
- 8.2.4 The Merchant Shipping (Fire Protection: Large Ships) Regulations 1998 (SI 1998 No 1012) and the Merchant Shipping (Fire Protection: Small Ships) Regulations 1998 (SI 1998 No 1011) specify the special requirements for cargo space ventilation
- 8.2.5 Merchant Shipping (Hatches and Lifting Plant) Regulations S.I. 1639 No.1988. (Note that new regulations are being prepared 2003)
- 8.2.6 The Merchant Shipping (Safe Movement on Board Ship) Regulations 1988 (S.I. 1988 No.1641)
- 8.2.7 Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 (S.I. 1997 No.2962)
- 8.2.8 Merchant Shipping and Fishing Vessels (Personal Protective Equipment) Regulations 1999 (S.I. 1999 No.2205)
- 8.2.9 Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (S.I. 1997 No.2367)

- 8.2.10 Merchant Shipping (Accident, Reporting and Investigation) Regulations 1999 (S.I. 1999 No 2567)
- 8.2.11 Merchant Shipping (Master's Discretion) Regulations 1997 (SI No. 2886)
- Note 1** *MCA published Merchant Shipping Notices, Marine Guidance Notes and Marine Information Notes are listed in MIN 110(M+F). This is superseded annually and the current version should be referred to. They are available on the MCA web-site at [www.mcga.gov.uk/publications/mnotice/index.htm](http://www.mcga.gov.uk/publications/mnotice/index.htm)*
- Note 2** *Principal Acts, Regulations, Orders and Codes of Practices on Merchant Shipping are listed in MIN 109 (M+F) which is superseded annually and should be referred to. Legislation is available on the MCA web-site at [www.mcga.gov.uk/publications/si/index.htm](http://www.mcga.gov.uk/publications/si/index.htm) or on the HMSO web-site [www.legislation.hmso.gov.uk](http://www.legislation.hmso.gov.uk)*
- Note 3** *Only the main regulations are specifically referred to.*
- 8.3 HSE Documents**
- 8.3.1 Safety in Docks – Docks Regulations 1988 and Guidance – Approved Code of Practice (COP 25) (ISBN 0-11-885456-9) (Note – currently being updated by HSE and industry)
- 8.3.2 Safety in Docks – Approved Code of Practice and Guidance (Docks Regulations Northern Ireland) (44/HAS/96)
- 8.3.3 The Docks Regulations 1988 (S.I. 1988 No 1655) which apply in Great Britain;
- 8.3.4 The Docks Regulations (Northern Ireland) 1989 (S.I. 1989 No 320), which apply in Northern Ireland.
- 8.3.5 The Provision and Use of Work Equipment Regulations 1998 (S.I. 1988 No.2306)
- 8.3.6 The Personal Protective Equipment at Work Regulations 1992 (S.I. 1992 No.2966)
- 8.3.7 The Management Regulations 1999 (S.I. 1999 No. 3242)
- 8.3.8 The Workplace Regulations 1992 (S.I. 3004)
- 8.3.9 The Lifting Operations and Lifting Equipment Regulations 1998 (S.I. 1998 No. 2307)
- 8.3.10 The Manual Handling Operation Regulations 1992 (S.I. 1992 No.2793)
- 8.3.11 The Safety Signs and Signals Regulations 1996 (S.I. 1996 No. 341)
- Note 4** *Regulations are available on the HMSO web-site [www.legislation.hmso.gov.uk](http://www.legislation.hmso.gov.uk)*
- 8.4 DEFRA Publications**
- 8.4.1 Ministry of Agriculture Fisheries and Food Publication  
“Guidelines for the Welfare of Animals (Transport) Order 1997 Chapter II”

## ANNEX 1

### VEHICLE LASHING ARRANGEMENTS

#### 1 General

- 1.1 The largest total acceleration can be expected high up forward and aft in the ship, while the smallest can be expected at the ship's centre line, amidships below the waterline. Vehicles which are the most difficult to secure should be stowed where the lowest accelerations can be expected. Transverse forces, primarily due to rolling, are most likely to cause cargo shift.
- 1.2 In the development of a securing system it is suggested that, unless more specific information is available, the vehicles stowed on the decks of ro/ro ships should be assumed to be subjected to forces arising from the product of GVM, the acceleration due to gravity ("g") and a factor as follows:
- (a) Force parallel to and across the deck = (GVM) ("g")  
(1.0) = 10 GVM kN
  - (b) Force normal to the deck = (GVM) ("g")  
(1.4) = 14 GVM kN
  - (c) Force in the longitudinal direction = (GVM)  
("g") (0.3) = 3 GVM kN

Where GVM is gross vehicle mass and "g" is approximated to 10.

The above forces are intended to represent the total force to be applied in each direction (ie the aggregate of the static and dynamic forces).

#### 2 Securing Points on Freight Vehicles

- 2.1 Securing points on freight vehicles should be designed for securing the freight vehicles to the ship. The securing point and aperture should permit varying directions of the lashing to the ship's deck. If more than one aperture is provided at a securing point, each aperture should have the strength for the securing point specified in the table in 2.3.
- 2.2 The same number of, not less than two nor more than six, securing points should be provided on each side of the freight vehicle in accordance with the provisions of 2.3.
- 2.3 Subject to the provisions of notes 1, 2 and 3 hereunder, the minimum number and minimum strength of securing points should be in accordance with the following table:

Gross Vehicle mass (GVM) tonnes	Minimum Number of securing points on each side of the freight vehicle	Minimum Strength without permanent deformation of each securing point as fitted (kN)
3.5 t ≤ GVM ≤ 20 t	2	$GVM \times 1.2g$
20 t < GVM ≤ 30 t	3	n*
30 t < GVM ** ≤ 40 t	4	<b>Note:</b> the value of g may be taken as 10

\* where n is the total number of securing points on each side of the freight vehicle.  
\*\* for vehicles with a GVM greater than 40 tonnes special conditions will apply.

- Note 1:** *For road trains, the table applies to each component, ie to the motor vehicle and each trailer, respectively.*
- Note 2:** *Semi-trailer towing vehicles which remain attached to their trailers when shipped are excluded from the table above. They should be provided with two securing points at the front of the vehicle, the strength of which should be sufficient to prevent lateral movement of the front of the vehicle. A towing coupling at the front may replace the two securing points.*
- Note 3:** *If the towing coupling is used for securing road vehicles other than semi-trailer towing vehicles, this should not replace or be substituted for the above-mentioned minimum number and strength of securing points on each side of the vehicle.*
- 2.4 Each securing point on the freight vehicle chassis should be painted in a contrasting colour.
- 2.5 Securing points on the freight vehicle should be so located as to ensure effective restraint of the vehicle by the lashings.
- 2.6 Securing points should be capable of transferring the forces from the lashings to the chassis of the freight vehicle and should not be fitted to bumpers or axles unless these are specially constructed and the forces are transmitted directly to the chassis.
- 2.7 Securing points should be positioned in such a way that the angle between the lashing and the horizontal and transverse planes lies preferably between 30° and 60°. Lashing points should preferably be set two by two on the vehicle symmetrical to its longitudinal axis.
- 2.8 Securing points should be so located that lashings can be readily and safely attached, particularly where side-guards are fitted to the freight vehicle.
- 2.9 The internal free passage of each securing point's aperture should be not less than 80 mm but the aperture need not be circular in shape.
- 2.10 Equivalent or superior securing arrangements may be considered for which the provisions of table 2.3 are unsuitable.
- 2.11 Where there is doubt that a freight vehicle complies with the provisions of paragraph 2.3 of this Annex, the master may exercise discretion whether to load the freight vehicle on board, taking into account the apparent condition of the freight vehicle, the weather and sea conditions expected on the intended voyage and all other circumstances.

### **3 Illustrative Lashing Charts for Ships on Short Voyages**

- 3.1 Paragraph 7.3.3 of this Code suggests a simplified method, applicable to ships carrying a limited number of cargo unit types on short sea voyages, for determining the lashings required as an alternative to the comprehensive advice given in the ship's Cargo Securing Manual. The illustrative lashing charts below show the minimum number of lashings of a given strength for a range of roll periods and a range of vertical heights above the waterline to resist the forces encountered in a defined case on typical tandem or triaxle semi-trailers and are based on typical trailer weights. The limit load of 9.5 tonnes used in the graphs gives a factor of safety of 2 in relation to the breaking load of typical grade 80 13mm alloy chains capable of withstanding a force of not less than 120kN without permanent deformation. This gives an effective maximum securing load of 95kN.

## 3.2 Use of the Charts

3.2.1 The accelerations to which vehicles are subjected and, hence, the lashing forces developed, become more severe as the natural period of roll decreases.

A good estimate for the roll period of a conventional ship is given by the formula:

$$T = \frac{0.7B}{\sqrt{GM}} \text{ where}$$

T = roll period in seconds  
B = moulded breadth in metres  
GM = metacentric height in metres

The metacentric height should be known for any condition of loading and the value to T may therefore be easily obtained.

3.2.2 The lashing charts are based upon a defined case of a ship undergoing a cyclic roll angle of 20 degrees in combination with a pitch of 5 degrees. It is assumed that a semi-trailer is positioned at the forward end and outboard lane of a typical ro/ro ship able to load standard trailers in six lanes. The charts show the number of lashings which should be required in the defined circumstances to ensure that a load on the lashings of 9.5 tonnes is not exceeded. The disposition of the lashings relating to the charts is shown in figure 1.

3.2.3 The charts are drawn up for typical ranges of GVM of semi-trailers up to the maximum weight currently permitted. For a 44 tonne gross train weight including tractor unit, it has been assumed that the corresponding trailer GVM is 36T.

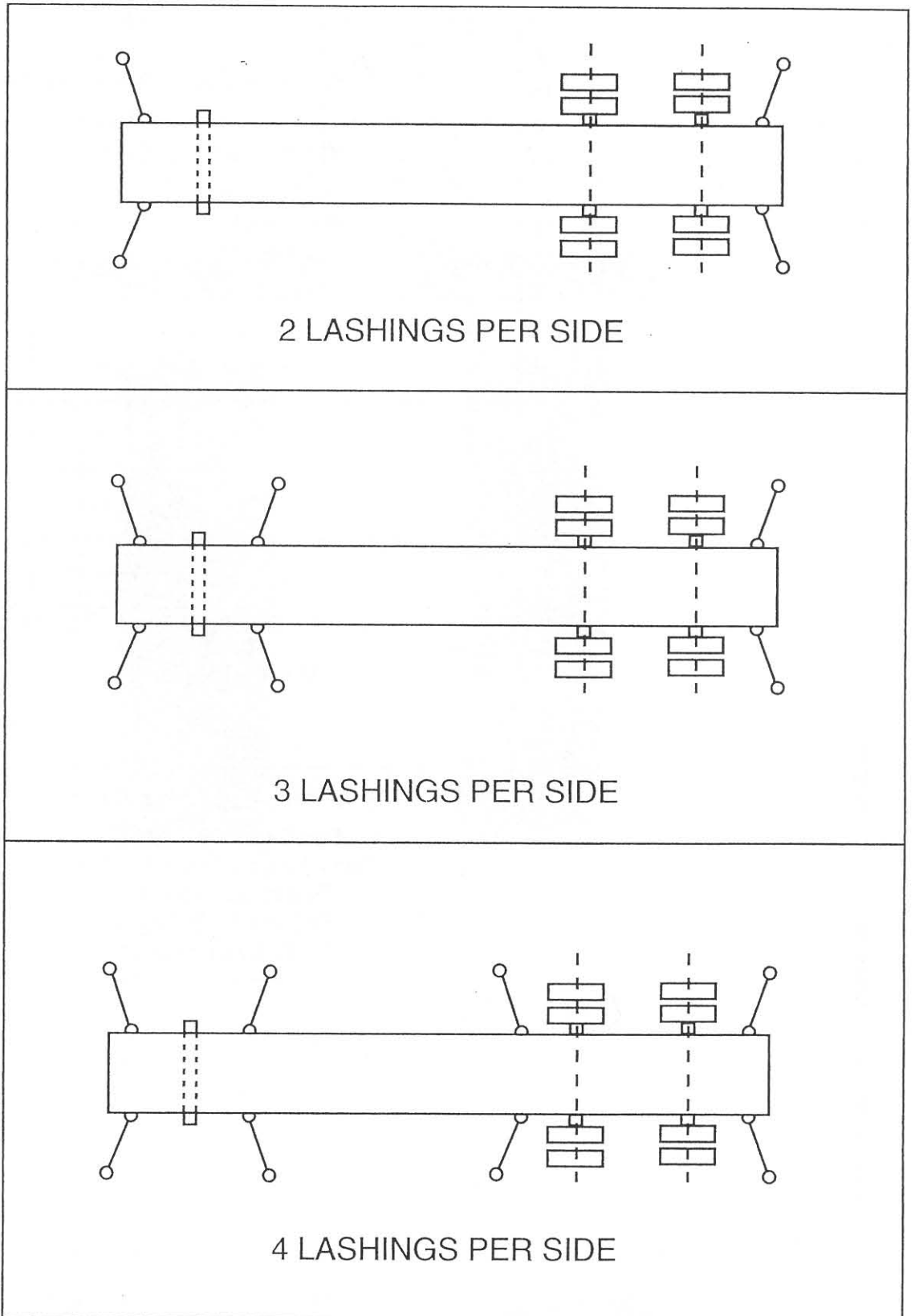
In order to use the charts for a particular case:

- .1 Work out the roll period T, using the formula in paragraph 3.2.1 above;
- .2 Select the chart for the appropriate vehicle GVM;
- .3 Pick off T, the roll period;
- .4 Pick off the height of the deck in question above the waterline;
- .5 Find the intersection of roll period and height above the waterline (Steps .3 and .4);
- .6 The minimum number of lashings recommended for the defined case is indicated by the limit line to the left of the point of intersection.

**Notes:** *Due to the difficulty in predicting dynamic accelerations and the complexity of dynamic calculations the lashing forces apply to rigid and unsprung cargo. Additional lashings may be required to resist dynamic forces.*

ANNEX 2

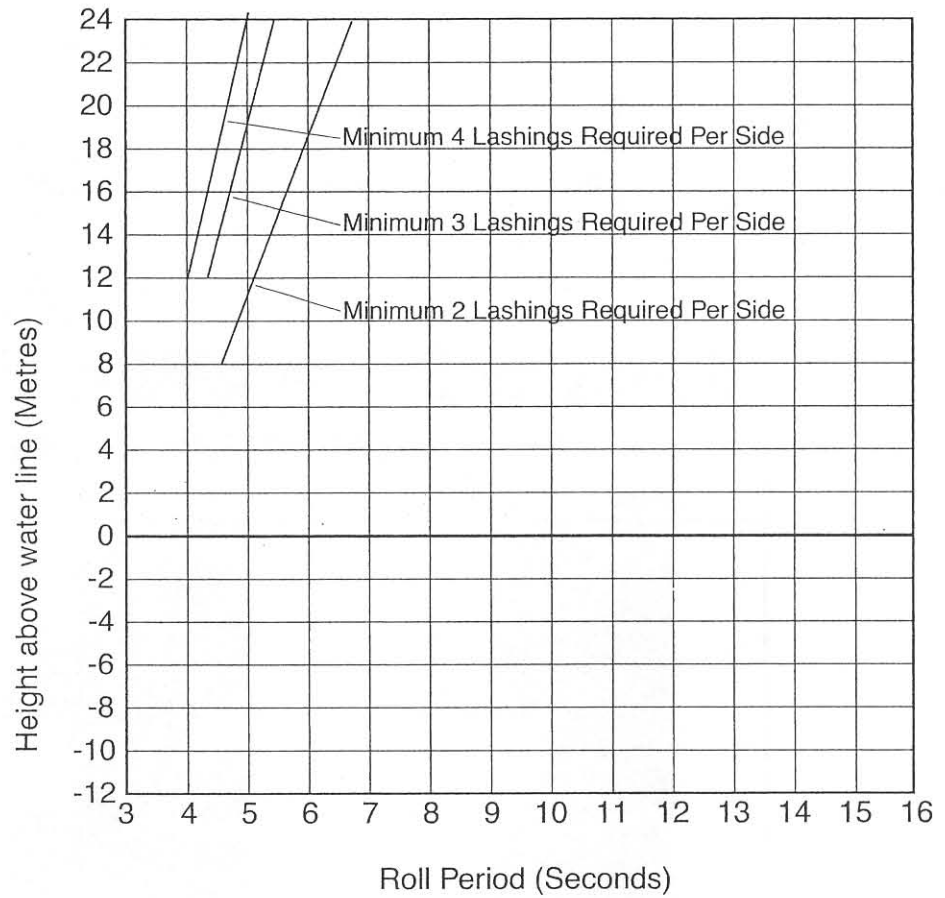
ILLUSTRATIVE LASHINGS CHARTS



Arrangements of lashings used in calculations  
Figure 1

S.R.T

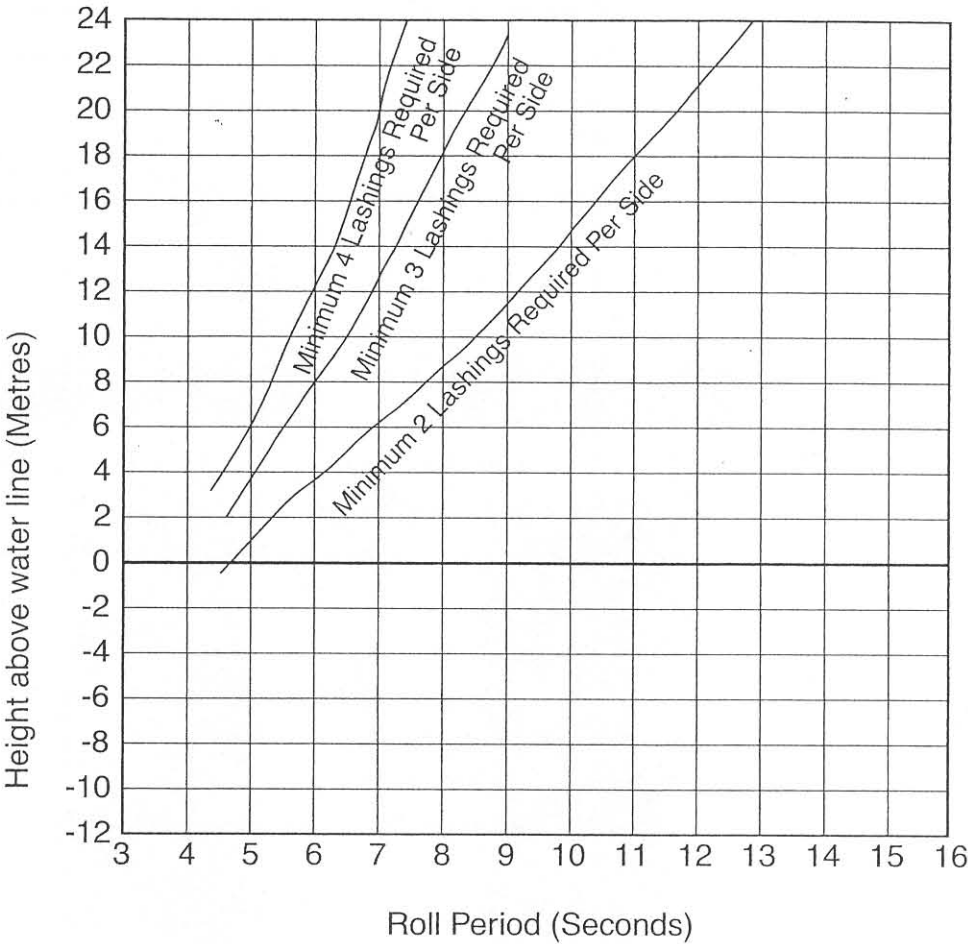
# 10 Tonne Trailer



9.5 Tonne Load Limit Lines  
 For: 6 Lane RO/RO Ship;  
 Semi-Trailer Stowed at Forward  
 End of Outboard Lane;  
 Roll Angle 20 Degrees;  
 Pitch Angle 5 Degrees.

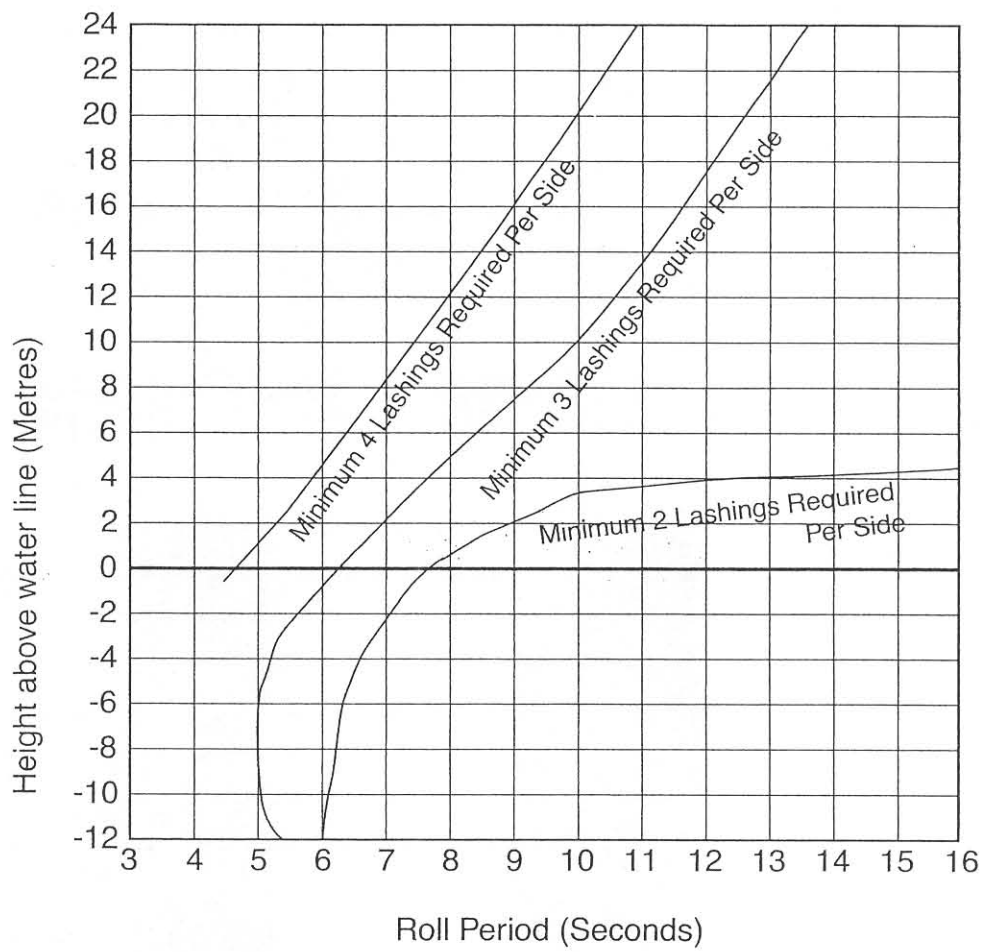


# 20 Tonne Trailer



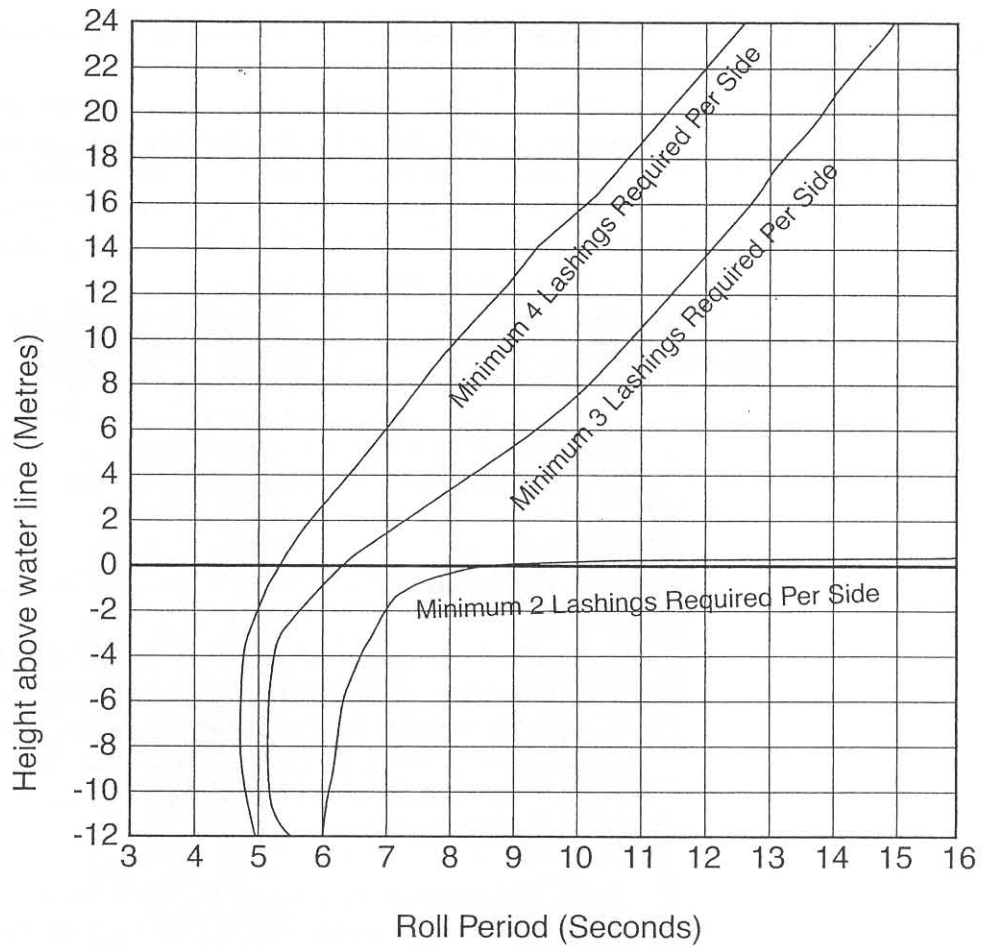
**9.5 Tonne Load Limit Lines**  
 For: 6 Lane RO/RO Ship;  
 Semi-Trailer Stowed at Forward  
 End of Outboard Lane;  
 Roll Angle 20 Degrees;  
 Pitch Angle 5 Degrees.

# 30 Tonne Trailer



**9.5 Tonne Load Limit Lines**  
 For: 6 Lane RO/RO Ship;  
 Semi-Trailer Stowed at Forward  
 End of Outboard Lane;  
 Roll Angle 20 Degrees;  
 Pitch Angle 5 Degrees.

## 32 Tonne Trailer



**9.5 Tonne Load Limit Lines**  
 For: 6 Lane RO/RO Ship;  
 Semi-Trailer Stowed at Forward  
 End of Outboard Lane;  
 Roll Angle 20 Degrees;  
 Pitch Angle 5 Degrees.

## ANNEX 3

### RELEVANT LEGISLATION

#### **1 Merchant Shipping Act 1995 (referred to in the Introduction – 2.1.1)**

1.1 Under Section 100 of the 1995 Act the owner is liable for the unsafe operation of a ship. This Section applies to a ship in a port in the United Kingdom and any ship which is registered under the law of any country outside the United Kingdom and which is within the seaward limits of the territorial sea of the United Kingdom while proceeding to and from a port in the United Kingdom, unless the ship would not be so proceeding but for weather conditions or any other unavoidable circumstances.

1.2 Section 58 of the 1995 Act gives the conditions under which a person is guilty of an offence for conduct endangering ships, structures or individuals. This Section applies to the master of, or any seaman employed in, a ship registered under the law of any country outside the United Kingdom, and which is in a port of the United Kingdom, or within the seaward limits of the territorial sea of the United Kingdom while proceeding to and from such a port.

#### **2 The Docks Regulations 1988 (referred to in the Introduction – 1.1 and 2.2)**

2.1 Legislation dealing with the safety of loading and unloading operations on ro-ro ships comprises primarily of the Health and Safety at Work Act 1974, which applies to all work activities. With regard to this Code, secondary legislation which has a basis with the 1974 Act are Health and Safety (The Docks Regulations) 1988 (S.I. 1988 No. 1655) and in the case of Northern Ireland the Health and Safety (The Docks Regulations) (Northern Ireland) 1989 (S.I. 1989 No. 320).

2.2 The Docks Regulations are enforced in Great Britain by HSE, while Northern Ireland Regulations (which impose the same requirements) are enforced by the Health and Safety Executive for Northern Ireland, which is an executive agency of the Department of Enterprise, Trade and Investment. The Dock Regulations 1998 Guidance” and for Northern Ireland employers Health and Safety Agency publication “Safety in Docks Approved Code of Practice and Guidance (Docks Regulations (Northern Ireland) 1989 (44/HAS/96)”.

#### **3 Personal Protective Equipment (PPE) (referred to in Section 2 – 2.12)**

3.1 With regard to PPE see regulation 7 of the Merchant Shipping and Fishing Vessels (Personal Protective Equipment) Regulations 1999 (S.I. 1999 No. 2205), regulation 7(5) of the Merchant Shipping (Health and Safety at Work) Regulations 1997, regulation 19(3) of the Docks Regulations and regulations 4, 5, 6 and 9 of the Health and Safety (Personal Protective Equipment) Regulations 1992 (S.I. 1992 No. 2966).

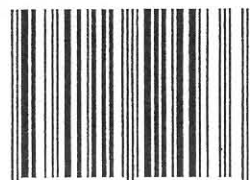
MCA Headquarters  
Maritime and Coastguard Agency  
Spring Place  
105 Commercial Road  
Southampton  
Hampshire  
SO15 1EG

£19



[www.tso.co.uk](http://www.tso.co.uk)

ISBN 0-11-552493-2



9 780115 524936