

国际航行船舶

货物系固手册

CARGO SECURING MANUAL

本手册是按照《国际海上人命安全公约》、国际海事组织 Msc/Circ745 号通函和“货物积载和系固安全操作规则<A.714(17)决议>”编制的。

This manual has been prepared according to the International Convention for the Safety of Life at Sea (SOLAS), the IMO Msc/circ745, the Code of Safe Practice for Cargo Stowage and Securing (IMO Resolution A.714(17)).

序言（PREAMBLE）

本手册是按照 1974 年《国际海上人命安全公约》、国际海事组织第 Msc/Circ745 号通函、国际海事组织决议 A.714(17)以及“货物积载和系固安全操作规则”编制的。

This manual has been prepared according to the International Convention for the Safety of Life at Sea , 1974 (SOLAS) 1994 amendment, the IMO Msc/circ745,the Code of Safe Practice for Cargo Stowage and Securing (IMO Resolution A.714(17)).

本手册应永久保留在船上，以便船级社的验船师、港口国检查的官员以及其他有关人员随时检查。

The manual shall always be kept on board and available for inspection by class surveyors , port/flag state inspectors and others to whom it may concern.

如系固装置和对系固手册的要求有变化，本手册应修订并送船级社或主管当局重新批准。

The manual is to be modified and re-approved by the Classification Society or the Administration in case of that the provision of Cargo Securing Manual was revised or the cargo securing devices were changed.

附录应保持最新有效。

Appendix should be maintained up to date.

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第一章 (CHAPTER 1)

总则(GENERAL)

1.1 船舶数据 (SHIP DATA)

船名 Ship name	
船级社 Classification	
海事组织编号 IMO No.	
船旗国 Flag	
船籍港 Port of registry	
船东 Owner	
船型 Ship type	
船长 Length, BP	
船宽 Breath, B	
型深 Depth, D	
服务航速 Service speed	
夏季吃水 Summer draft	
总吨位 Gross tonnage	
初稳性高度范围 Range of GM ₀	

1.2 定义 (DEFINITIONS)

.1 货物单元 (Cargo Units)

系指车辆（公路车辆、滚装拖车等）、铁路车辆、集装箱、板材、托盘、便携式容器、中间散装容器、包装单元、成组货、其他货物运输单元如船运箱盒、件杂货如线材卷、重货如火车头和变压器。不是永久固定在船上的船运输的装载设备或其部件，也应被视

为货物单元。

means vehicles (road vehicles, roll trailers, etc.), railway wagons, containers, flats, pallets, portable tanks, intermediate bulk containers (IBC), packaged units, unit loads, other cargo carrying units such as shipping cassettes, cargo entities such as steel coils and heavy cargo items such as locomotives and transformers. Loading equipment, or any part thereof, transported on the ship, but which is not permanently fixed to the ship, is also considered as cargo units.

.2 货物系固设备 (Cargo Securing Devices)

所有用于系固和支持货物单元的固定式和便携式装具。

means all fixed and portable devices used to secure and support cargo units.

.3 最大系固载荷 (Maximum Securing Load) (MSL)

本术语用于限定船上系固设备的许用负荷。当能提供等同或较高的强度时，安全工作负荷 (SWL) 可以替代 MSL。

MSL is a term used to define the allowable load capacity for a device used to secure cargo to a ship. Safe Working Load (SWL) may be substituted for MSL for securing purposes, provided this is equal to or exceeds the strength defined by MSL.

.4 标准货 (Standardized Cargo)

已根据货物单元的特定形式在船上设置了经批准的系固系统的货物。

means cargo for which the ship is provided with an approved securing system based upon cargo units of specific types.

.5 半标准货 (Semi-standardized Cargo)

在船上设置的系固系统仅适应货物单元的有限变化。如：车辆、拖车等。

means cargo for which the ship is provided with a securing system capable of accommodating a limited variety of cargo units, such as vehicles, trailers, etc.

.6 非标准货 (Non-standardized Cargo)

需要专门的装载和系固安排的货物。

means cargo which requires individual stowage and securing arrangements.

.7 固定式系固设备 (fixed cargo securing devices)

指系固点及其支撑结构。这些设备既可以是内部的，如焊接在船体结构内，也可以是暴露在外的，如直接焊接在船体结构外部。

Means securing point and its supporting configuration. It can be inside, such as welding in the hull structure. Can expose outside too, if weld it on the hull structure outside directly.

.8 便携式系固设备 (portable cargo securing devices)

指用于货物单元绑扎、系固和支撑的移动式设备。

Mean portable devices used for cargo units colligation、securing and supporting.

1.3 概述 (GENERAL INFORMATION)

.1 本手册不排除良好的航海技术，也不排除经验和在装载和系固方面的实践。

The guidance given herein should by no means rule out the principles of good seamanship, neither can they replace experience in stowage and securing practice.

.2 本手册的资料和要求与下述文件中的要求相一致：

-----船舶稳性计算书

-----1966 年国际载重线证书

-----船体强度装载手册（如有时）

-----国际海运危险货物规则（如适用）

The information and requirements set forth in this Manual are consistent with the requirements of the vessel's trim and stability booklet, International Load Line Certificate (1966), the hull strength loading manual (if provided) and with the requirements of the International Maritime Dangerous Goods (IMDG) Code (if applicable).

.3 本手册规定了船上的货物系固设备及其布置方式，以便对货物单元进行正确的系固。

这些规定基于恶劣气候和海况下货物所受到的纵、横、垂向力。

This Cargo Securing Manual specifies arrangements and cargo securing devices provided on board the ship for the correct application to and the securing of cargo units, containers, vehicles and other entities, based on transverse, longitudinal and vertical forces which may arise during adverse weather and sea conditions.

.4 应该认识到对货物的适当系固以及在船上选择适当的系固点对船、货、人的安全都是重要的。

It is imperative to the safety of the ship and the protection of the cargo and personnel that the securing of the cargo is carried out properly and that only appropriate securing points or fittings should be used for cargo securing.

.5 本手册中提到的货物系固设备应被正确地使用，并应适合货物的数量、包装方式和物理特性。当采用新型或替代的货物系固设备时，手册应相应修改。替代的货物系固设备的强度不应低于原设备。

The cargo securing devices mentioned in this manual should be applied so as to be suitable and adapted to the quantity, type of packaging, and physical properties of the cargo to be carried. When new or alternative types of cargo securing devices are introduced, the Cargo Securing Manual should be revised accordingly. Alternative cargo securing devices introduced should not have less strength than the equipment which it replaces.

.6 船上应配有足够的备用货物系固设备。

There should be a sufficient quantity of reserve cargo securing devices on board the ship.

.7 手册中已包括每种货物系固设备的强度资料、使用和保养的须知。货物系固设备应保养良好，当存在影响系固效果的磨损或损伤时应更新设备。

Information on the strength and instructions for the use and maintenance of each specific type of cargo securing device, where applicable, is provided in this manual. The cargo securing devices should be maintained in a satisfactory condition. Items worn or damaged to such an extent that their quality is impaired should be replaced.

.8 未经船长许可船体结构上不得加焊任何部件。

The hull structure can't be added and welded any part without permission of captain.

.9 如要在甲板板、舱壁板上焊接系固设备，必须同扶强材、横梁、纵骨或肋板重合，且具有合适的焊接面积来承载。

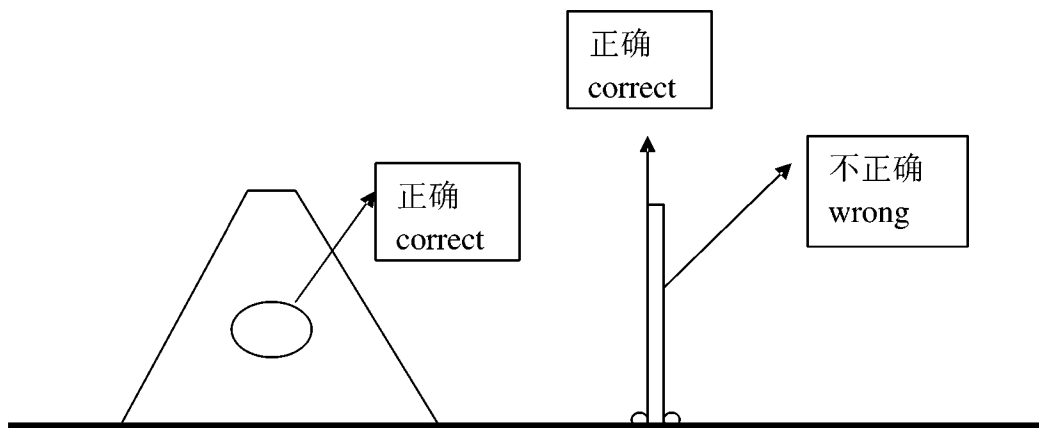
If securing devices shall be weld at deck, bulkhead, it must connect with the stiffener , beam , longitudinal or frames, and the suitable area of welding is born the weight of.

.10 所有新更换的基座、绑扎眼板和绑扎地令等应配有符合合适的国家或国际标准的证书，以证明其最大系固负荷。

All renewal of base , eyeplate and D-ring should provide with suitable certificate of nation or the international standard in order to prove its maximum securing load.

.11 载荷不应直接作用于船体结构上，也不应与系固设备允许的受力面成一定角度（如下图）

Load should act on hull structure directly, and should not form into a certain angle with allowable forces against securing devices (see the following picture)



第二章 (CHAPTER 2)

货物系固装置

(CARGO SECURING DEVICES)

2.1 固定式货物系固设备 (Fixed cargo securing devices)

.1 固定式货物系固设备清单 (List of Fixed cargo securing devices)

见附录二

see appendix 2

.2 固定式货物系固设备布置图 (Arrangement of fixed cargo securing devices)

见附录二

see appendix 2

.3 固定式货物系固设备结构图 (Sketch of fixed cargo securing devices)

见附录二

see appendix 2

2.2 便携式货物系固设备 (Portable cargo securing devices)

.1 便携式货物系固设备清单 (List of portable cargo securing devices)

见附录三

see appendix 3

.2 便携式货物系固设备结构图 (Sketch of portable cargo securing devices)

见附录三

see appendix 3

.3 便携式货物系固设备证明书 (Documents to portable cargo securing devices)

见附录三

see appendix 3

2.3 检查和维护计划(Inspection and Maintenance Schemes)

2.3.1 船长应负责定期检查和维修。货物系固设备的检查的最低要求应包括:

Regular inspection and maintenance are carried out under the responsibility of the Master. Cargo securing device inspection should as a minimum include:

.1 对零件的日常外观检查:

Routine visual examinations of components being utilized:

- 使用任何货物系固设备前,无论是固定式还是便携式,均应进行外观检查以确认没有缺陷。当适用时,所有活动部件应已润滑并要正确使用。

- Before using any cargo securing device, whether fixed or portable,the equipment must be visually inspected to ensure that there are no defects and that when appropriate,all moving parts have been greased and are operating correctly.

- 使用后及存放前,应对每一部件做外观检查,确认其未受到损坏,保持良好状态,不必进行修理或更换。特别在船舶航行遇有恶劣天气后,应对绑扎设备仔细检查。有缺陷的便携式绑扎设备应存放在合适的独立处所,如标有“已坏”的箱子里,在其再次使用前须进行必要的修理和试验。如部件无修理价值,就应将其报废。

- After use,and before going into storage,each device should be visually inspected to ensure that the device has not sustained damage, is still in good condition and does not require repair or replacement. Especially after heavy weather voyages the lashing equipment should be carefully examined.Defective portable

lashing equipment should be put aside into a suitable separate location, i.e. bins marked “BAD”, and any necessary repairs and testing must be carried out prior to re-use. If beyond repair the equipment is to be scrapped.

- 报废部件应用等同部件代替。换新的货物系固设备必须具有证书。
- Discarded parts of equipment should be replaced by equivalent parts. Cargo Securing Equipment is only to be renewed by certified equipment.

- 所有便携式系固设备应每隔不超过三个月进行外观检查及必要的润滑。
- All portable securing devices shall be visually examined and greased as necessary at intervals not exceeding 3 months.

- 未使用的便携式设备应收集、存放在箱子里。
- Portable equipment not in use should be collected and stored in bins.

.2 定期检查和/或重新试验按照主管机关要求进行。当需要时,有关的货物系固设备应经 OMCS 检验。

Periodic examinations/re-testing as required by the Administration. When required, the cargo securing devices concerned should be subject to inspections by OMCS.

- 固定式货物系固设备和船舶结构的连接焊缝应定期检查,任何裂纹或开裂都应刨掉并焊补。该连接焊缝应由有资格的焊工按照批准的焊接工艺进行焊接。

- The welds connecting the fixed cargo securing equipment to the ship's structures should be inspected regularly and any fractures or tearing should be gouged out and rewelded. Welding of the device to the structure should be carried out by approval personnel in accordance with recognized welding practice.

- 如果甲板、内底板、舱盖、舱壁或舷侧结构的基本结构已经变形到可导致积载不均匀的程度时,这些结构必须用最适当的方法进行修理。船舶结构在系固点附近任何重大变形的修理,应在最早时间内报告 OMCS。

- If the underlying structure of the deck, tank top, hatch covers, bulkhead or side

structure is deformed to such an extent that an uneven stow would result, the structure should be repaired by the most appropriate method. Any significant deformation of the ship's structure in way of securing points is to be reported to OMCS at the earliest opportunity.

- 货物系固设备使用几次后,无论是未紧固的还是固定的,均应定期进行重新试验。被试验的设备应是随机选取,如每种型号设备中,50 件中取一件。这些试验应采用许用强度负荷。

- Cargo securing equipment used several times, both loose and fixed, should be re-tested regularly. The equipment to be tested should be selected by random selection, for instance 1 of 50 pieces of each type of equipment. These tests should be proof strength load.

2.3.2 本节以文件形式给出检查和维护船舶货物系固设备的作法。应在附在货物系固手册后的记录簿作记录。

This sub-chapter documents actions to inspect and maintain the ship's cargo securing devices. Entries are made in a record book, which should be kept with the Cargo Securing Manual.

.1 检查、维护、修理和换新应定期进行,以确保货物在整个航程中被安全系固。

The inspection, maintenance, repair and renewal to the cargo securing devices should be regularly carried out to ensure that the cargo remains safely secured throughout the voyage.

见附录四

See appendix 4.

.2 检查和维护应记入附录四中的货物系固设备检查/维护簿上。

Inspection and maintenance carried out are to be entered into the "LOG FOR INSPECTION/MAINTENANCE OF CARGO SECURING DEVICES" shown in appendix 4.

2.3.3 本节内容包括提供给船长的有关航行中系固布置的检查和调整的信息。

This sub-chapter should contain information for the master regarding inspections and adjustments of securing arrangements during the voyage.

.1 应对系固设备进行定期检查,以确保货物在整个航程中被安全系固。

The securing devices should be regularly inspected to ensure that the cargo remains safely secured throughout the voyage.

.2 航行中,经检查如有必要,应及时调整系固布置。系固设备的调整包括收紧系索或重新绑扎。如有必要应安装额外的系索,并且如可行,应增加摩擦力。当预期船舶要遇到恶劣气象或涌浪及船舶遇到恶劣气象后,上述措施更是至关重要。航行中因货物变形或挤压可导致系索松动,故应密切注意系索的情况。当货物在温度较低的环境中装载或系固后,船舶驶向温度较高的环境中,系索也容易松动。

The securing arrangement should be adjusted, if found necessary after inspection, during the voyage. Adjustment of securing devices include re-tightening of lashings or remarking the lashing. If necessary additional lashings should be fitted, and if possible the friction could be increased. This is particular important when heavy weather or swell is expected. Moreover, when heavy weather has passed.

Particular attention should also be paid to lashing which may become slack due to the cargo deforming or compacting during the voyage. Lashings may also become slack when cargoes are loaded and secured in conditions of low ambient temperature and the vessel then proceeds to areas of significantly higher ambient temperature.

.3 如船舶遇有恶劣气象及海况而对货物系固布置进行调整时,应特别小心以避免船员受伤。良好的航海技术是必要的。

If adjustment to the cargo securing arrangement has to be carried out at sea under adverse weather and sea conditions adequate precautions have to be taken to avoid dangerous situations for the crew. Good seamanship is necessary.

.4 在一个航次中,部分卸载将导致货物暴露在外,应对其进行良好系固以避免在卸载其它货物时发生危险。

During a voyage, partial discharge may result in an exposed cargo face. This should preferably be secured while loading to avoid hazards while discharging other cargo.

.5 应有足够的备用系固设备以应付不可预测的情况发生。

Sufficient reserve securing devices should be carried to deal with unexpected circumstances.

.6 对绑扎件的全部检查和调整应记入船舶记录簿。

Entries of all examinations and adjustments to lashings should be made in the ship's record book.

第三章 (CHAPTER 3)

非标准化和半标准化货物的积载和系固 (Stowage and Securing of Non-Standardized and Semi-Standardized Cargo)

3.1 积载和系固须知 (Stowage and securing instructions)

3.1.1 系固设备的使用须知 (Instructions on the proper handling of the securing devices)

.1 当垫货材放在甲板时,方向应横对船体,以便污水能容易排到舱内。

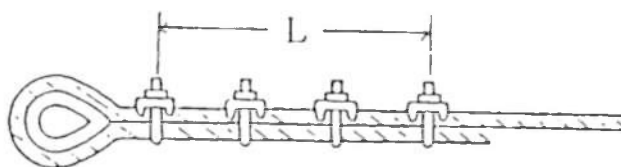
When dunnage is laid on deck, it should be directed athwartships so that bilge can be easily drained into the tank.

.2 当使用钢丝绳、链条等器械时,应该对缠绕进行相应的注意。

In applying wire ropes、chains etc. due care should be given to any twisting on them.

.3 当钢丝采用夹钳夹紧时,应按照下面的标准图进行:

The standard illustrated below is to be followed when applying clips to wires:



clips : 3 — 4 pieces size : 20 — 22 mm Φ L : 300 — 500 mm

3.1.2 使用货物系固设备及由船上或岸上人员进行系固操作的安全须知

Safety instructions related to handling of the cargo securing devices

and to securing operations by ship or shore personnel.

.1 为了防止不适当地积载和系固货物,船上人员应监督货物的系固操作过程。

Ship personnel are to supervise cargo securing operations in order to prevent unsuitable stowage and securing of cargoes.

.2 工作处所应井然有序,在光线暗淡的处所,应有灯具照明。

Working space are to be put in order and lighted by any lighting apparatus where it is dark.

.3 系固操作开始前,船上人员应检查工作处所以确保工作安全。

Ship personnel are to inspect working spaces prior to securing operations and ensure that they are suitably safe for carrying out such work.

3.2 货物单元受力计算 (Evaluation of forces acting on the cargo units)

下文系直接引用“CSS 规则”附则 13, 序号同原文。

The following text is quoted directly from Annex 13 to the CSS Code. The same chapter numbering is applied.

1.适用范围(Scope of Application)

本规则介绍的方法适用于非标准货物,但不适用于集装箱船上装载的集装箱。

The methods described in this annex should be applied to non-standardized cargoes, but not to containers on container ships.

按照“货物积载和系固安全操作规则”(以下简称“规则”)第 1.8 章条款载运的非常沉重的货件和规则附则中已给出关于装载和系固的详尽建议的其他货物,不包括在本附则范围内。

Very heavy units as carried under the provisions of chapter 1.8 of the Code of Safe Practice for Cargo Stowage and Securing (CSS Code) and those items for which exhaustive advice on stowage and securing is given in the annexes to the Code should be excluded.

如果计算机软件输出的设计参数满足最低安全系数要求时,,则允许使用该软件。

Nothing in this annex should be read to exclude the use of computer software ,provided the output achieves design parameters which meet the minimum safety factors applied in this sub-chapter.

采用本附则所描述的方法是对良好航海技术原则的补充,并不能代替在装载和系固方面的实践经验。

The application of the methods described in this section is supplementary to the principles of good seamanship and shall not replace experience in stowage and securing practice.

2. 目的(Purpose of the methods)

本计算方法应: (The methods should:)

.1 提供货物系固手册的编写指南;

provided guidance for the preparation of the Cargo Securing Manual and the examples therein;

.2 就不包括在货物系固手册内的货物单元的系固方式向船上人员提供评定方法;

assist ship's staff on assessing the securing of cargo units not covered by the Cargo Securing Manual;

.3 帮助岸上人员评定手册以外的货物单元的系固方式;

assist qualified shore personnel in assessing the securing of cargo units not covered by the Cargo Securing Manual; and

.4 供船岸人员培训参考。

serve as a reference for maritime and port-related education and training.

3. 计算方法简述(Presentation of the methods)

本计算方法采用了一种可普遍采用的和灵活的方式。

The methods are presented in a universally applicable and flexible way.

4. 系固设备的强度(Strength of securing equipment)

.1 系固设备的制造商应至少提供设备的破断强度(kN);

Manufacturers of securing equipment should at least supply information on the nominal breaking strength of the equipment in kilo-Newton's(kN);

.2 “最大系固载荷”(MSL)用于限制船上某一用于系固货物的设备的载荷。最大系固载荷是系固设备的安全载荷,相当于起重设备的安全工作载荷。

“Maximum securing load”(MSL) is a term used to define the load capacity for a device used to secure cargo to a ship; Maximum securing load is to securing devices as safe working load is to lifting tackle.

除 4.3 所述情况外,各种不同的系固设备的 MSL 见表 1。

The MSLs for different securing devices are given in Table 1 if not given under 4.3.

木材的 MSL 取 0.3kN/cm^2 (顺 纹) 。

The MSL of timber should be taken as 0.3 kN/cm^2 normal to the grain.

由破断强度确定 MSL

Determination of MSL from breaking strength

表 1 (Table 1)

MATERIAL	MSL
shackles, rings, deck eyes, turnbuckles	50% of breaking strength
of mild steel	33% of breaking strength
fibre rope	80% of breaking strength
wire rope(single use)	30% of breaking strength
wire rope(re-usable)	70% of breaking strength
steel band(single use)	50% of breaking strength
chains	

.3 对于某些系固设备(如:带有张紧装置的纤维带或系固集装箱的特殊设备),可由主管机关规定并标出许用工作负荷。该值可作为 MSL。

For particular securing devices (e.g. fibre straps with tensioners or special equipment for securing containers) a permissible working load may be prescribed and marked by authority. This should be taken as the MSL.

.4 当系固装置的部件以串联形式连接时,如钢丝绳连接卸扣再连接甲板眼环,则该系固装置的 MSL 为串联中的最小的 MSL 值。

When the components of a lashing devices are connected in series, for example, a wire to a shackle to a deck eye, the minimum MSL in the series shall apply to that device.

5. 安全系数(Safety factor)

在用力矩和力矩的计算平衡来评估绑扎布置时,绑扎装置的计算强度(CS)可用安全系数 1.5 对 MSL 按下述方法折减:

Within the assessment of a securing arrangement by a calculated balance of forces and moments, the calculated strength (CS) of securing devices should be reduced against MSL, using a safety factor of 1.5, as follows:

$$CS = MSL/1.5$$

折减的原因是由于绑扎装置中力的不均匀分布可能性、由于不良装配而导致的强度降低或其他原因。

The reason for this reduction are the possibility of uneven distribution of forces among the devices, strength reduction due to poor assembly and others.

尽管引入了上述的安全系数,还应尽量采用长度和材料相似的系固部件以使绑扎装置的弹性特性一致。

Notwithstanding the introduction of such a safety factor, care should be taken to use securing elements of similar material and length in order to provided a uniform elastic behavior within the arrangement.

6. 经验方法(Rule-of-thumb method)

.1 货物单元任一侧(左舷和右舷)的系固设备的 MSL 之和应等于该单元的重量(单元的重量单位应为 kN)。

The total of the MSL values of the securing devices on each side of a unit of cargo (port as well as starboard) should equal the weight of the unit.(The weight of the unit should be taken in kN).

.2 本办法实际上是将横向加速度取为 $1g(9.81\text{kN/s}^2)$,适用于所有尺度的船舶,不管其码放位置、稳性和装载条件、季节和运营区域。另外,本方法不考虑系索角度的不利作用和同类系固点间的不均匀性,也未考虑摩擦的有利作用。

This method, which implies a transverse acceleration of $1g(9.81\text{m/s}^2)$, applies to nearly any size of ship, regardless of the location of stowage, stability and loading condition, season and area of operation. The method, however, takes into account neither the adverse effects of lashing angles and homogeneous distribution of forces

among the securing devices nor the favourable effect friction.

.3 系索与甲板间的横向夹角应不大于 60° ,并且使用适当的材料以产生足够的摩擦。夹角大于 60° 的系索只能用于防止货物翻转而不能计入与经验方法有关的系索之中。

Transverse lashing angles to the deck should not be greater than 60° and it is important that adequate friction is provided by the use of suitable material. Additional lashings at angle of greater than 60° may be desirable to prevent tipping but are not to be counted in the number of lashings under the rule-of-thumb.

7. 改进的计算法(Advanced calculation method)

7.1 外力假设(Assumption of external forces)

在纵、横、垂三个方向作用在货物单元上的外力应使用下式求得:

External forces to a cargo unit in longitudinal, transverse and vertical direction should be obtained using the formula:

$$F_{(x, y, z)} = ma_{(x, y, z)} + F_{w(x, y)} + F_{s(x, y)}$$

$F_{(x, y, z)}$: 纵、横、垂向力(longitudinal, transverse and vertical forces);

m: 货物单元的质量(mass of unit);

$a_{(x, y, z)}$: 纵、横、垂向加速度(见表 2)(longitudinal, transverse and vertical accelerations(see Table 2);

$F_{w(x, y)}$: 由风压造成的纵、横向力(longitudinal and transverse forces by wind pressure);

$F_{s(x, y)}$: 由浪的拍击造成的纵、横向力(longitudinal and transverse forces by sea sloshing)。

基本加速度值见表 2(The basic acceleration data are presented in Table 2)。

表 2 基本加速度值

Transverse acceleration a_y in m/s^2											Longitudinal acceleration a_x in m/s^2	
on deck, high	7.1	6.9	6.8	6.7	6.7	6.8	6.9	7.1	7.4		3.8	
on deck, low	6.5	6.3	6.1	6.1	6.1	6.1	6.3	6.5	6.7		2.9	
'tween-deck	5.9	5.6	5.5	5.4	5.4	5.5	5.6	5.9	6.2		2.0	
lower hold	5.5	5.3	5.1	5.0	5.0	5.1	5.3	5.5	5.9		1.5	
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	L	
Vertical acceleration a_z in m/s^2												
7.6 6.2 5.0 4.3 4.3 5.0 6.2 7.6 9.2												

B/GM $\geq$ 13(B: breadth of ship, GM: metacentric height).

若在限制航区运营,表列数值可在考虑季节和航次的航行时间后减少。

For operation in a restricted area, reduction of these figures may be considered. taking into account the season of the year and the duration of the voyage.

若船长并非 100 m 且服务航速并非 15 kn, 应根据表 3 修正加速度值。

For ships of a length other than 100 m and a service speed other than 15 knots, the acceleration figures should be corrected by a factor given in Table 3.

与船长和航速有关的修正

Correction factors for length and speed

表 3 (Table 3)

Speed \ Length	50	60	70	80	90	100	120	140	160	180	200
9 kn	1.20	1.09	1.00	0.92	0.85	0.79	0.70	0.63	0.57	0.53	0.49
12 kn	1.34	1.22	1.12	1.03	0.96	0.90	0.79	0.72	0.65	0.60	0.56
15 kn	1.49	1.36	1.24	1.15	1.07	1.00	0.89	0.80	0.73	0.68	0.63
18 kn	1.64	1.49	1.37	1.27	1.18	1.10	0.98	0.89	0.82	0.76	0.71
21 kn	1.78	1.62	1.49	1.38	1.29	1.21	1.08	0.98	0.90	0.83	0.78
24 kn	1.93	1.76	1.62	1.50	1.40	1.31	1.17	1.07	0.98	0.91	0.85

对于 $B/GM < 13$ 的情况,应按表 4 对横向加速度值进行修正。

In addition, for ships with B/GM less than 13, the transverse acceleration figures should be corrected by a factor given in Table 4.

$B/GM < 13$ 时的修正系数

Correction factors for $B/GM < 13$

表 4 (Table 4)

B/GM	7	8	9	10	11	12	13or abve
ondeck high	1.56	1.40	1.27	1.19	1.11	1.05	1.00
on deck low	1.42	1.30	1.21	1.14	1.09	1.04	1.00
tween deck	1.26	1.19	1.14	1.09	1.06	1.03	1.00
lower hold	1.15	1.12	1.09	1.06	1.04	1.02	1.00

当发生严重的横摇共振时,横摇幅值可超过 $\pm 30^\circ$, 此时横向加速度可能超过表列值,应采取有效措施加以避免。

In the case of marked roll resonance with amplitudes above $\pm 30^\circ$, the given figures of transverse acceleration may be exceeded. Effective measures should be taken to avoid this condition.

当迎浪高速航行砰击严重时,则纵向和垂向加速度可能超过表列值,应适当减速。

in the case of heading into the seas at high speed with marked slamming shocks, the given figures of longitudinal and vertical acceleration may be exceed. An appropriate reduction of speed should be considered.

当随浪或随尾斜浪航行时,尽管其稳性不明显低于最低要求,但可能发生大的横摇因而横向加速度可能超过表列值。此时应适当该变航向。

In the case of running before large stern or quartering seas with a stability which does not amply excess the accepted minimum requirements, large roll amplitudes must be expected with transverse acceleration greater than the figures given. An appropriate change of heading should be considered.

露天甲板上货物件的风浪力应由下式确定:

Forces by wind and sea to cargo units above the weather deck should be accounted for by simple approach:

$$\text{风力} = 1 \text{ kN/m}^2$$

$$\text{forces by wind pressure} = 1 \text{ kN/m}^2$$

$$\text{飞溅力} = 1 \text{ kN/m}^2$$

$$\text{forces by sea sloshing} = 1 \text{ kN/m}^2$$

实际的飞溅力可能比上述数值大的多。上述数值可以被认为是经采取保护措施后的剩余部分。

Sloshing by sea can induce forces much greater than the figure given above. this figure should be considered as remaining unavoidable after adequate measures to prevent overcoming seas.

仅就高于露天甲板或舱口 2 M 以下的范围内的甲板货考虑飞溅力。

在限制航区航行可以忽略飞溅力。

Sea sloshing forces need only be applied to height of deck cargo up to 2m above the weather deck or hatch top.

For voyages in restricted area sea sloshing forces may be neglected.

7.2 力和力矩的平衡(Balance of forces and moments)

平衡计算应包括如下内容:

The balance calculation should preferably be carried out for:

- 向左、右舷的横向滑动
- transverse sliding in port and starboard directions
- 向左、右舷的横向转动
- transverse tipping in port and starboard direction
- 在减少摩擦的条件下向前、后的纵向滑动
- longitudinal sliding under conditions of reduced friction in forward and aft direction

若系固安排是对称的,则可仅计算一次。

In the case of symmetrical securing arrangements, one appropriate calculation is sufficient.

7.2.1 横向滑动(Transverse sliding)

平衡计算应在如下条件下进行(见图 1)

The balance calculation should meet the following condition(see also figure 1)

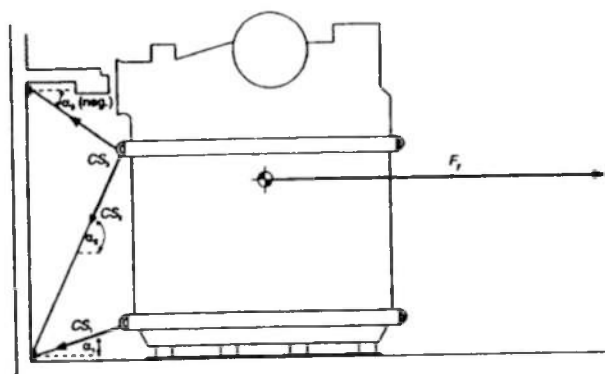


Figure 1 - Balance of transverse forces

$$F_y \leq \mu mg + CS_1 f_1 + CS_2 f_2 + \dots + CS_n f_n$$

其中(where):

n: 纳入计算的系索的根数(the number of lashings being calculated);

F_y : 由外力假设而得到的横向力(transverse force from load assumption),kN;

μ : 摩擦系数(friction coefficient);

($\mu=0.3$ 钢、木或钢、橡胶(for steel-timber or steel-rubber))

($\mu=0.1$ 干燥的钢、钢(for steel -steel, dry))

($\mu=0.0$ 潮湿的钢、钢(for steel-steel, wet))

m: 货物质量(mass of the cargo unit),t;

g: 地球重力加速度,取 9.81m/s^2 (gravity acceleration of earth= 9.81m/s^2);

CS: 横向系固设备的计算强度,(calculated strength of transverse securing devices)
kN;

f: μ 和垂向系固角 α 的函数(见表 5)(a function of μ and the vertical securing angle α (see Table 5)).

作为 μ 和 α 的函数的 f 的值/即 $f=\mu \cdot \sin \alpha+\cos \alpha$

f-values as function of α and μ /Remark: $f=\mu \cdot \sin \alpha+\cos \alpha$

表 5 (Table 5)

$\mu \backslash \alpha$	-30°	-20°	-10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
0.3	0.72	0.84	0.93	1.00	1.04	1.04	1.02	0.96	0.87	0.76	0.62	0.47	0.30
0.1	0.82	0.91	0.97	1.00	1.00	0.97	0.92	0.83	0.72	0.59	0.44	0.27	0.10
0.0	0.87	0.94	0.98	1.00	0.98	0.94	0.87	0.77	0.64	0.50	0.34	0.17	0.00

当垂向系固角大于 60° 时将降低系固设备在防止货物单元滑动方面的作用,应考虑在平衡计算中不计入该系固设备,除非它用于防止翻转和提供预应力。

A vertical securing angle α greater than 60° will reduce the effectiveness of this particular securing device in respect to sliding of the units. Disregarding of such devices from the balance of forces should be considered, unless the necessary load is gained by the imminent tendency to tipping or by a reliable pre-tensioning of the securing device and maintain the pre-tension throughout the voyage.

水平系固角不应大于 30° , 否则该系索不应纳入横向滑动平衡计算。

Any horizontal securing angle ,i.e. deviation from the transverse direction, should not exceed 30° , otherwise an exclusion of this device from the transverse sliding balance should be considered.

7.2.2 横向翻转(Transverse tipping)

平衡应满足下式(见图 2):

This balance calculation should meet the following condition(see also Figure 2):

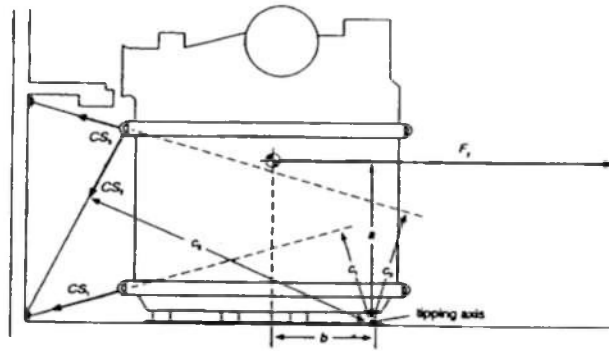


Figure 2 - Balance of transverse moments

$$F_y a \leq bmg + CS_1 c_1 + CS_2 c_2 + \dots + CS_n c_n$$

其中(where):

F_y , m , g , CS , n 同上述 7.2.1 (F_y , m , g , CS , n are as explained under 7.2.1);

a : 翻转力臂(见图 2)(lever-arm of tipping (see Figure 2)), m ;

b : 稳定力臂(见图 2)(lever-arm of stability(see Figure 2)), m ;

c : 系固力臂(见图 2)(lever-arm of securing force(see Figure 2)), m 。

7.2.3 纵向滑动(longitudinal sliding)

在常规情况下,横向的系固装置的纵向分力足够防止纵向滑动。如存在疑问,则应满足下式:

Under normal conditions the transverse securing devices provided sufficient longitudinal components to prevent longitudinal sliding. If in doubt, a balance calculation should meet the following condition:

$$F_x \leq \mu (mg - F_z) + CS_1 f_1 + CS_2 f_2 + \dots + CS_n f_n$$

其中(where):

F_x : 由外力假设而得到的纵向力(longitudinal force from load assumption), kN ;

μ , m , g , f , n 同 7.2.1 (μ , m , g , f , n are as explained under 7.2.1);

F_z :由外力假设而得到的垂向力(vertical force from load assumption), kN ;

CS: 纵向系固设备的计算强度(calculated strength of longitudinal securing devices),kN。

注:横向系索的纵向分力不应大于 0.5CS。

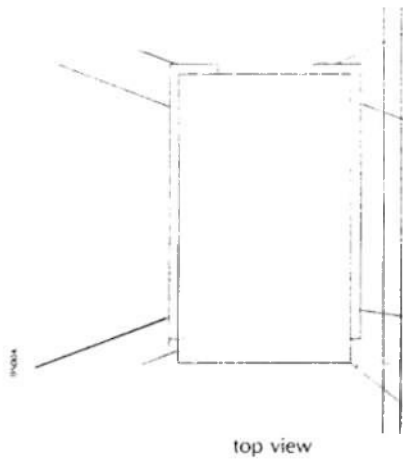
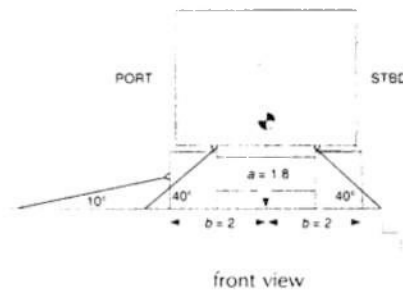
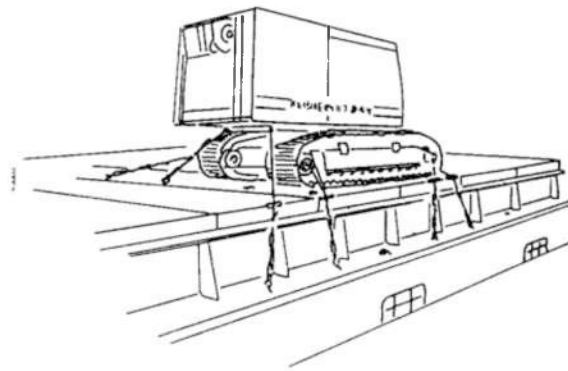
Remark: Longitudinal components of transverse securing devices should not be assumed greater than 0.5 CS.

改进计算方法算例(Advanced calculation method: calculated example)

船舶(Ship): $L=120\text{m}$; $B=16\text{m}$; $GM=1.4\text{m}$; 航速(speed)=15 节(knots)

货物(Cargo): $m=62\text{t}$; 尺寸(dimensions)= $6\text{m}\times 4\text{m}\times 4\text{m}$; 积载在甲板下 0.7 L

船长处(storage at 0.7 L on deck low)



系固材料(Securing material):

钢丝绳(wire rope):

破断强度(breaking strength)=125kN;MSL=100kN

卸扣(shackles), 松紧螺丝(turnbuckles) 甲板环(deck rings):

破断强度(breaking strength)=180kN;MSL=90kN

装在垫货材上(stowage on dunnage boards):

$$\mu=0.3; CS=90/1.5=60kN$$

系固布置 (Securing arrangement):

边(side)	n	CS	α	f	c
右舷(stbd)	4	60kN	40 °	0.96	-
左舷(port)	2	60kN	40 °	0.96	-
左舷(port)	2	60kN	10 °	1.04	-

外力(External forces):

$$F_x=2.9 \times 0.89 \times 62 + 16 + 8 = 184kN$$

$$F_y=6.3 \times 0.89 \times 62 + 24 + 12 = 384kN$$

$$F_z=6.2 \times 0.89 \times 62 = 342kN$$

力的平衡(Balance of forces): (左舷布置(port arrangement)):

$$384 < 0.3 \times 62 \times 9.81 + 2 \times 60 \times 0.96 + 2 \times 60 \times 1.04$$

$$384 < 422 \quad \text{满足(this is OK)}$$

力的平衡(Balance of forces): (右舷布置(stbd arrangement)):

$$384 < 0.3 \times 62 \times 9.81 + 4 \times 60 \times 0.96$$

$$384 < 412 \quad \text{满足(this is OK)}$$

力矩的平衡(Balance of moments):

$$384 \times 1.8 < 2 \times 62 \times 9.81$$

$$691 < 1216 \quad \text{即使没有绑扎也不会翻转(no tipping, even without lashing) !}$$

注(Remark):

船上货物单元的受力计算应根据附录一给出的表格进行。

Evaluation of forces acting on cargo units on board should be verified in accordance with the table given in Appendix 1

对评估非标准货物系固装置有效性的方法的说明和解释

Explanations and interpretation of “methods to assess the efficiency of securing arrangements for non-standardized cargo”

1. 应了解按本规则第 1.8 章的规定装运特重货物件所采纳方法范围以外情况,为在特定气象条件和海浪条件下运输时提供采纳堆装和系固此类重货件的方法。对范围以外情况的了解并不是对货物件所采纳的方法限止到某一重量或尺寸。

The exclusion of very heavy units as carried under the provisions of chapter 1.8 of the Code from the scope of application of the methods should be understood to accommodate the possibility of adapting the stowage and securing of such units to specifically determined weather conditions and sea conditions during transport. The exclusion should not be understood as being a restriction of the methods to units up to a certain mass or dimension.

2. 表 2 给出的加速度数与修正系数一起代表一个 25 天航程的峰值。这一点并不表示在 x、y 和 z 轴向的峰值以相同的概率同时发生。一般可以这样假设即横向峰值将与小于 60%的纵向和垂向峰值一起出现。

纵向和垂向的峰值可以更紧密地参与进来。由于它们都有纵倾和升沉的共同源。

The acceleration figures given in Table 2 in combination with the correction factors represent peak values on a 25-day voyage. This does not imply that peak value in x,y and z directions occur simultaneously with the same probability. It can be generally assumed that peak values in the transverse direction will appear in combination with less than 60% of the peak values in longitudinal and vertical directions.

Peak values in longitudinal and vertical directions may be associated more closely because they have the common source of pitching and heaving.

3. 改进计算方法使用了“最差条件方法”。这一点可以通过横向加速度数清楚地表示出来,这些数值在船舶的首部和尾部的增大并显示出同时产生的垂向加速度的横向分力的影响。因此在力和力矩的横向平衡中不必分别考虑垂向加速度。这些同时作用的垂向加速度会引起货件的重量明显增大,因而促进力平衡中的摩擦力以及力矩平衡中各力矩

的稳定性。正因为如此,没有由于现有的横倾角而减小法向力 $m \cdot g$ 。

这种情况对纵向滑动平衡是不同的。最差的情况将是纵向力 F_x 伴随由垂向力 F_z 极大减小重量的峰值。

The advanced calculation method uses the “worst case approach”. That is expressed clearly by the transverse acceleration figures, which increase to forward and aft in the ship and thereby show the influence of transverse components of simultaneous vertical acceleration. Consequently there is no need to consider vertical accelerations separately in the balance of transverse forces and the moments. These simultaneously acting vertical acceleration create an apparent increase of weight of the unit and thus increase the effect of the friction in the balance of moments. For this reason there is no reduction of the force $m \cdot g$ normal to the deck due to the presence of an angle of heel.

The situation is different for the longitudinal sliding balance. The worst case would be a peak value of the longitudinal force F_x accompanied by an extreme reduction of weight through the vertical force F_z .

4. 在这些方法中显示的摩擦系数是对其他出版物中适用数值进行某种减小。关于这一点情理应该在实际航运中可能出现的各种影响之中体现出来:如湿度、油脂、油、灰和其他残杂物、船舶的振动。

应备有据说可大大增加摩擦的某种装堆材料。对这些材料的扩大使用可给实际应用中带进附加的系数。

The friction coefficients shown in the methods are somewhat reduced against appropriate figures in other publications. The reason for this should be seen in various influence which may appear in practical shipping, as: moisture, grease, oil, dust and other residues, vibration of the ship.

There are certain stowage materials available which are said to increase friction considerably. Extended experience with these materials may bring additional coefficients into practical use.

5. 对复杂系固装置中的系固分力计算力的主要方法应必要包括考虑每个单一系固分力的如下情况:

- 负荷伸长特性(弹性);

- 几何布置(角度、长度);
- 预应力。

此计算方法要求大量的信息和复杂且迭代运算。但是计算结果仍然因不定参数而不能确定。因此选择了简化计算方法,即假定每个分力取计算强度的均匀负荷,该计算强度对最大系固负荷是以安全系数为 1.5 而减小。

The principal way of calculating forces within the securing elements of a complex securing arrangement should necessarily include the consideration of :

- load-elongation behavior(elasticity),
- geometrical arrangement(angles, length),
- pretension,

of each individual securing element.

This approach would require a large volume of information and a complex, iterative calculation. The results would still be doubtful due to uncertain parameters.

Therefore the simplified approach was chosen with the assumption that the elements take an even load of CS (calculated strength) which is reduced against the MSL (maximum securing load) by the safety factor 1.5.

6. 当应用改进计算方法时,收集数据的方法应按照在计算样例中所示的方法。估算系固角度,对一组绑扎取平均角度,同样对力矩平衡取力臂合适的 a、b 和 c 数值。

应该有所了解的是仅通过一个或其他参数的一点细微变化表示满足或失去平衡计算不管如何表示已接近目标。在安全和非安全之间就没有清晰的分界线。因此该系固装置应有所改进。

When employing the advanced calculation methode, the way of collecting data should be followed as shown in the calculated example. It is acceptable to estimate securing angles, to take average angles for a set of lashings and similarly to arrive at reasonable figures of the levers a,b and c for the balance of moments.

It should be borne in mind that meeting or missing the balance calculation just by a tiny chance of one or the other parameters indicates to be near the goal anyway. There is no clear-cut borderline between safety and non-safety, If in doubt, the arrangement should be improved.

7. 根据 OMCS 附则 13, 以下给出推荐的专用计算表格:

According to OMCS supplementary provisions 13 , provide the special-purpose computation sheet recommended as follows:

计算表格 1 加速度值								
K1	船长		(m)	GM0	K8			
K2	型宽		(m)		甲二层	甲二层	二甲板	底货舱
K3	航速		(kn)					
K4	初稳性高度 GM0		(m)					
K5	货物单元的重心距 A.P 的距离		(m)					
K6	K6=K5/K1		(-)					
K7	与船长和航速有关的修正系数		(-)					
K8	B/GM0<13 时的修正系数		(-)					
基本加速度值					甲二层	甲二层	二甲板	底货舱
K9	纵向基本加速度		(m/S2)					
K10	垂向基本加速度(根据 K6 查表 1)		(m/S2)					
K11	横向基本加速度(根据 K6 查表 1)		(m/s2)					
加速度值					甲二层	甲二层	二甲板	底货舱
K12	纵向加速度=K9*K7		(m/s2)					
K13	垂向加速度=K10*K7		(m/s2)					
K14	横向加速度=K11*K7*K8		(m/s2)					

计算表格2 横向滑移和翻转 方向： 左舷或右舷													
K1	货物单元质量		(t)	外力计算									
K2	翻转力臂		(m)	K8	滑移力=K1*K5+K6*p1+K7*p2							(kN)	
K3	稳定力臂		(m)	K9	翻转力矩=K8*K2							(kN. m)	
K4	摩擦系数		(-)	货物稳定特性									
K5	横向加速度		(m/s ²)										
K6	受风面积		m ²	K10	摩擦力=9.81*K1*K4							(kN)	
K7	受飞溅面积		m ²	K11	稳定力矩=9.81*K3*K1							(kN. m)	
绑扎表													
绑扎编号		1	2	3	4	5	6	7	8	9	10		
K12	MSL (kN)												
K13	垂向绑扎角												
K14	f值（查表4）												
K15=0.67*K12*K14											K18=Σ K15 ₁₋₁₀		
K15	滑移（kN）											K18	
K16	系固力臂（m）												
K17=0.67*K12*K16											K19=Σ K17 ₁₋₁₀		
K17	翻转(kN.m)											K19	
平衡计算及衡准													
滑移	K8		K10		K18		K10+K18	不满足/满足					
(kN)		<		+		=							
翻转	K9						K11+K19	不满足/满足					
(kN. m)		<		+		=							

注：风力 p1=1kN/m2 飞溅力 p2=1kN/m2

计算表格3 纵向滑移 方向： 船艏或船艉												
K1	货物单元质量		(t)	外力计算								
K2	摩擦系数		(-)	K7	滑移力=K1*K3+K5*p1+K6*p2						(kN)	
K3	纵向加速度		(m/s ²)	货物稳定特性								
K4	垂向加速度		(m/s ²)									
K5	受风面积		m ²									
K6	受飞溅面积		m ²	K8	摩擦力=(9.81-K4)*K1*K2						(kN)	
绑扎表												
绑扎编号		1	2	3	4	5	6	7	8	9	10	
K9	MSL (kN)											
K10	垂向绑扎角											
K11	f值 (查表4)											
K12=0.67*K9*K11或K12=0.67*0.5*K9(取较小值) (注：该系索为横向系索)												
K12=0.67*K9*K11 (注：该系索为纵向系索)											K13=Σ K12 ₁₋₁₀	
K12	滑移(kN)											K13
平衡计算及衡准												
滑移	K7		K8		K13		K8+K13	不满足/满足				
(kN)		<		+		=						

注：风力 p1=1kN/m2 飞溅力 p2=1kN/m2

3.3 各种货物单元、车辆和积载容器上的可移动系固装置的使用

Application of portable securing devices on various cargo units, vehicles and stowage blocks

3.3.1 正确使用可移动系固装置的注意事项

Attention to the correct application of portable securing devices 船

长应认真注意可移动系固装置的正确使用,考虑下列各种因素:

The master is to pay careful attention to the correct application of portable securing devices taking into account the following:

.1 航程时间

duration of the voyage;

.2 航程的地理区域,特别应考虑可移动系固装置的最低安全工作温度;

geographical area of the voyage with particular regard to the minimum safe operational temperature of the portable securing devices;

.3 可预见的海况;

sea condition which may be expected;

.4 船舶的大小、设计及特点;

dimensions, design and characteristic of the ship;

.5 航行中可预见的静、动态外力;

expected static and dynamic forces during the voyage;

.6 所运载的货物单元和车辆的种类和包装形式;

type and packaging of cargo units including vehicles;

.7 货物单元和车辆的预计积载形式;

intended stowage pattern of the cargo units including vehicles;

.8 货物单元和车辆的重量和尺寸。

mass and dimensions of the cargo units and vehicles.

3.3.2 可移动系固装置的使用方法

Application of portable cargo securing devices

使用可移动系固装置时,应特别注意以下几点:

particular attention is to be given to the following points when applying portable securing devices:

- .1 系固任何货物之前，要确认所有系固装置均处于良好工作状态。

Prior to securing of any cargo, it should be confirm that all securing devices are in good working condition.

- .2 应特别注意尽实际可能使货物系固装置间受力均匀。

Particular care should be taken to distribute forces as evenly as practicable between the cargo securing devices.

- .3 如货物和平轨架集装箱底部或货物单元间的摩擦力不足以避免滑动的危险,则应使用软板、垫板或其他止滑材料来增加摩擦力以防止滑动或错动。

Where friction between the cargo and the bottom of flat rack containers or between cargo units is insufficient to avoid the risk of sliding, suitable material such as soft boards, dunnage, or other anti-skid material should be used to increase friction and prevent such sliding or slippage.

3.3.3 对货物积载和系固的位置和方法的指导和建议

Guidance as to recommended location and method of stowage and securing of cargoes

对货物积载和系固的位置和方法的指导和建议在下面的“OMCS 规则”附则中给出:

Guidance as to recommended location and method of stowage and securing of cargo is shown in Annex to OMCS Code listed below:

附则 1 (ANNEX 1)

不是特别设计和装备用于运输集装箱的船舶

甲板上的集装箱的安全积载和系固

Safe stowage and securing of containers on deck of ships which are not specially designed and fitted for the purpose of carrying containers

1. 积载 (Stowage)

1.1 装在这类船舶甲板或舱口盖上的集装箱最好沿首尾方向积载。

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

1.2 集装箱不应超出船舷。当集装箱伸出舱口盖或甲板结构物外时应提供适当的支架。

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

1.3 集装箱的积载和系固应能允许从事船舶必要作业的人员安全走近或通过。

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

1.4 集装箱在任何时候都不应使承载它们的甲板或舱口盖受到过度应力。

Containers should at no time over stress the deck or hatches on which they are stowed.

1.5 底层集装箱，当不是放在堆码装置上时，应积载在有足够厚度的木材上，其布置应能使堆积的负荷均匀地转移到积载区域的结构物上。

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

1.6 在堆置集装箱时，在集装箱间应视情况使用锁紧装置、定位锥或相似的堆垛器材。

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

1.7 当在甲板或舱口盖上积载集装箱时，应考虑到系固点的位置和强度。

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

2. 系固 (Securing)

2.1 所有集装箱应有效地系固，使之不会滑动和翻倒。承载集装箱的舱口盖应适当地系固在船上。

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

2.2 集装箱应使用图 1 推荐的三种方法之一或与此等效的方法系固。

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

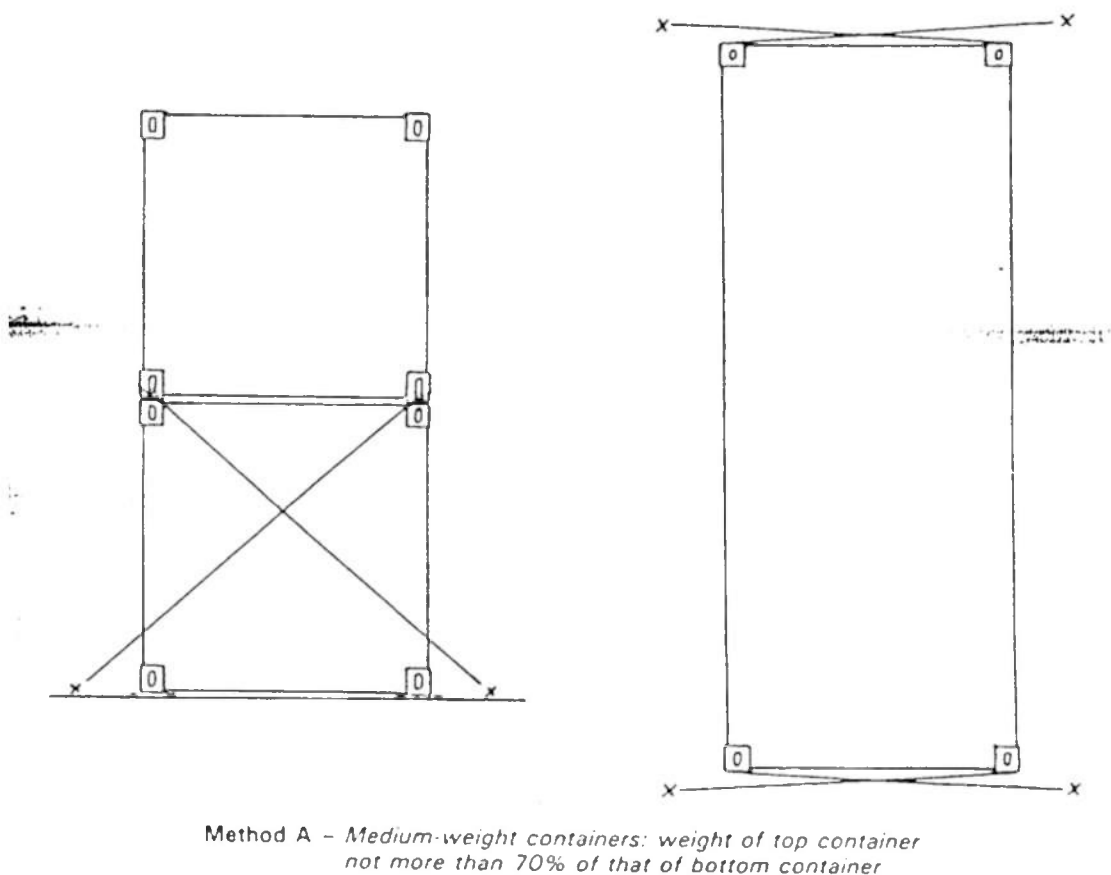
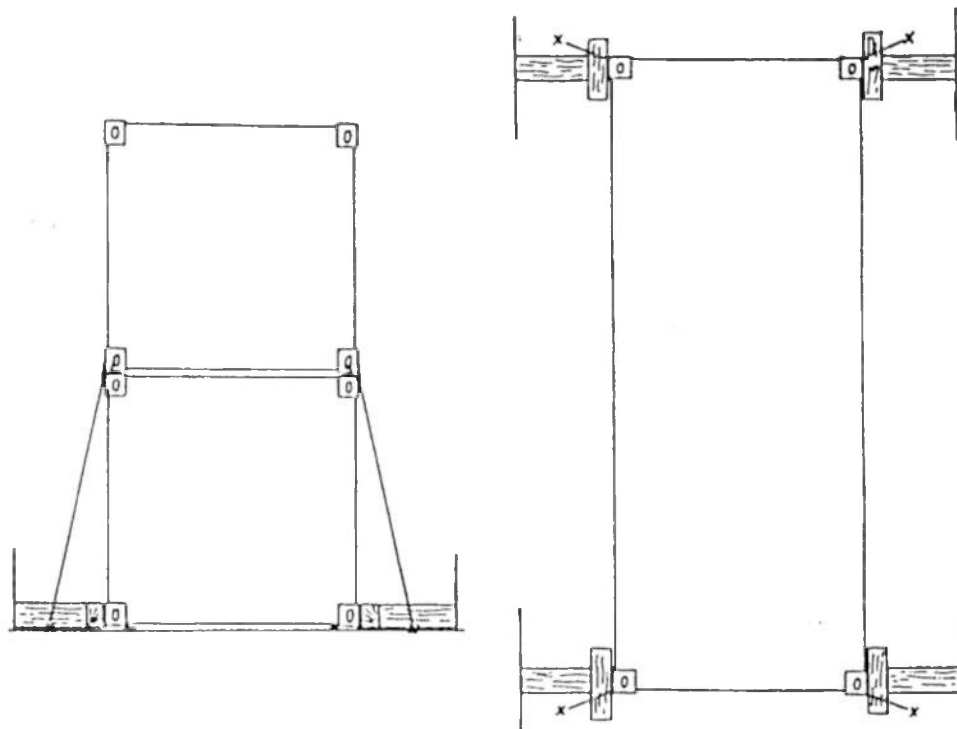
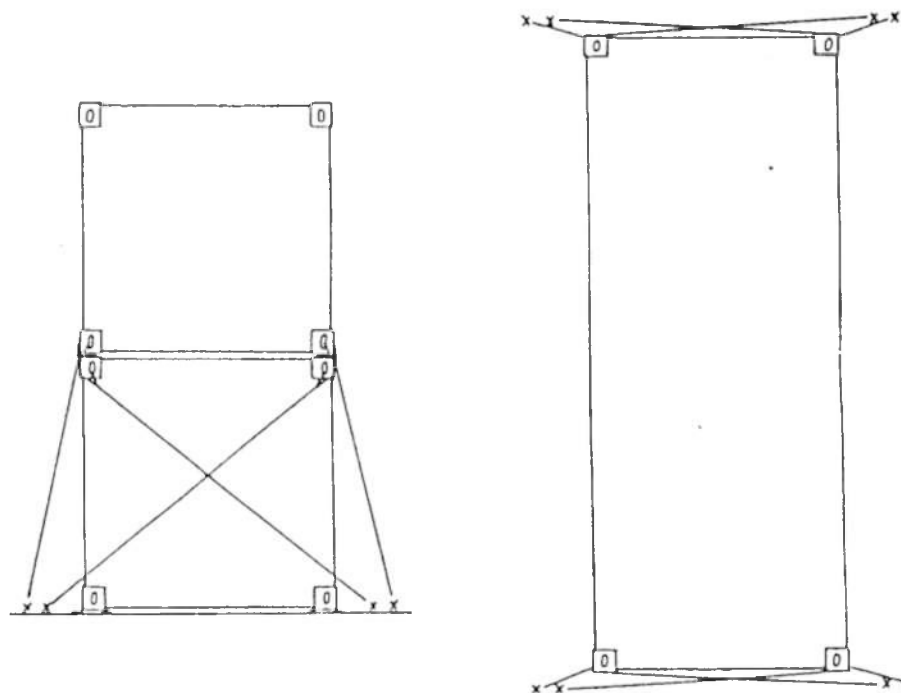


Figure 1 - Recommended methods of non-standardized securing of containers



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



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

Figure 1 (cont.) – Recommended methods of non-standardized securing of containers

2.3 绑绳最好由钢丝绳或链条或具有等效强度和伸长特性的材料构成。

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

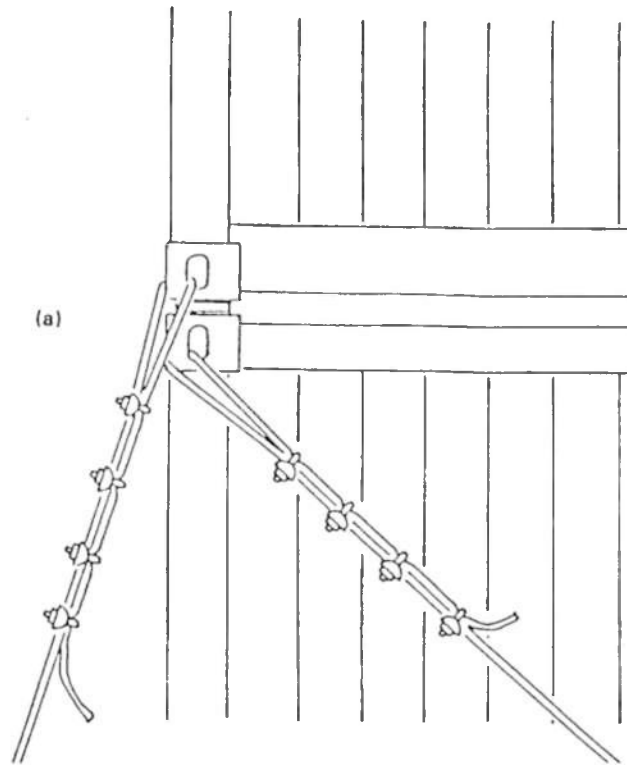
2.4 木横支架的长度不应超过 2 米。

Timber shoring should not exceed 2m in length.

2.5 钢丝夹应有适量油脂，并拉紧至钢丝绳的终端明显受到压力（图 2）

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

Fastening of wire lashings to corner fittings



Alternative constructions of wire lashings

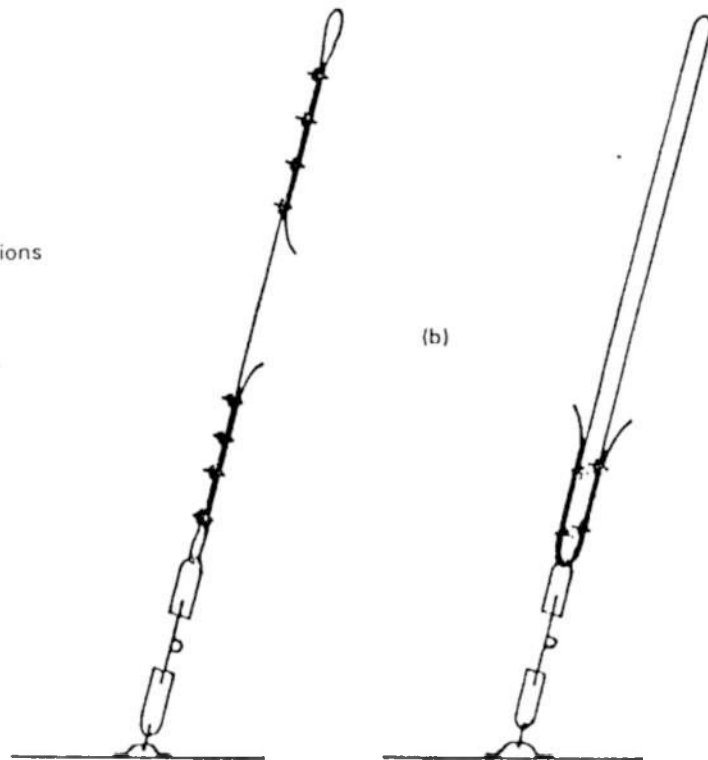


Figure 2

2.6 绑绳在可能时应受到均匀的拉力。

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

附则 2 （Annex 2）

移动式罐柜的安全积载和系固

Safe stowage and securing of portable tanks

1.1 本附则的规定适用于移动式罐柜，在本附则中，它们系指非永久性系固在船上、容积大于 450 升、其外壳装有外部稳定构件和运输液体、固体或气体所必须的维修工具和结构性设备的罐柜。

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

1.2 这些规定不适用于容积等于或小于 450 升、运输液体、固体或气体的罐柜。

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

注：装运气体的移动式罐柜的容积应等于或大于 1000 升。

Note: The capacity for portable tanks for gases is 1000 l or more.

2. 对移动式罐柜的一般规定

General provisions for portable tanks

2.1 移动式罐柜应能在不必移开其结构设备的情况下装卸，并能在装有货物时在船上吊上吊下。

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

2.2 经修正的《1972 年国际集装箱安全公约》的适用要求，符合该公约集装箱定义的任何罐柜式集装箱均应满足。此外，《国际危规》总前言第 13 节的规定，在罐柜用于运输危险货物时，也应予以满足。

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

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