



Roll-on/Roll-off Ships - Guidance for the Stowage and Securing of Vehicles

Notice to all Ship Owners, Ship Operators, Terminal Operators, Port Authorities, Classification Societies, Masters, Officers and Crews of Merchant Ships and all Other Parties concerned

Summary

This MGN annexes a revision of the Code of Practice 'Roll-on/Roll-off Ships – Stowage and Securing of Vehicles' which is now published in the form of Guidance. It takes into consideration recommendations by the Marine Accident Investigation Branch concerning the potential hazards when carrying Specialised Vehicles. It also updates references to relevant legislation and guidance.

Introduction

The original publication "Code of Practice for Roll-on/Roll-off Ships – Stowage and Securing of Vehicles" was first published in 1991 with revised editions in 1996 and 2003. This is the fourth edition re-titled as a Guidance document. The purpose of the Guidance is to provide detail and information on safe procedures to be followed during Roll-on/Roll-off operations to reduce the risks to persons and ships. These standards have been developed by the International Maritime Organisation (IMO).

The revised Guidance

The Guidance annexed to this MGN sets out the revision to the Code of Practice 'Roll-on/Roll-off Ships – Stowage and Securing of Vehicles'.

The previous Code has been revised as Guidance and incorporates a Recommendation by the Marine Accident Investigation Branch (MAIB) following an incident in which a vessel developed a



starboard list causing cargo shift and the grounding of the vessel. The aim is to ensure that operators have access to up to date IMO resolutions to ensure that vehicles are stowed and secured in accordance with international standards.

As well as incorporating the MAIB Recommendation, the Guidance has been updated to include references to the latest versions of Regulations and Guidance.

This Guidance replaces the version of the Code published in 2003.

The key points from the MAIB recommendation are:

- Ships should ensure that cargo is stowed and secured in accordance with the approved Cargo Securing Manual (CSM) before the ship leaves a berth.
- 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.
- Lashings should not be released for unloading before the ship is secured at the berth, without the Master's express permission.
- 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 minimise the forces acting on the cargo keeping in mind that large metacentric height could cause the ship to roll violently in adverse sea conditions.
- Sudden change of course and/or speed may create adverse forces acting on the ship and the cargo. This is especially relevant for vessels fitted with high lift rudders, where moderate to high rudder angles may result in high forces being generated.
- The crew should be familiar with the requirements contained within the approved CSM.
- Ships' officers and managers should carry out checks on lashings during audits and inspections to ensure that bad practices are not taking place, especially where operations are rapid and very repetitive.
- The condition of lashing systems should be monitored closely.
- There should be an effective maintenance programme for all the portable and fixed securing devices. Web lashings are to be marked and limited to a maximum working life.

More Information

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Maritime &
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Roll-on/Roll-off Ships Guidance for the Stowage and Securing of Vehicles

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1. Introduction

- 1.1 The Health and Safety Executive is responsible for enforcing shore-based health and safety regulations and legislation in docks and has been consulted in the preparation of this Guidance.
- 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 Guidance, which includes the standards developed by IMO, provides information on safe procedures to be followed during roll-on/roll-off (ro-ro) 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 Guidance would be regarded as proper conduct for persons operating ships and this would be taken into account in applying the relevant regulations.

2.2 Health and Safety Regulations.

- 2.2.1 The Safety in Docks, Approved Code of Practice (ACOP) and Guidance, L148 has been developed by the Health and Safety Executive and is aimed at those who have a duty to comply with provisions of the Health and Safety at Work Act 1974 (HSW). The ACOP deals primarily with the duties of shoreside employers and the safety of their employees. It provides practical guidance on sections 2, 3, 4, 7 and 8 of the HSW Act in respect of some of the work activities carried out in docks. These set out the basic requirements to ensure, so far as reasonably practicable, the health, safety and welfare of all involved. In docks employers, employees and others need to comply with these and a number of other sets of Regulations made under the HSW Act which prescribe more specific ways in which the general duties should be complied with. Many of those duties apply to work carried out in docks, as they would apply in other places of work. Examples of regulations which also apply to work carried out in docks include:

- Management of Health and Safety at Work Regulations 1999 (the Management Regulations) ;
- Workplace (Health, Safety and Welfare) Regulations 1992 (the Workplace Regulations);
- Work at Height Regulations 2005 (WAHR);
- Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) and
- Personal Protective Equipment at Work Regulations 1992.

This Guidance gives useful advice to all those involved, whether ship-based or shore-based. For shore-based employers, this Guidance supplements the HSE ACOP.

2.3 SOLAS 1974 (As Amended)

- 2.3.1 Chapter II - 1 Regulation 23 – 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 (also see MGN 341 Part 3 regarding access to vehicle decks).

3. Parties Affected by this Guidance

- 3.1 This Guidance 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 the knowledge or experience necessary for the performance of their duties.

“Cargo Transport Unit (CTU)” means a freight container, swap body, vehicle, railway wagon, portable tank or any other similar unit in particular when used in intermodal transport.

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

“Road vehicle” means a vehicle which is a goods vehicle, flat bed trailer, road train, articulated road train, combination of 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.

“Roll-on Roll-off (ro-ro) Ship” means a ship which has one or more decks either closed or open, not normally subdivided and generally running the entire length of the ship, in which goods (packaged or in bulk in or on road vehicles including road tank vehicles, trailers, containers, pallets, demountable or portable tanks or in similar cargo transport units or other receptacles) can be loaded or unloaded normally in a horizontal direction.

“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 When Stowing & Securing Vehicles

The sources of danger which can affect the safety of ro-ro ships and of persons on board include:

- 1.1 the unsatisfactory condition or design of vehicles presented for shipment, e.g. 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 unsatisfactory stowage of the cargo with respect to size, type and weight of the cargo within the vessel;
- 1.4 failure to accurately declare the weight of the cargo;
- 1.5 free surface effect in tank vehicles and tank containers which are slack;
- 1.6 poorly maintained ramps, lifts, bow and stern doors, and mezzanine and portable decks;
- 1.7 poorly maintained, inadequately illuminated or badly planned decks;
- 1.8 wet decks;
- 1.9 inadequate supervision of vehicle movements on vehicle decks and ramps;
- 1.10 the reversing of vehicles on vehicle decks and ramps;
- 1.11 failure to apply brakes correctly;
- 1.12 failure to secure vehicles;
- 1.13 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;
- 1.14 free play in the suspension of vehicles;
- 1.15 failure to comply with the correct declaration, placarding and labelling and stowage and segregation requirements for road vehicles carrying dangerous goods;
- 1.16 inadequate securing arrangements for specialised vehicles, e.g. track laying vehicles, high-sided freight vehicles, earth moving plant, low loaders, freight vehicles carrying livestock, coaches, large motorhomes and vehicles with a high centre of gravity.

- 1.17 inadequate securing arrangements leading to ro-ro cargo breaking loose in the vicinity of bow, stern and side doors and side shell plating;
- 1.18 failure to stow away and secure equipment such as trestles, unused lashings and portable ladders;
- 1.19 failure to verify the vessel meets the minimum stability criteria for the intended voyage.

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 road 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). In all cases, the master has overall responsibility for the cargo operation and can refuse to accept any cargo deemed to be unsuitable for the vessel. See section 4 for further details.
- 2.3 All cargo is to be documented and loaded as per the requirements of Part II of the Merchant Shipping (Carriage of Cargoes) Regulations 1999 (SI 1999/336).
- 2.4 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.
- 2.5 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.
- 2.6 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 23. Prominent notices should be displayed in vehicle spaces and passenger accommodation to bring this restriction to the attention of passengers and drivers. 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 (also see MGN 341 Part 3 for circumstances where the master may permit access).
- 2.7 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.

- 2.8 Hand signals used by vehicle deck personnel during loading and unloading operations should be unambiguous and in accordance with the Code of Safe Working Practices for Merchant Seafarers. 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.
- 2.9 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.
- 2.10 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.
- 2.11 Vehicles should not be parked in such a way as to obstruct permanent walkways, shell doors, emergency escapes or lifesaving and firefighting appliances.
- 2.12 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.
- 2.13 Personnel working on vehicle decks shall wear suitable Personal Protective Equipment (PPE), including high visibility garments as determined by risk assessment. Further information on the provision and use of PPE can be found in the Code of Safe Working Practices for Merchant Seafarers, Section 8.
- 2.14 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.
- 2.15 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.
- 2.16 Where personnel are working in shadow areas, hand lamps and torches should be available for use.

- 2.17 Personnel engaged in the securing of vehicles should take care to avoid injury from protrusions on the underside of the vehicles.
- 2.18 Personnel should release lashings with care to reduce the risk of injury when tension is released.
- 2.19 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.
- 2.20 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. Ventilation fans should be in operation during loading and discharge operations and in any case when there is doubt about the freshness of the atmosphere. Particular care should be taken when entering enclosed vehicle deck spaces and where appropriate dangerous space entry procedures should be followed.
- 2.21 Noise levels on vehicle decks should not exceed 85 dB(A). Persons working on the vehicle deck should not be exposed to noise levels greater than those allowed under the Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007 (SI 2007/3075). A risk assessment should be carried out to establish the level of noise workers are exposed to. Additional guidance can be found in the Code of Practice for Controlling Risks Due to Noise on Ships. An employer shall make personal hearing protectors available to any worker who is or is likely to be exposed to noise above a lower exposure action value as outlined in SI 2007/3075.
- 2.22 Smoking shall not be permitted on any vehicle deck. Conspicuous "No Smoking" or "No Smoking/No Naked Lights" signs should be displayed.
- 2.23 All vehicle decks, ships' ramps and lifting appliances should be adequately lit when persons have access to them (see paragraph 3.1.3).
- 2.24 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. When necessary, cargo operations should be suspended to allow ramps and decks to be cleared of snow, ice etc. and the application of de-icing agents.
- 2.25 All vehicle decks, ships' ramps and lifting appliances should be kept free of loose items such as unused lashings, stores and refuse.

- 2.26 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.
- 2.27 Retractable car-decks and lifting appliances should be securely locked when in the stowed position and confirmed as such by a suitably trained person. All alarms, interlocks and indicators are to be fully functional.
- 2.28 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 as required by Merchant Shipping (Lifting Operations and Lifting Equipment) Regulations 2006 (SI 2006/2184).
- 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 shadowed 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 e.g. 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, e.g. 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 and tested 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 (see Section 7).

- 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 decks of a ship intended for road vehicles should be provided with securing points. The arrangement of securing points should be left to the discretion of the shipowner provided that for each road vehicle or element of a combination of road vehicles, there is the following minimum arrangement of securing points:

- .1 The distance between securing points in the longitudinal direction should in general not exceed 2.5 m. However, there may be a need for the securing points in the forward and after parts of the ship to be more closely spaced than they are amidships.

- .2 The athwartships spacing of securing points should not be less than 2.8m and not more than 3m. However, there may be a need for the securing points in the forward and after parts of the ship to be more closely spaced than they are amidships.
- .3 The minimum strength without permanent deformation of each securing point should be 120 kN. If the securing point is designed to accommodate more than one lashing (y lashings), the corresponding strength should be not less than $y \times 120$ kN
- 3.4.3 The maximum securing load (MSL) of each securing point for road 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 In ro-ro ships which only occasionally carry road vehicles, the spacing and strength of securing points should be such that the special considerations which may be necessary to stow and secure road vehicles safely are taken into account. 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 vehicles of more than 3.5 tonnes such as freight vehicles are provided with an adequate number of accessible securing points of sufficient strength which are so located as to ensure effective restraint of the 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 vehicle, the jacking up positions on the chassis are strengthened and clearly marked;
- .6 refrigerated vehicles of more than 3.5 tonnes, with flush insulated undersides, have jacking points especially fitted and marked to avoid damage to insulation;
- .7 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 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 road 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 The Stationery Office(TSO) or downloadable from www.gov.uk, provides guidance as to how loads should be secured on vehicles (see also IMO/ILO/UNECE Code of Practice For Packing of Cargo Transport Units);
- .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 e.g. 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 341) 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 (block stowed) 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, emergency escapes, 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) and the deck plating has adequate strength for the point loadings or there are suitable arrangements to spread the load.
- 5.1.9 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.

5.1.10 Depending on the area of operation, the predominant weather conditions and the characteristics of the ship, road 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, for example, by securing the vehicle to the deck as tightly as the lashing tensioning device will permit, by jacking up the vehicle chassis prior to securing or by releasing the air pressure on compressed air suspension systems.

5.1.11 Taking into account the conditions referred to in 5.1.10 and the fact that compressed air suspension systems may lose air, the air pressure should be released on every vehicle fitted with such a system if the voyage is of more than 24 hours duration. If practicable, the air pressure should be released also on voyages of a shorter duration. If the air pressure is not released, the vehicle should be jacked up to prevent any slackening of the lashings resulting from any air leakage from the system during the voyage.

5.1.12 Wheels should be chocked to provide additional security in adverse conditions.

5.1.13 Vehicles with diesel engines should not be left in gear during the voyage.

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 Road 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 road 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, kingpins, 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 and checked by a competent person.
- 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 and adjusted where necessary to ensure that vehicles remain safely secured.
- 5.2.12 Without the master's express permission, lashings should not be released for unloading before the ship is secured at the berth.
- 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 injury and 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 (Also see Annex 1)

- 5.3.1 The maximum securing load (MSL) of lashings should not be less than 100 kN and they should be made of material having suitable elongation characteristics. However, for vehicles not exceeding 15 tonnes gross vehicle mass (GVM), lashings with lower MSL values may be used. The required number and MSL of lashings may be calculated according to annex 13 to the Code of Safe Practice for Cargo Stowage and Securing (CSS Code), taking into consideration the criteria mentioned in paragraph 1.5.1 of the Code.
- 5.3.2 Chains/Straps and associated elements (e.g. hooks, shackles, elephants' feet and tensioning devices) should have an MSL of 100 kN.

- 5.3.3 Where, exceptionally, wire ropes or other materials are used their breaking load should be at least 200 kN.
- 5.3.4 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.
- 5.3.5 Lashings should be so designed and attached that, provided that there is safe access, it is possible to tighten them if they become slack.
- 5.3.6 Lashings should only be attached to the securing points on the vehicle provided for that purpose. Only one lashing should be attached to any one aperture loop or lashing ring at each securing point.
- 5.3.7 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.
- 5.3.8 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.
- 5.3.9 Crossed lashings should, where practicable, not be used for securing road 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.
- 5.3.10 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.
- 5.3.11 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. 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 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 The Merchant Shipping (Provisions and Use of Work Equipment) Regulations 2006 (SI 2183/2006) sets out some requirements for the maintenance and inspection of work equipment.

5.5.2 An employer shall ensure that work equipment is maintained in an efficient state, in efficient working order and in good repair. Where any machinery has a maintenance log, that the log is kept up to date.

5.5.3 An employer shall ensure that work equipment exposed to conditions causing deterioration liable to result in dangerous situations is inspected by a competent person at suitable intervals. In addition, inspections should be carried out where exceptional circumstances have occurred which may jeopardise the safety of work equipment (such as modification work, accidents, bad weather and prolonged periods of inactivity). This maintenance and inspection work should ensure that any deterioration is detected and remedied in good time.

5.5.4 It is recommended that all fixed and portable devices should be tested at appropriate intervals. These tests should be carried out as part of a shipboard programme of inspections and tests for cargo securing devices. These tests may 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. For fixed devices, 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.

5.5.5 The tests should only be carried out using the Maximum Securing Load of the device in order to avoid damage.

- 5.5.6 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.
- 5.5.7 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 Maritime and Coastguard Agency (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.
- 5.5.8 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 implement the IMO publication International Maritime Dangerous Goods (IMDG) Code. In addition, elements of the Merchant Shipping (Carriage of Cargoes) Regulations 1999 will also apply.
- 6.1.2 Prior to loading, road vehicles carrying dangerous goods should be examined externally for damage and signs of leakage or the shifting of granular contents. Any vehicle found to be damaged, leaking or with shifting contents should not be accepted for shipment. If a 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 Seafarers Chapter 21 Hazardous Substances and mixtures, Chapter 27 Roll-on/Roll-off Ferries 27.11 Dangerous Goods and Chapter 28 Dry Cargo 28.02 Dangerous Goods and Substances).
- 6.1.3 Road vehicles carrying dangerous goods and adjacent 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 Response Procedures for Ships Carrying Dangerous Goods (EmS) Guide and the 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 CTUs 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 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.
- 6.2.3 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 i.e. 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
- 6.2.4 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.
- 6.2.5 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. Track laying vehicles should be stowed on dunnage, soft boards or rubber mats before being secured. The deck area should be cleaned prior to applying the matting to ensure the rubber adhesion is not compromised in any way.
- 6.2.6 Low-loader trailers with bare steel landing parts should be landed on rubber mats or dunnage.
- 6.2.7 Where the stowage of cargo in a road 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 i.e. on the centre line, towards amidships and on a deck near the waterline.

- 6.2.8 Cargo information provided by shippers must include dimensions, weight, location(s) of securing points and centre of gravity for all cargo to be loaded.
- 6.2.9 Shippers, forwarding agents and any party presenting 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.
- 6.2.10 Vehicles should be provided with adequate and clearly marked securing points or other equivalent means of sufficient strength to which lashings may be applied.
- 6.2.11 Road 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 Department for Environment, Food and Rural Affairs (DEFRA) and Animal and Plant Health Agency (APHA) publications. Further advice may be obtained from APHA's Welfare in Transport team on 03000 200 301, email WIT@apha.gov.uk, or on www.gov.uk.

6.3 Cargo Distribution

- 6.3.1 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.
- 6.3.2 Cargo distribution should be such that the structural strength of the ship is not adversely affected throughout the voyage and cargo units can be inspected for verification of securing arrangements.

6.4 Reporting of hazardous incidents

- 6.4.1 The Marine Accident Investigation Branch (MAIB) investigates marine accidents involving UK vessels worldwide and all vessels in UK territorial waters. Accidents, including serious injuries, should be reported to the MAIB by the quickest means possible. This is so that the MAIB can decide whether to investigate the accident without delay and prevents evidence of all types being lost or decaying. The MAIB is responsible for carrying out investigations to determine the causes of accidents at sea, publishing reports that include recommendations on improving safety at sea and the actions they've taken, increasing awareness of how marine accidents happen and improving national and international co-operation in marine accident investigations.
- 6.4.2 The requirements for reporting incidents to the MAIB are set out in the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 and the Merchant Shipping (Accident and Investigation) (Amendment) Regulations 2013.

- 6.4.3 To report an accident to the MAIB you should phone the MAIB's dedicated accident reporting line on +44 (0)23 8023 2527 which is monitored 24 hours a day. After this initial notification you can expect to be asked to complete the accident report form (ARF).
- 6.4.4 Further information and the ARF can be found at: <https://www.gov.uk/government/publications/report-a-marine-accident>
- 6.4.5 Information on the Maritime Transport Confidential, Human, Incident Reporting System (CHIRP) can be found on the CHIRP website at www.chirpmaritime.org
- 6.4.6 Information on the Nautical Institute's Mariners' Alerting and Reporting Scheme (MARS) can be found at: www.nautinst.org/resource-library/mars.html

Section 7 – The Cargo Securing Manual

7.1 Preamble

- 7.1.1 Vessels should be provided with an approved ship specific Cargo Securing Manual (CSM) which is a mandatory requirement of the Merchant Shipping (Carriage of Cargoes) Regulations 1999, Chapters VI and VII of SOLAS and the Code of Safe Practice for Cargo Stowage and Securing. The manual shall be approved by the vessel's Flag State or Recognised Organisation on behalf of the Flag State in accordance with MSC.1/Circ.1353/Rev.1 or any future amendments thereto.
- 7.1.2 The purpose of the CSM is to set out the procedures and standards for securing cargo which will take into account the type of cargo which is being carried, the differing characteristics of the vessel and the conditions which may be encountered during the voyage it will be making.
- 7.1.3 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.
- 7.1.4 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 mandatory approved Cargo Securing Manual 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.
- 7.1.5 The information contained in the Cargo Securing Manual may be based upon company experience and past practice, i.e. 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. SWL may be substituted for MSL for securing purposes, provided this is equal to or exceeds the strength defined by the MSL (see MSC Circ.1026 Amendment to the Code of Safe Practice for Cargo Stowage and Securing);
- .5 Procedures for the inspection and maintenance of cargo securing gear should be sufficient to ensure that the gear is 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).

7.3 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 utilised from IMO Assembly resolutions A.533(13) and A.581(14) (as amended) as appropriate.
- .2 In designing securing arrangements for cargo units on ro-ro 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 73/74 as amended
- 8.1.3 The joint IMO/ILO/UNECE publication Code of Practice for Packing of Cargo Transport Units (CTU Code)
- 8.1.4 International Maritime Dangerous Goods (IMDG) Code including the Emergency Procedures (Gems) and Medical First Aid Guide (MFAG)
- 8.1.5 IMO Revised Guidelines for the Preparation of the Cargo Securing Manual MSC.1/Circ.1353/Rev.1 (although Cargo Securing Manuals drafted in accordance with MSC/Circ.385 or MSC/Circ 745 may still be accepted provided that they satisfy the requirements of these guidelines)
- 8.1.6 IMO Resolution A.581(14) Guidelines for Securing Arrangements for the Transport of Road Vehicles on Ro-Ro Ships (as amended)
- 8.1.7 IMO Res A.714(17) (as amended) Code of Safe Practice for Cargo Stowage and Securing
- 8.1.8 The International Safety Management Code (ISM Code)

8.2 MCA Publications

- 8.2.1 Code of Safe Working Practices for Merchant Seafarers
- 8.2.2 Fire Protection Arrangements – Instructions for the Guidance of Surveyors (MSIS 12)
- 8.2.3 Code of Practice for Controlling Risks Due to Noise on Ships (ISBN 9780115530753)
- 8.2.4 Code of Practice – Safety of Loads on Vehicles (ISBN 9780115525476)
- 8.2.5 The Merchant Shipping (Fire Protection: Large Ships) Regulations 1998 (SI 1998 No 1012) (as amended) and the Merchant Shipping (Fire Protection: Small Ships) Regulations 1998 (SI 1998 No 1011) (as amended) specifically the special requirements for cargo space ventilation.
- 8.2.6 Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations 2006 SI 2006/2184
- 8.2.7 The Merchant Shipping (Maritime Labour Convention) (Minimum Requirements for Seafarers etc.) Regulations 2014 (S.I. 2014/1613)

- 8.2.8 The Merchant Shipping (Maritime Labour Convention) (Health and Safety) (Amendment) Regulations 2014 (S.I. 2014/1616).
- 8.2.9 Merchant Shipping and Fishing Vessels (Personal Protective Equipment) Regulations 1999 (S.I. 1999 No.2205)
- 8.2.10 Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (S.I. 1997 No.2367)
- 8.2.11 Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 (SI 2012 No.1743)
- 8.2.12 Merchant Shipping (Safety of Navigation) Regulations 2002 (SI 2002/1473)

Note 1 MCA published documents are available to download from www.gov.uk or to purchase from www.tsoshop.co.uk. Primary and secondary legislation is available to download from www.legislation.gov.uk.

Note 2 This is not an exhaustive list of all regulations which may apply.

8.3 HSE Documents

- 8.3.1 Safety in Docks, Approved Code of Practice and Guidance, L148 (also approved for use in Northern Ireland by HSENI)
- 8.3.2 The Docks Regulations (Northern Ireland) 1989 (S.I. 1989 No 320)
- 8.3.3 The Provision and Use of Work Equipment Regulations 1998 (S.I. 1998 No.2306) (as amended)
- 8.3.4 The Personal Protective Equipment at Work Regulations 1992 (S.I. 1992 No.2966) (as amended)
- 8.3.5 The Management of Health and Safety at Work Regulations 1999 (S.I. 1999 No. 3242) (as amended)
- 8.3.6 The Workplace (Health, Safety and Welfare) Regulations 1992 (S.I. 1992 No.3004) (as amended)
- 8.3.7 The Lifting Operations and Lifting Equipment Regulations 1998 (S.I. 1998 No. 2307) (as amended)
- 8.3.8 The Manual Handling Operation Regulations 1992 (S.I. 1992 No.2793) (as amended)
- 8.3.9 The Safety Signs and Signals Regulations 1996 (S.I. 1996 No. 341) (as amended)

Note 3 Regulations are available online at www.legislation.gov.uk

8.4 DEFRA Publications

- 8.4.1 In England – The Welfare of Animals (Transport) (England) Order 2006 (S.I. 2006 No. 3260);
In Wales – The Welfare of Animals (Transport) (Wales) Order 2007 (2007 No. 1047 (W. 105));
In Scotland – The Welfare of Animals (Transport) (Scotland) Regulations 2006 (S.I. 2006 No. 606) and The Welfare of Animals (Transport) (Scotland) Amendment Regulations 2009 (S.I. 2009 No. 339); and
In Northern Ireland – The Welfare of Animals (Transport) Regulations (Northern Ireland) 2006 (S.I. 2006 No. 538) and The Welfare of Animals (Transport) (Amendment) Regulations (Northern Ireland) 2007 (S.I. 2007 No. 32).

DEFRA Guidance for the Welfare of Animals during Transport;
www.gov.uk/government/publications/welfare-of-animals-during-transport

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 (i.e. the aggregate of the static and dynamic forces).

2. Securing Points on Road Vehicles

- 2.1 Securing points on road vehicles should be designed for securing the 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	$\frac{\text{GVM} \times 1.2g}{n^*}$ <p>Note: the value of g may be taken as 10</p>
20 t < GVM ≤ 30 t	3	
30 t < GVM ** ≤ 40 t	4	

* 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, i.e. 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 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 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 80mm but the aperture need not be circular in shape.
- 2.10 Equivalent or superior securing arrangements may be considered for vehicles for which the provisions of table 2.3 are unsuitable.
- 2.11 Where there is doubt that a vehicle complies with the provisions of paragraph 2.3 of this Annex, the master may exercise discretion whether to load the vehicle on board, taking into account the apparent condition of the 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 Guide 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:

$$T = \frac{0.7B}{\sqrt{GM}} \text{ where } \begin{array}{l} T = \text{roll period in seconds} \\ B = \text{moulded breadth in metres} \\ GM = \text{metacentric height in metres} \end{array}$$

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 of 40 tonnes. 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

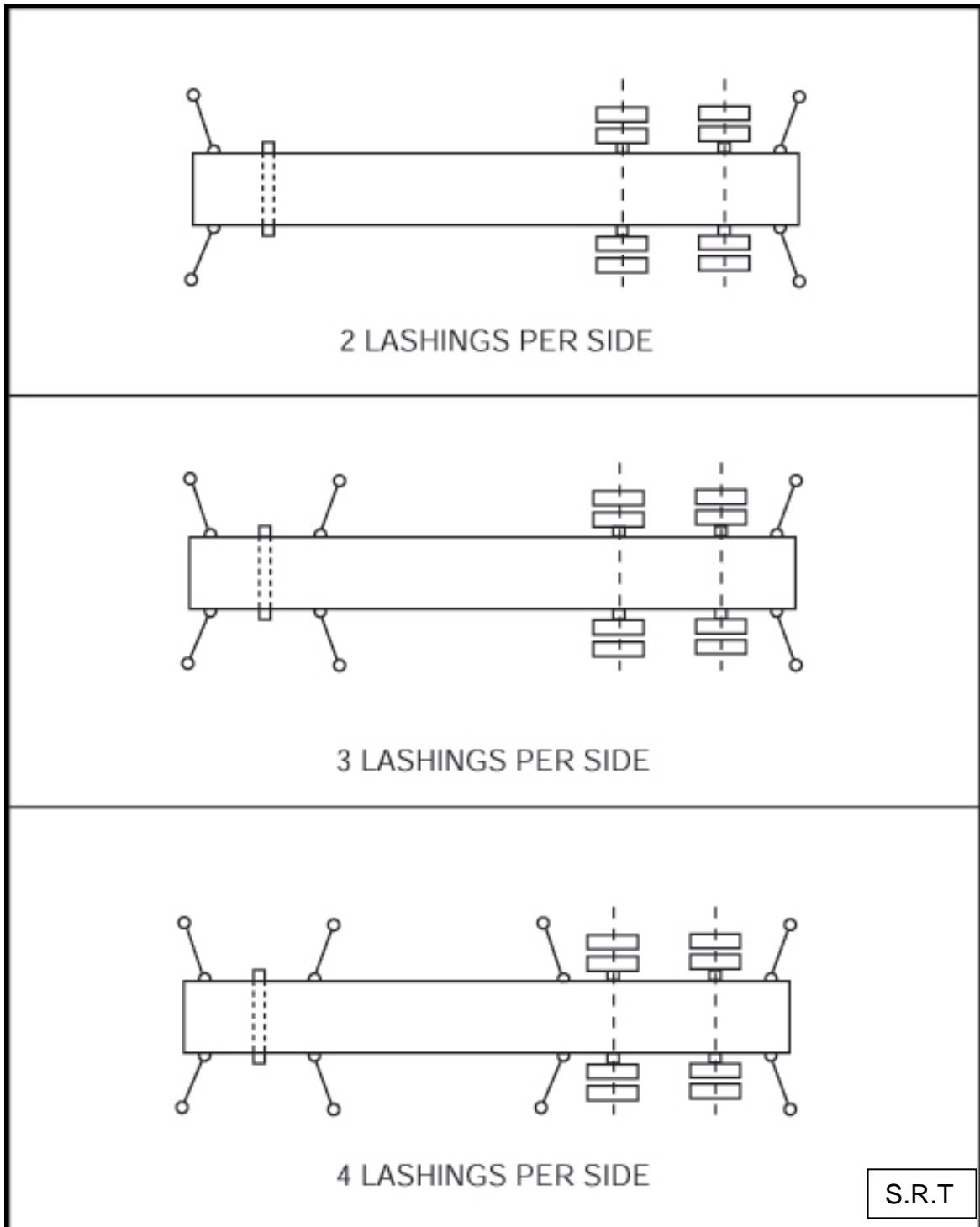
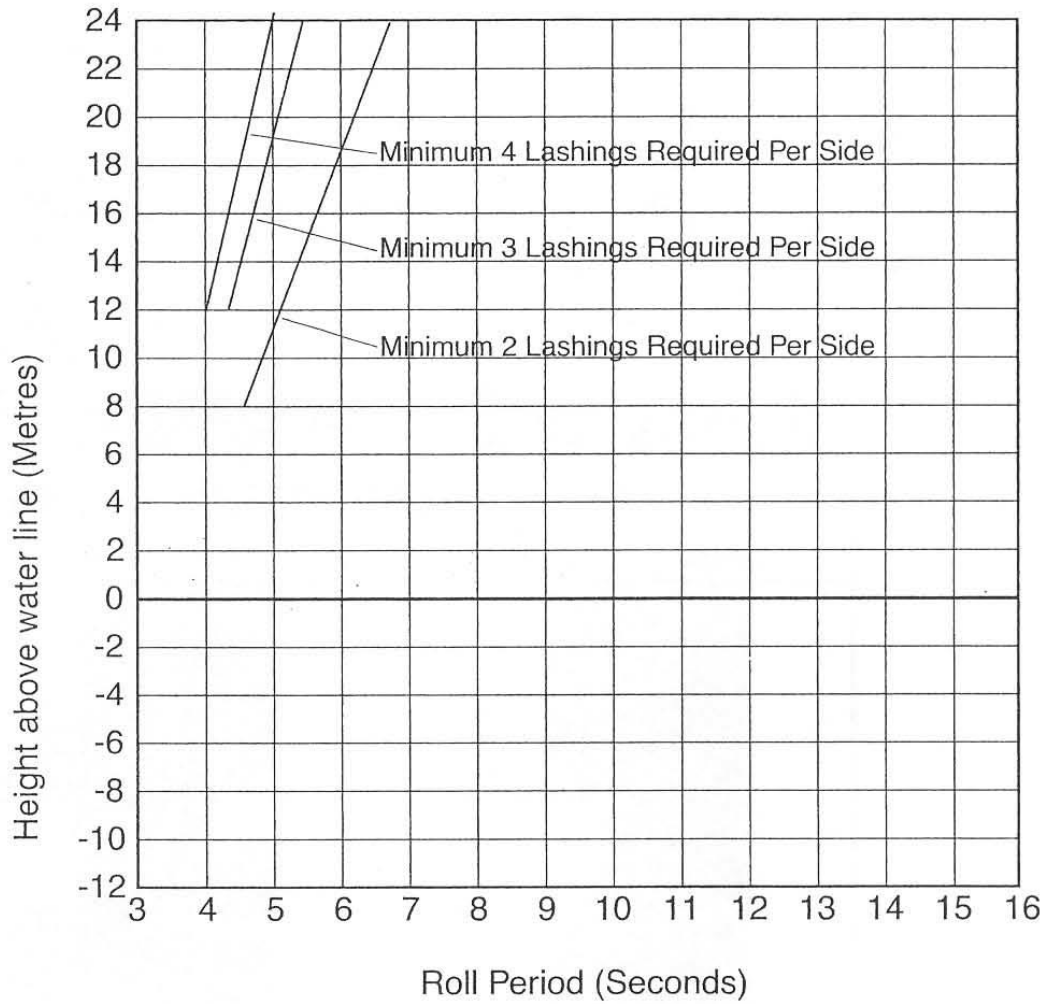


Figure 1. Arrangement of lashings used in calculations

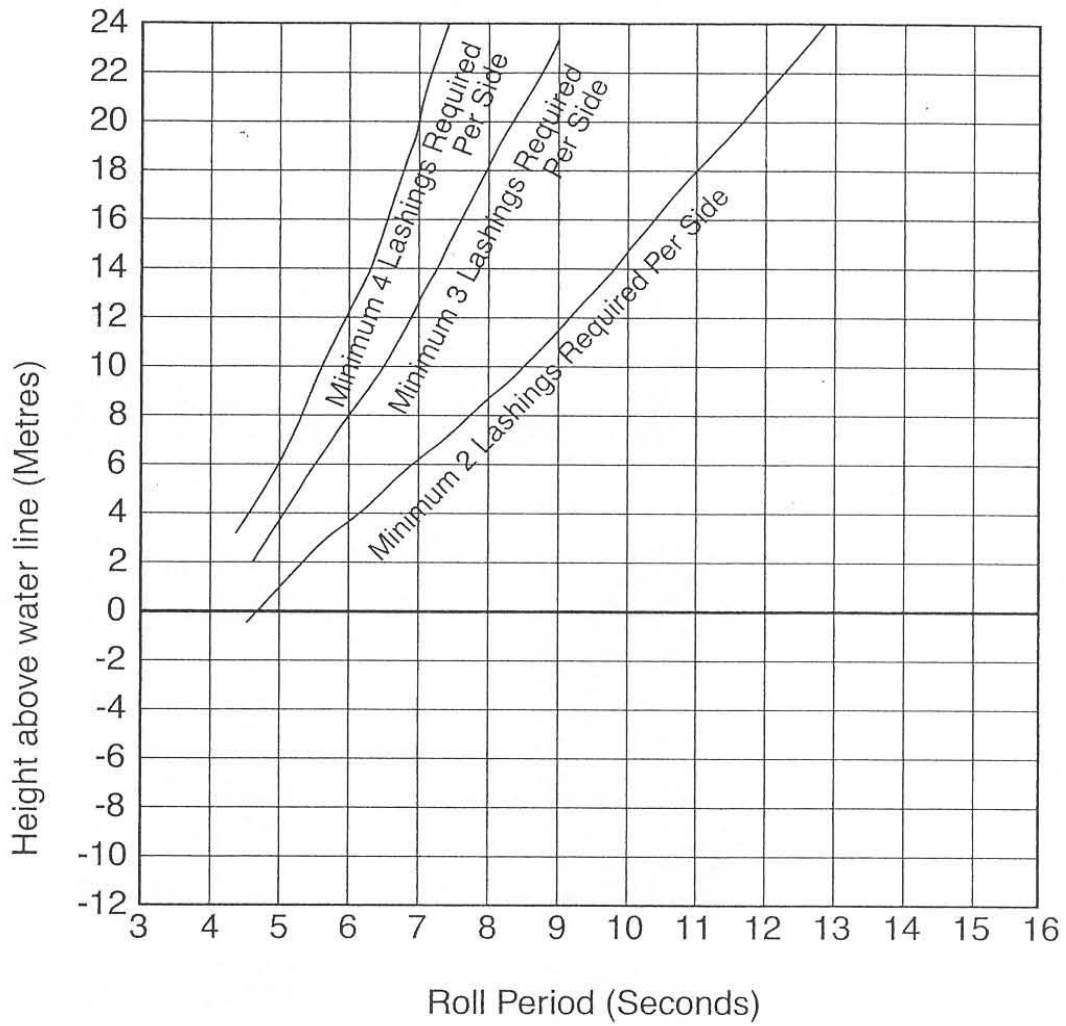
10 Tonne Trailer



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.

Figure 2. 10 Tonne Trailer

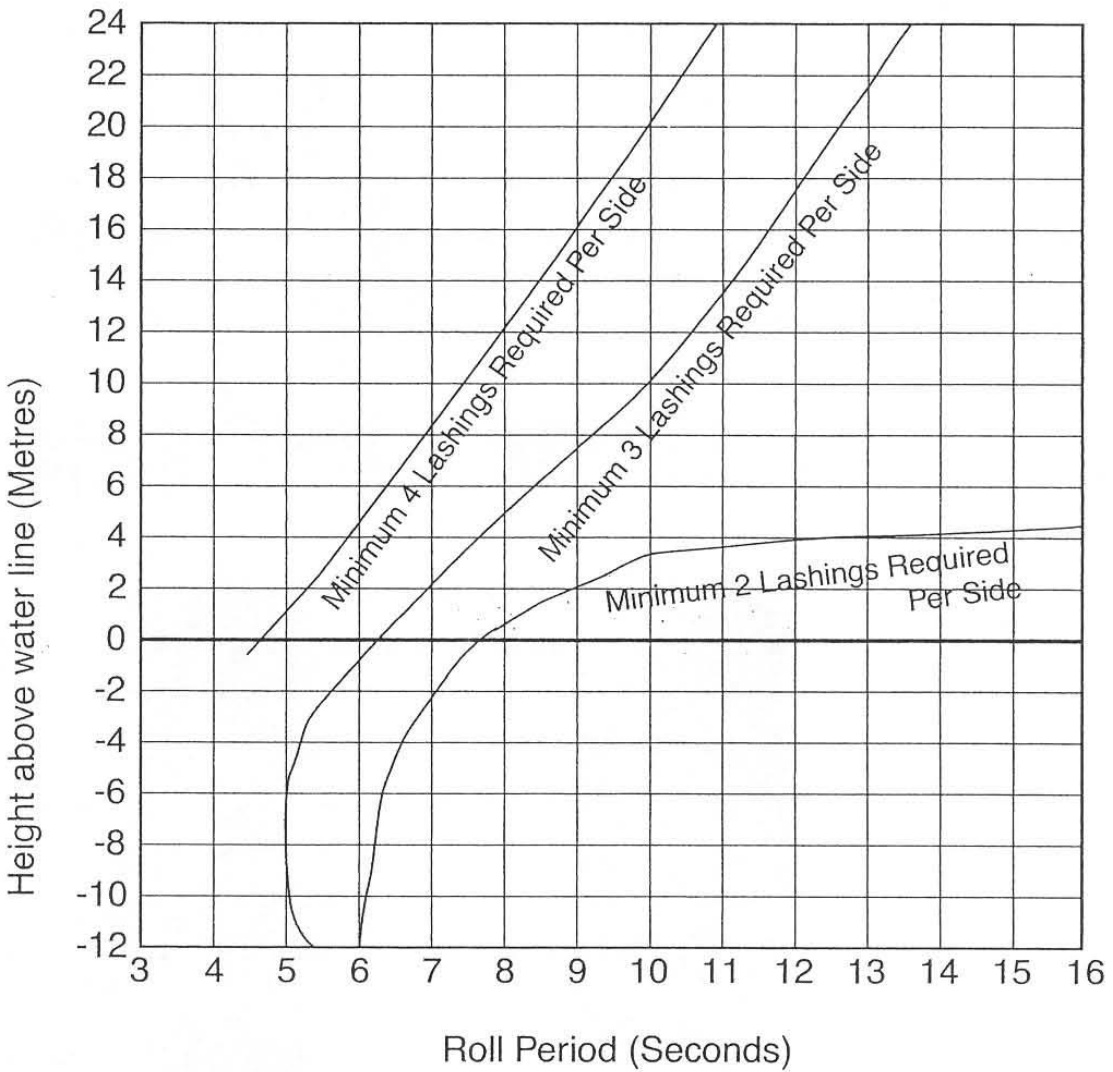
20 Tonne Trailer



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.

Figure 3. 20 Tonne Trailer

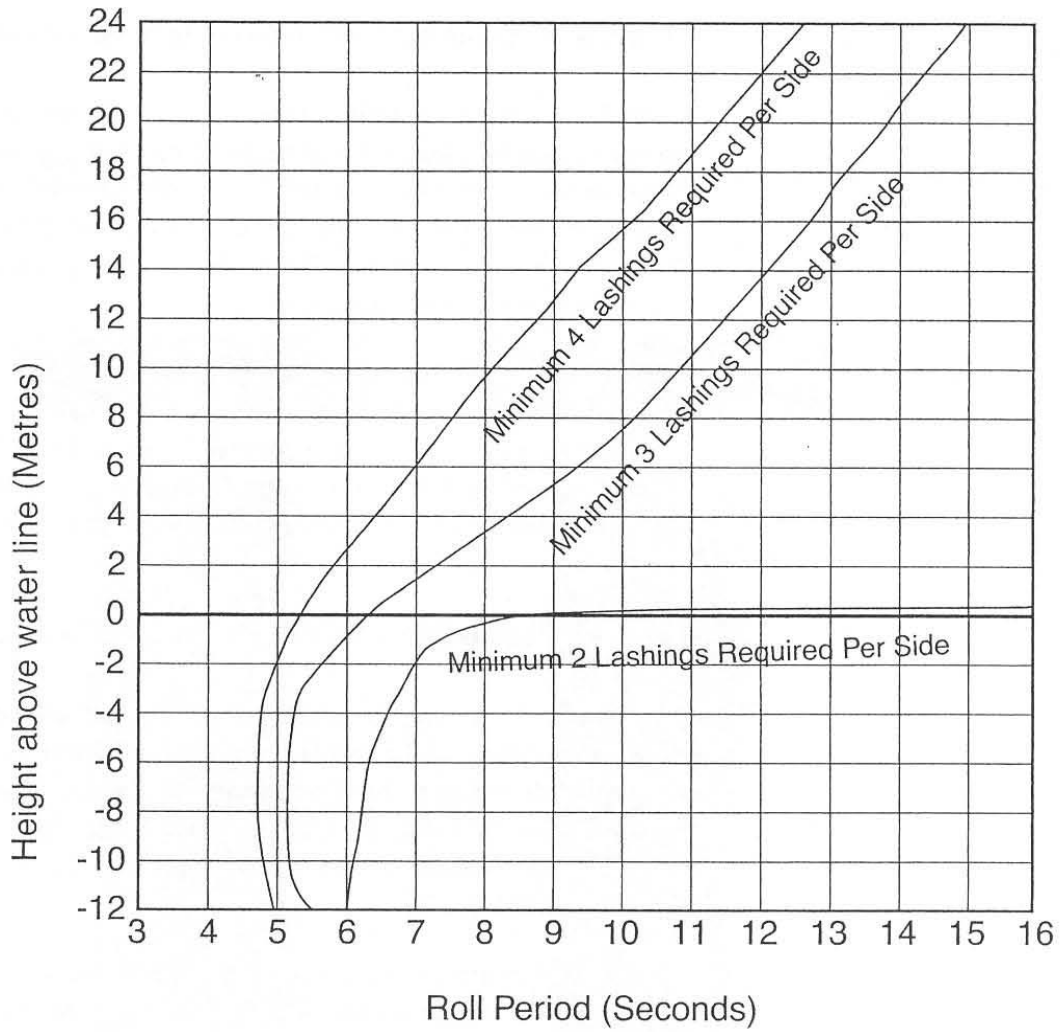
30 Tonne Trailer



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.

Figure 4. 30 Tonne Trailer

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.

Figure 5. 32 Tonne Trailer

ANNEX 3

RELEVANT LEGISLATION

1. Merchant Shipping Act 1995 (referred to in the Introduction - 2.1.1)

- 1.1 Under Section 100 of the Merchant Shipping Act 1995 (MSA 95) 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 MSA 95 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.
- 1.3 Regulations under the MSA 95 which are relevant here include, but are not limited to, the Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007 (SI 2007/3075) (the "Noise Regulations"), the Merchant Shipping (Lifting Operations and Lifting Equipment) Regulations 2006 (SI 2006/2184), the Merchant Shipping (Maritime Labour Convention) (Health and Safety) (Amendment) Regulations 2014 (S.I. 2014/1616), the Merchant Shipping and Fishing Vessels (Personal Protective Equipment) Regulations 1999 (S.I. 1999 No.2205), the Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (S.I. 1997 No.2367) and the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 (SI 2012 No.1743).

2. Health and Safety at Work Act 1974 (referred to in the introduction – 2.2)

- 2.1 Legislation dealing with the safety of loading and unloading operations on ro-ro ships includes the Health and Safety at Work Act 1974 (HSW), which applies to all work activities. Under the HSW Act, employers, people in control of premises, the self-employed and employees must ensure the health and safety of others and themselves so far as is reasonably practicable. There are also regulations that apply to all industries because many of the hazards will be the same regardless of the industry involved. But some industries do have specific pieces of legislation. In the port industry this includes, for example, duties under the Dangerous Goods in Harbour Areas Regulations 2016.
- 2.2 The Safety in Docks - Approved Code of Practice (L148) covers safety in dock operations and is aimed at those who have a duty to comply with the provisions of the HSW Act.

- 2.3 Relevant regulations related to the HSW Act include, for example, the Confined Spaces Regulations 1997, Dangerous Substances and Explosive Atmospheres Regulations 2002 and Work at Height Regulations 2005.
- 2.4 The HSW Act and associated regulations do not apply to seafarers working on board ship under the control of the ship's master. Merchant Shipping regulations apply to ship's crew.
- 2.5 Health and safety regulations in Northern Ireland are enforced by the Health and Safety Executive for Northern Ireland (HSENI). In NI, The Docks Regulations (Northern Ireland) 1989 (S.I. 1989 No 320) apply and the HSE document The Safety in Docks - Approved Code of Practice (L148) is also approved for use in NI.