Transportstyrelsens författningssamling

TRANSPORT STYRELSEN

TSFS 2018:89

Utkom från trycket
den 2 november 2018

SJÖFART

Föreskrifter om ändring i Transportstyrelsens föreskrifter och allmänna råd (TSFS 2010:174) om transport av last på fartyg och terminaler som anlöps av fartyg som lastar eller lossar fast bulklast;

beslutade den 25 oktober 2018.

Transportstyrelsen föreskriver med stöd av 2 kap. 4 § fartygssäkerhetsförordningen (2003:438) i fråga om styrelsens föreskrifter och allmänna råd (TSFS 2010:174) om transport av last på fartyg och terminaler som anlöps av fartyg som lastar eller lossar fast bulklast

dels att 1 kap. 2, 3, 7, 10, 12 och 13 §§, 2 kap. 1, 2, 4 och 5 §§, bilaga 2, 3, 9 och 10 samt rubrikerna närmast före 1 kap. 6 § och 2 kap. ska ha följande lydelse,

dels att det ska införas ett nytt kapitel, 6 kap., och en ny paragraf, 2 kap. 5 a §, av följande lydelse,

och beslutar följande allmänna råd.

1 kap.

2 § I dessa föreskrifter används följande definitioner, om inte annat särskilt anges:

container	en transportanordning som är 1. tillräckligt motståndskraftig för att medge upprepad användning, 2. konstruerad för att underlätta godstransporter med ett eller flera transportsätt utan att godset lastas om, 3. konstruerad för att lätt kunna förankras och hanteras och för de ändamålen försedd med en särskild anordning av öppningar och ytor, som är placerad på containerns över- eller undersida för att möjliggöra hantering, stapling eller förankring (hörnbeslag), och 4. så stor att den yta som omfattas av de fyra yttre bottenhörnen är antingen minst 14 m2 (150 kvadratfot) eller, om containern är försedd med övre hörnbeslag, minst 7 m2 (75 kvadratfot)

CSS-koden	koden för säker stuvning och säkring av last, (Code of Safe Practice for Cargo Stowage and Securing) antagen genom IMO-resolution A.714(17), ändrad genom IMO-cirkulären MSC/Circ.664, MSC/-Circ.691, MSC/ Circ.740, MSC/Circ.812, MSC/-Circ.1026, MSC/ Circ.1352 och MSC.1/Circ.1352/ Rev.1
fartområde	sådan indelning av farvatten som följer av fartygssäkerhetsförordningen (2003:438) och Transportstyrelsens föreskrifter (TSFS 2009:8) om fartområdenas indelning
fast bulklast	alla material, utom vätskor och gaser, som består av en kombination av partiklar, granulat eller större bitar av material, i allmänhet likformiga till sin sammansättning, som lastas direkt ner i fartygets lastutrymmen utan någon mellanliggande form av inneslutning
fysisk blandning	process där ett fartygs lastpumpar och rörsystem används för att cirkulera två eller flera olika laster inuti fartyget i syfte att generera en last med en ny produktbeteckning
förstängning	(blockering) metod att hindra last att glida och, om förstängningen sträcker sig tillräckligt högt upp, även att tippa
IMO	den internationella sjöfartsorganisationen (International Maritime Organization)
lastinformation	de upplysningar om lasten som krävs enligt 1 kap. 3 och 4 §§
lastsäkring	metoder för att hålla kvar lasten i avsett läge under transport
lastsäkrings-utrustning	all utrustning som i något avseende används för lastsäkring
låsning	mekaniskt fastgörande av last så att den hindras att glida och/eller tippa
MBL	lastsäkringsutrustningens brottstyrka (Minimum Breaking Load)
MSL	maximal tillåten belastning av lastsäkringsutrustningen (Maximum Securing Load)
paketgods	gods samlat i mindre lastbärare, såsom kartonger eller lådor, fristående eller på öppen pall

produktions-process	avsiktlig verksamhet där det sker en kemisk reaktion mellan fartygslaster eller mellan fartygslast och något annat ämne
skrovlängd	skrovets största längd inklusive fast anbringad utrustning och varaktigt integrerade tillbehör
spannmål	vete, råg, korn, havre, majs, ris, frön, baljfrukter och bearbetade former av dessa, vilkas beteende liknar spannmålets i dess naturliga form
spannmålskoden	den internationella koden för transport av spannmål i bulk (International Code for the Safe Carriage of Grain in Bulk) antagen genom IMO-resolution MSC.23(59)
surrning	metoder för att med hjälp av lastsäkringsutrustning förhindra last från att glida och/eller tippa
terminal	varje fast, flytande eller rörlig anläggning som är utrustad och används för att lasta eller lossa fasta bulklaster i eller ur bulkfartyg
terminaloperatör	ägaren av en terminal eller den fysiska eller juridiska person till vilken ägaren har överlämnat ansvaret för den lastning och lossning av ett enskilt bulkfartyg som utförs vid terminalen
terminal-representant	den person som utsetts av terminaloperatören att ha det övergripande ansvaret för och rätten att vid terminalen kontrollera lastningen eller lossningen av ett enskilt bulkfartyg
timmerlastkoden	2011 års kod för säkerheten vid transport av timmer som däckslast, (Code of Safe Practice for Ships carrying Timber Deck Cargoes, 2011 (2011 TDC Code) antagen genom IMO-resolution A.1048(27) med rättelse
transportköpare	person som ingår ett godstransportavtal med en transportör eller i vars namn eller på vars vägnar ett sådant avtal ingås
verifierad bruttovikt (VGM)	bruttovikten av en packad container bestämd genom tillämpning av någon av två metoder enligt bilaga 1

3 §[1] Befälhavaren ska kunna säkerställa att

1. olika typer av last är kompatibla med varandra och tillräckligt separerade från varandra,

[1] Motsvarar SOLAS regel VI/1.2 och 2.1-2.

2. lasten är anpassad för fartyget,
3. lasten kan lastas, stuvas och säkras på ett erforderligt sätt, och
4. containrar som lastas ombord har en verifierad bruttovikt (VGM).

Befälhavaren ska därför i god tid före lastning se till att han har nödvändig information om lasten. För fartyg med en bruttodräktighet om 500 och däröver ska informationen framgå av ett formulär för lastinformation. Formuläret får vara i elektronisk form.

Kravet i första stycket 4 gäller inte containrar på nationell resa eller containrar på chassi eller trailer som körs på eller av ett ro-ro-fartyg på kort internationell resa.

Allmänna råd

Formuläret om lastinformation kan ha det utseende som framgår av bilaga 1. Om någon annan typ av informationsbärare används ska den informationen omfatta åtminstone samma uppgifter som framgår av formuläret i bilaga 1.

Riktlinjer för vilka uppgifter som bör finnas med i lastinformationen finns för respektive last i CSS-koden (bilaga 3), i timmerlastkoden (bilaga 4), spannmålskoden (bilaga 21) samt i IMO-cirkulär MSC/Circ.525, MSC/Circ.548 och MSC/Circ.663.

Stuvning och säkring av last på fartyg

6 § Fartyg ska vara lastade och barlastade så att fartygets sjövärdighet bibehålls under hela transporten. Last som förs på eller under däck ska lastas, stuvas och säkras så att

– fartygets stabilitet eller strukturella styrka inte äventyras,
– lasten inte förskjuts under transporten, och
– säkerheten för fartyget eller de ombordvarande inte äventyras på annat sätt.

7 § För alla typer av last gäller följande: surrningsdon, låsningsdon, förstängningsdon och andra säkringsanordningar ska, vad gäller antal, styrka och elasticitet, dimensioneras så att

1. arrangemangen kan ta upp de krafter som uppstår till följd av de dimensionerande accelerationerna, och
2. lasten inte förskjuts.

Endast funktionsduglig utrustning med erforderlig styrka får användas för säkring av last ombord på fartyg.

Den säkerhetsnivå som framgår av dessa föreskrifter kan behöva höjas, om extraordinära förhållanden så kräver.

Allmänna råd

Surrningsutrustning och luftkuddar för säkring av last bör vara märkt med antingen MSL eller MBL. Saknar utrustningen uppgift om

MSL kan MSL för olika typer av utrustning beräknas enligt bilaga 9, avsnitt ”Säkerhetsfaktorer”.

10 §[2] Lastsäkringsmanualen ska innehålla anvisningar för stuvning och säkring av last i enlighet med bestämmelserna i IMO-cirkulär MSC.1/-Circ.1353/Rev.1, med undantag för vad som gäller enligt 11 §. Den arabiska, engelska, franska, kinesiska, ryska och spanska texten av cirkuläret ska ha samma giltighet[3]. Cirkuläret finns på engelska i bilaga 2 till dessa föreskrifter.

12 §[4] Vid upprättande av lastsäkringsmanualer för svenska fartyg ska, med undantag för vad som gäller enligt 13 §, beroende av lastens och fartygets beskaffenhet, bestämmelserna i punkt 1–3 nedan följas.

1. CSS-koden.
2. Timmerlastkoden.
3. IMO-resolutionerna A.489(XII), A.533(13) ändrad genom MSC.1/-Circ.1354 och A.581(14) ändrad genom MSC/Circ.812 och MSC.1/-Circ.1355.

En annan metod, än de som anges i 1–3, som säkerställer en likvärdig eller högre säkerhetsnivå kan godtas efter beslut från Transportstyrelsen.

Den arabiska, engelska, franska, kinesiska, ryska och spanska texten av koderna och resolutionerna ska ha samma giltighet. CSS-koden, timmerlastkoden och ovannämnda IMO-resolutioner finns på engelska i bilaga 3–8 till dessa föreskrifter.

Vid tillämpning av annex 13 i CSS-koden får de framräknade accelerationerna (a) reduceras i farvatten med begränsade signifikanta våghöjder (H_S) i meter enligt nedanstående formel där a_R avser de reducerade accelerationerna:

$$a_R = a \cdot \left(\frac{H_s}{19{,}6} \right)^{\frac{1}{3}}$$

13 § Vid upprättande av lastsäkringsmanualer med förenklat innehåll enligt 11 § behöver inte bestämmelserna i 12 § tillämpas. I stället får lastsäkringsarrangemanget dimensioneras enligt 2 kap. beroende på lastens och fartygets beskaffenhet.

[2] Motsvarar SOLAS regel VI/5.6.
[3] Texterna på arabiska, franska, kinesiska, ryska och spanska finns tillgängliga hos IMO.
[4] Motsvarar SOLAS regel VI/1.2 och 5.1-2.

2 kap. Säkring av last i eller på lastbärare

1 § Detta kapitel gäller säkring av last i eller på lastbärare avsedda för sjötransport.

Kapitlet gäller inte

1. paketgods som ska transporteras i fartområde E,
2. paketgods som ska transporteras på inre vattenvägar i zon 3 eller 4, eller
3. gods som ska transporteras med vägfärja i trafik på ordinarie färjeled.

2 § Gods som transporteras med vägfärja i trafik på ordinarie färjeled omfattas i stället av bestämmelserna i Transportstyrelsens föreskrifter och allmänna råd (TSFS 2017:25) om lastsäkring och kontroll av lastsäkring på och i fordon.

4 § Last i eller på lastbärare ska vara säkrad genom låsning, förstängning eller surrning, genom en kombination av dessa lastsäkringsmetoder eller genom annan metod i den omfattning som krävs för att förhindra lastförskjutning. Endast funktionsduglig utrustning med erforderlig styrka får användas för säkring av last.

Allmänna råd

För att uppfylla kravet på lastsäkring bör lastsäkring i eller på lastbärare anordnas på ett sätt som minst motsvarar kraven i CTU-koden (IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code), publicerad i IMO:s cirkulär MSC.1/Circ.1497). Ytterligare information om CTU-kodens tillämpning finns i MSC.1/Circ.1498 (Informative Material Related to the CTU Code).

Personal som är involverad i lastning och säkring av gods i lastbärare bör ha erforderliga kunskaper så att kraven i CTU-koden är uppfyllda genom att ha relevant utbildning i enlighet med kapitel 13 i CTU-koden.

Som stöd för transportköpare vid val av olika aktörer i transportkedjan finns IMO cirkulär MSC.1/Circ.1531 ”Due diligence checklist in identifying providers of CTU-related services”.

5 § Lastsäkring i eller på lastbärare ska dimensioneras med användande av de accelerations-, friktions- och säkerhetsfaktorer som framgår av bilaga 9 till dessa föreskrifter.

Allmänna råd

För dimensionering av lastsäkring i eller på lastbärare för kombinerad transport bör de rekommendationer av accelerationsfaktorer för de respektive transportslagen som ger högsta kraven användas.

5 a § Som alternativ till dimensionering enligt 5 § får dimensionering av lastsäkring, med Transportstyrelsens godkännande, utföras genom praktiska prov enligt bilaga 10.

6 kap. Förbud mot fysisk blandning och mot produktionsprocesser på fartyg under gång[5]

1 § Detta kapitel gäller transport av flytande ämnen i bulk.

2 § Fysisk blandning av flytande bulklaster på fartyg under gång är förbjuden. Befälhavaren får, trots förbudet, förflytta last om det är nödvändigt för att trygga fartygets säkerhet eller skyddet av den marina miljön.

3 § Det är, trots förbudet i 2 §, tillåtet med fysisk blandning av flytande bulklaster på ett fartyg om

1. fartyget används för att underlätta arbete med att prospektera efter mineraler på havsbotten och bearbeta sådana mineraler, och
2. de flytande bulklaster som blandas är avsedda att användas i prospekterings- och bearbetningsprocessen.

4 § Alla produktionsprocesser ombord på fartyg under gång är förbjudna.

5 § Det är, trots förbudet i 4 §, tillåtet med produktionsprocesser av laster på ett fartyg om

1. fartyget används för att underlätta arbete med att prospektera efter mineraler på havsbotten och bearbeta sådana mineraler, och
2. lasterna är avsedda att användas i prospekterings- och bearbetningsprocessen.

Denna författning träder i kraft den 15 november 2018.

På Transportstyrelsens vägnar

JONAS BJELFVENSTAM

Johan Troive
(Sjö- och luftfart)

[5] Motsvarar SOLAS VI/5-2.

Utgivare: Kristina Nilsson, Transportstyrelsen, Norrköping ISSN 2000-1975

INTERNATIONAL MARITIME ORGANIZATION

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

MSC.1/Circ.1353/Rev.1
15 December 2014

REVISED GUIDELINES FOR THE PREPARATION OF THE CARGO SECURING MANUAL

1 In accordance with regulations VI/5 and VII/5 of the 1974 SOLAS Convention, as amended, cargo units and cargo transport units shall be loaded, stowed and secured throughout the voyage in accordance with the Cargo Securing Manual approved by the Administration, which shall be drawn up to a standard at least equivalent to the guidelines developed by the Organization.

2 The Maritime Safety Committee, at its eighty-seventh session (12 to 21 May 2010), considered the proposal by the Sub-Committee on Dangerous Goods, Solid Cargoes and Containers, at its fourteenth session (21 to 25 September 2009), and approved the *Revised guidelines for the preparation of the Cargo Securing Manua*l, as set out in the annex.

3 These revised guidelines are based on the provisions contained in the annex to MSC/Circ.745 but have been expanded to include the safe access for lashing of containers, taking into account the provisions of the Code of Safe Practice for Cargo Stowage and Securing (CSS Code), as amended. They are of a general nature and intended to provide guidance on the preparation of such Cargo Securing Manuals, which are required on all types of ships engaged in the carriage of cargoes other than solid and liquid bulk cargoes.

4 Member Governments are invited to bring these guidelines to the attention of all parties concerned, with the aim of having Cargo Securing Manuals carried on board ships prepared appropriately and in a consistent manner, and to:

.1 apply the revised guidelines in its entirety for containerships*, the keels of which were laid or which are at a similar stage of construction on or after 1 January 2015; and

.2 apply chapters 1 to 4 of the revised guidelines to existing containerships*, the keels of which were laid or which were at a similar stage of construction before 1 January 2015.

5 This circular supersedes MSC.1/Circ.1353.

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* As approved by the Maritime Safety Committee at its ninety-fourth session (17 to 21 November 2014), reference to containerships means dedicated container ships and those parts of other ships for which arrangements are specifically designed and fitted for the purpose of carrying containers on deck.

ANNEX

REVISED GUIDELINES FOR THE PREPARATION OF THE CARGO SECURING MANUAL

PREAMBLE

1 In accordance with the International Convention for the Safety of Life at Sea, 1974 (SOLAS) chapters VI, VII and the Code of Safe Practice for Cargo Stowage and Securing (CSS Code), cargo units, including containers shall be stowed and secured throughout the voyage in accordance with a Cargo Securing Manual, approved by the Administration.

2 The Cargo Securing Manual is required on all types of ships engaged in the carriage of all cargoes other than solid and liquid bulk cargoes.

3 The purpose of these guidelines is to ensure that Cargo Securing Manuals cover all relevant aspects of cargo stowage and securing and to provide a uniform approach to the preparation of Cargo Securing Manuals, their layout and content. Administrations may continue accepting Cargo Securing Manuals drafted in accordance with Containers and cargoes (BC) – Cargo Securing Manual (MSC/Circ.385) provided that they satisfy the requirements of these guidelines.

4 If necessary, those manuals should be revised explicitly when the ship is intended to carry containers in a standardized system.

5 It is important that securing devices meet acceptable functional and strength criteria applicable to the ship and its cargo. It is also important that the officers on board are aware of the magnitude and direction of the forces involved and the correct application and limitations of the cargo securing devices. The crew and other persons employed for the securing of cargoes should be instructed in the correct application and use of the cargo securing devices on board the ship.

CHAPTER 1 – GENERAL

1.1 Definitions

1.1.1 *Cargo securing devices* are all fixed and portable devices used to secure and support cargo units.

1.1.2 *Maximum securing load (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.

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

1.1.4 *Semi-standardized cargo* 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.

1.1.5 *Non-standardized cargo* means cargo which requires individual stowage and securing arrangements.

1.2 Preparation of the manual

The Cargo Securing Manual should be developed, taking into account the recommendations given in these Guidelines, and should be written in the working language or languages of the ship. If the language or languages used is not English, French or Spanish, a translation into one of these languages should be included.

1.3 General information

This chapter should contain the following general statements:

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

.2 "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 "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 "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 "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 devices being replaced."

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

.7 "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 The Cargo Safe Access Plan (CSAP) is intended to provide detailed information for persons engaged in work connected with cargo stowage and securing. Safe access should be provided and maintained in accordance with this plan.

CHAPTER 2 – SECURING DEVICES AND ARRANGEMENTS

2.1 Specification for fixed cargo securing devices

This sub-chapter should indicate and where necessary illustrate the number, locations, type and MSL of the fixed devices used to secure cargo and should as a minimum contain the following information:

2.1.1 a list and/or plan of the fixed cargo securing devices, which should be supplemented with appropriate documentation for each type of device as far as practicable. The appropriate documentation should include information as applicable regarding:

.1 name of manufacturer;

.2 type designation of item with simple sketch for ease of identification;

.3 material(s);

.4 identification marking;

.5 strength test result or ultimate tensile strength test result;

.6 result of non destructive testing; and

.7 Maximum Securing Load (MSL);

2.1.2 fixed securing devices on bulkheads, web frames, stanchions, etc. and their types (e.g. pad eyes, eyebolts, etc.), where provided, including their MSL;

2.1.3 fixed securing devices on decks and their types (e.g. elephant feet fittings, container fittings, apertures, etc.) where provided, including their MSL;

2.1.4 fixed securing devices on deckheads, where provided, listing their types and MSL; and

2.1.5 for existing ships with non-standardized fixed securing devices, the information on MSL and location of securing points is deemed sufficient.

2.2 Specification for portable cargo securing devices

This sub-chapter should describe the number of and the functional and design characteristics of the portable cargo securing devices carried on board the ship, and should be supplemented by suitable drawings or sketches if deemed necessary. It should contain the following information as applicable:

2.2.1 a list for the portable securing devices, which should be supplemented with appropriate documentation for each type of device, as far as practicable. The appropriate documentation should include information as applicable regarding:

.1 name of manufacturer;

.2 type designation of item with simple sketch for ease of identification;

.3 material(s), including minimum safe operational temperature;

.4 identification marking;

.5 strength test result or ultimate tensile strength test result;

.6 result of non destructive testing; and

.7 Maximum Securing Load (MSL);

2.2.2 container stacking fittings, container deck securing fittings, fittings for interlocking of containers, bridge-fittings, etc. their MSL and use;

2.2.3 chains, wire lashings, rods, etc. their MSL and use;

2.2.4 tensioners (e.g. turnbuckles, chain tensioners, etc.), their MSL and use;

2.2.5 securing gear for cars, if appropriate, and other vehicles, their MSL and use;

2.2.6 trestles and jacks, etc. for vehicles (trailers) where provided, including their MSL and use; and

2.2.7 anti-skid material (e.g. soft boards) for use with cargo units having low frictional characteristics.

2.3 Inspection and maintenance schemes

This sub-chapter should describe inspection and maintenance schemes of the cargo securing devices on board the ship.

2.3.1 Regular inspections and maintenance should be carried out under the responsibility of the master. Cargo securing devices inspections as a minimum should include:

.1 routine visual examinations of components being utilized; and

.2 periodic examinations/re-testing as required by the Administration. When required, the cargo securing devices concerned should be subjected to inspections by the Administration.

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

.1 procedures for accepting, maintaining and repairing or rejecting cargo securing devices; and

.2 record of inspections.

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

2.3.4 Computerized maintenance procedures may be referred to in this sub-chapter.

CHAPTER 3 – STOWAGE AND SECURING OF NON-STANDARDIZED AND SEMI-STANDARDIZED CARGO

3.1 Handling and safety instructions

This sub-chapter should contain:

.1 instructions on the proper handling of the securing devices; and

.2 safety instructions related to handling of securing devices and to securing and unsecuring of units by ship or shore personnel.

3.2 Evaluation of forces acting on cargo units

This sub-chapter should contain the following information:

.1 tables or diagrams giving a broad outline of the accelerations which can be expected in various positions on board the ship in adverse sea conditions and with a range of applicable metacentric height (GM) values;

.2 examples of the forces acting on typical cargo units when subjected to the accelerations referred to in paragraph 3.2.1 and angles of roll and metacentric height (GM) values above which the forces acting on the cargo units exceed the permissible limit for the specified securing arrangements as far as practicable;

.3 examples of how to calculate number and strength of portable securing devices required to counteract the forces referred to in 3.2.2 as well as safety factors to be used for different types of portable cargo securing devices. Calculations may be carried out according to annex 13 to the CSS Code or methods accepted by the Administration;

.4 it is recommended that the designer of a Cargo Securing Manual converts the calculation method used into a form suiting the particular ship, its securing devices and the cargo carried. This form may consist of applicable diagrams, tables or calculated examples; and

.5 other operational arrangements such as electronic data processing (EDP) or use of a loading computer may be accepted as alternatives to the requirements of the above paragraphs 3.2.1 to 3.2.4, providing that this system contains the same information.

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

3.3.1 This sub-chapter should draw the master's attention to the correct application of portable securing devices, taking into account the following factors:

.1 duration of the voyage;

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

.3 sea conditions which may be expected;

.4 dimensions, design and characteristics of the ship;

.5 expected static and dynamic forces during the voyage;

.6 type and packaging of cargo units including vehicles;

.7 intended stowage pattern of the cargo units including vehicles; and

.8 mass and dimensions of the cargo units and vehicles.

3.3.2 This sub-chapter should describe the application of portable cargo securing devices as to number of lashings and allowable lashing angles. Where necessary, the text should be supplemented by suitable drawings or sketches to facilitate the correct understanding and proper application of the securing devices to various types of cargo and cargo units. It should be pointed out that for certain cargo units and other entities with low friction resistance, it is advisable to place soft boards or other anti-skid material under the cargo to increase friction between the deck and the cargo.

3.3.3 This sub-chapter should contain guidance as to the recommended location and method of stowing and securing of containers, trailers and other cargo carrying vehicles, palletized cargoes, unit loads and single cargo items (e.g. woodpulp, paper rolls, etc.), heavy weight cargoes, cars and other vehicles.

3.4 Supplementary requirements for ro-ro ships

3.4.1 The manual should contain sketches showing the layout of the fixed securing devices with identification of strength (MSL) as well as longitudinal and transverse distances between securing points. In preparing this sub-chapter further guidance should be utilized from IMO Assembly resolutions A.533(13) and A.581(14), as appropriate.

3.4.2 In designing securing arrangements for cargo units, including vehicles and containers, on ro-ro passenger ships and specifying minimum strength requirements for securing devices used, forces due to the motion of the ship, angle of heel after damage or flooding and other considerations relevant to the effectiveness of the cargo securing arrangement should be taken into account.

3.5 Bulk carriers

If bulk carriers carry cargo units falling within the scope of chapter VI/5 or chapter VII/5 of the SOLAS Convention, this cargo shall be stowed and secured in accordance with a Cargo Securing Manual, approved by the Administration.

CHAPTER 4 – STOWAGE AND SECURING OF CONTAINERS AND OTHER STANDARDIZED CARGO

4.1 Handling and safety instructions

This sub-chapter should contain:

.1 instructions on the proper handling of the securing devices; and

.2 safety instructions related to handling of securing devices and to securing and unsecuring of containers or other standardized cargo by ship or shore personnel.

4.2 Stowage and securing instructions

This sub-chapter is applicable to any stowage and securing system (i.e. stowage within or without cellguides) for containers and other standardized cargo. On existing ships the relevant documents regarding safe stowage and securing may be integrated into the material used for the preparation of this chapter.

4.2.1 Stowage and securing plan

This sub-chapter should consist of a comprehensive and understandable plan or set of plans providing the necessary overview on:

.1 longitudinal and athwartship views of under deck and on deck stowage locations of containers as appropriate;

.2 alternative stowage patterns for containers of different dimensions;

.3 maximum stack masses;

.4 permissible vertical sequences of masses in stacks;

.5 maximum stack heights with respect to approved sight lines; and

.6 application of securing devices using suitable symbols with due regard to stowage position, stack mass, sequence of masses in stack and stack height. The symbols used should be consistent throughout the Cargo Securing Manual.

4.2.2 Stowage and securing principle on deck and under deck

This sub-chapter should support the interpretation of the stowage and securing plan with regard to container stowage, highlighting:

.1 the use of the specified devices; and

.2 any guiding or limiting parameters as dimension of containers, maximum stack masses, sequence of masses in stacks, stacks affected by wind load, height of stacks.

It should contain specific warnings of possible consequences from misuse of securing devices or misinterpretation of instructions given.

4.3 Other allowable stowage patterns

4.3.1 This sub-chapter should provide the necessary information for the master to deal with cargo stowage situations deviating from the general instructions addressed under sub-chapter 4.2, including appropriate warnings of possible consequences from misuse of securing devices or misinterpretation of instructions given.

4.3.2 Information should be provided with regard to, inter alia:

.1 alternative vertical sequences of masses in stacks;

.2 stacks affected by wind load in the absence of outer stacks;

.3 alternative stowage of containers with various dimensions; and

.4 permissible reduction of securing effort with regard to lower stacks masses, lesser stack heights or other reasons.

4.4 Forces acting on cargo units

4.4.1 This sub-chapter should present the distribution of accelerations on which the stowage and securing system is based, and specify the underlying condition of stability. Information on forces induced by wind and sea on deck cargo should be provided.

4.4.2 It should further contain information on the nominal increase of forces or accelerations with an increase of initial stability. Recommendations should be given for reducing the risk of cargo losses from deck stowage by restrictions to stack masses or stack heights, where high initial stability cannot be avoided.

CHAPTER 5 – CARGO SAFE ACCESS PLAN (CSAP)

5.1 Ships which are specifically designed and fitted for the purpose of carrying containers should be provided with a Cargo Safe Access Plan (CSAP) in order to demonstrate that personnel will have safe access for container securing operations. This plan should detail arrangements necessary for the conducting of cargo stowage and securing in a safe manner. It should include the following for all areas to be worked by personnel:

.1 hand rails;

.2 platforms;

.3 walkways;

.4 ladders;

.5 access covers;

.6 location of equipment storage facilities;

.7 lighting fixtures;

.8 container alignment on hatch covers/pedestals;

.9 fittings for specialized containers, such as reefer plugs/receptacles;

.10 first aid stations and emergency access/egress;

.11 gangways; and

.12 any other arrangements necessary for the provision of safe access.

5.2 Guidelines for specific requirements are contained in annex 14 to the CSS Code.

Transverse balance of forces (STBD arrangement) Nos. 1, 2, 3 and 4:

312 < 0.3*68*9.81 + 68.8 + 55.6 + 55.6 + 62.4
312 < 443 this is OK !

Transverse balance of forces (PORT arrangement) Nos. 5, 6, 7 and 8:

312 < 0.3*68*9.81 + 68.8 + 66.3 + 69.0 + 68.8
312 < 473 this is OK!

Longitudinal balance of forces (FWD arrangement) Nos. 1, 3, 7, 8:

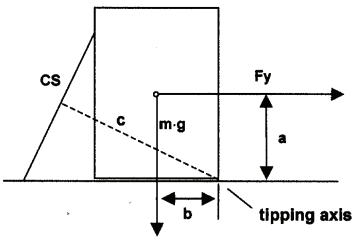
112 < 0.3 (68*9.81 – 346) +) + 46.4 + 30.2 + 18.1 + 46.4
112 < 237 this is OK !

Longitude balance of forces (AFT arrangement) Nos. 2, 4, 5, 6:

112 < 0.3 (68*9.81 – 346) + 30.2 + 55.2 + 46.4 + 38.2
112 <266 this is OK!

Transverse Tipping

Unless specific information is provided, the vertical center of gravity of the cargo unit can be assumed to be at one half the height and the transverse center of gravity at one half the width. Also, if the lashing is connected as shown in the sketch, instead of measuring c, the length of the lever from the tipping axis to the lashing CS, it is conservative to assume that it is equal to the width of the cargo unit.



$Fy \cdot a \leq b \cdot m \cdot g + 0.9 \cdot (CS_1 \cdot c_1 + CS_2 \cdot c_2 + CS_3 \cdot c_3 + CS_4 \cdot c_4)$
$312 \cdot 2.4/2 < 1.8/2 \cdot 68 \cdot 9.81 + 0.9 \cdot 1.8 \cdot (80 + 67 + 67 + 80)$
$374 < 600 + 476$
374 < 1076 this is OK !

17 The existing text under the heading “Explanation and interpretation of “Methods of assess the efficiency of securing arrangements for non-standardized cargo” with the heading are deleted from section 7 and added in as new Appendix 2 to the Annex.

INTERNATIONAL MARITIME ORGANIZATION

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

MSC.1/Circ.1352/Rev.1
15 December 2014

AMENDMENTS TO THE CODE OF SAFE PRACTICE FOR CARGO STOWAGE AND SECURING (CSS CODE)

1 The Maritime Safety Committee (the Committee), at its ninety-fourth session (17 to 21 November 2014), considered and approved amendments to the Code of Safe Practice for Cargo Stowage and Securing (CSS Code), set out in the annex. The present circular also incorporates the amendments approved by the Committee, at its eighty-seventh session (12 to 21 May 2010) (MSC 87/26, paragraph 10.4 refers).

2 Member Governments are invited to bring the annexed Amendments to the CSS Code to the attention of shipowners, ship operators, shipmasters and crews and all other parties concerned and, in particular, encourage shipowners and terminal operators to:

.1 apply the annexed amendments in its entirety for containerships*, the keels of which were laid or which are at a similar stage of construction on or after 1 January 2015;

.2 apply sections 4.4 (Training and familiarization), 7.1 (Introduction), 7.3 (Maintenance) and section 8 (Specialized container safety design) to existing containerships*, the keels of which were laid or which are at a similar stage of construction before 1 January 2015; and

.3 apply the principles of this guidance contained in sections 6 (Design) and 7.2 (Operational procedures) to existing containerships* as far as practical by the flag State Administration with the understanding that existing ships would not be required to be enlarged or undergo other major structural modifications as determined.

3 This circular revokes MSC.1/Circ.1352 issued on 30 June 2010 and any reference to MSC.1/Circ.1352 should be read as reference to the present circular.

***

* Reference to containerships means dedicated containerships and those parts of other ships for which arrangements are specifically designed and fitted for the purpose of carrying containers on deck.

ANNEX

AMENDMENTS TO THE CODE OF SAFE PRACTICE FOR CARGO STOWAGE AND SECURING (CSS CODE)

1 The following new annex 14 is inserted after the existing annex 13:

"**ANNEX 14**

GUIDANCE ON PROVIDING SAFE WORKING CONDITIONS FOR SECURING OF CONTAINERS ON DECK

1 AIM

To ensure that persons engaged in carrying out container securing operations on deck have safe working conditions and, in particular safe access, appropriate securing equipment and safe places of work. These guidelines should be taken into account at the design stage when securing systems are devised. These guidelines provide shipowners, ship builders, classification societies, Administrations and ship designers with guidance on producing or authorizing a Cargo Safe Access Plan (CSAP).

2 SCOPE

Ships which are specifically designed and fitted for the purpose of carrying containers on deck.

3 DEFINITIONS

3.1 *Administration* means the Government of the State whose flag the ship is entitled to fly.

3.2 *Containership* means dedicated containerships and those parts of other ships for which arrangements are specifically designed and fitted for the purpose of carrying containers on deck.

3.3 *Fencing* is a generic term for guardrails, safety rails, safety barriers and similar structures that provide protection against the falls of persons.

3.4 *Lashing positions* include positions:

.1 in between container stows on hatch covers;
.2 at the end of hatches;
.3 on outboard lashing stanchions/pedestals;
.4 outboard lashing positions on hatch covers; and
.5 any other position where people work with container securing.

3.5 *SATLs* are semi-automatic twistlocks.

3.6 *Securing* includes lashing and unlashing.

3.7 *Stringers* are the uprights or sides of a ladder.

3.8 *Turnbuckles and lashing rods*[*] include similar cargo securing devices.

4 GENERAL

4.1 Introduction

4.1.1 Injuries to dockworkers on board visiting ships account for the majority of accidents that occur within container ports, with the most common activity that involves such injuries being the lashing/unlashing of deck containers. Ships' crew engaged in securing operations face similar dangers.

4.1.2 During the design and construction of containerships the provision of a safe place of work for lashing personnel is essential.

4.1.3 Container shipowners and designers are reminded of the dangers associated with container securing operations and urged to develop and use container securing systems which are safe by design. The aim should be to eliminate or at least minimize the need for:

.1 container top work;
.2 work in other equally hazardous locations; and
.3 the use of heavy and difficult to handle securing equipment.

4.1.4 It should be borne in mind that providing safe working conditions for securing containers deals with matters relating to design, operation, and maintenance, and that the problems on large containerships are not the same as on smaller ones.

4.2 Revised recommendations on safety of personnel during container securing operations (MSC.1/Circ.1263)

Shipowners, ship designers and Administrations should take into account the recommendations on safe design of securing arrangements contained in these guidelines, and in the Recommendations on safety of personnel during container securing operations (MSC.1/Circ.1263).

4.3 Cargo Safe Access Plan (CSAP)

4.3.1 The *Guidelines for the preparation of the Cargo Securing Manual* (MSC/Circ.745) requires ships which are specifically designed and fitted for the purpose of carrying containers to have an approved Cargo Safe Access Plan (CSAP) on board, for all areas where containers are secured.

4.3.2 Stakeholders, including, but not limited to shipowners, ship designers, ship builders, administrations, classification societies and lashing equipment manufacturers, should be involved at an early stage in the design of securing arrangements on containerships and in the development of the CSAP.

4.3.3 The CSAP should be developed at the design stage in accordance with chapter 5 of the annex to MSC.1/Circ.1353.

4.3.4 Designers should incorporate the recommendations of this annex into the CSAP so that safe working conditions can be maintained during all anticipated configurations of container stowage.

[*] Refer to standard ISO 3874, Annex D Lashing rod systems and tensioning devices.

4.4 Training and familiarization

4.4.1 Personnel engaged in cargo securing operations should be trained in the lashing and unlashing of containers as necessary to carry out their duties in a safe manner. This should include the different types of lashing equipment that are expected to be used.

4.4.2 Personnel engaged in cargo securing operations should be trained in the identification and handling of bad order or defective securing gear in accordance with each ship's procedures to ensure damaged gear is segregated for repair and maintenance or disposal.

4.4.3 Personnel engaged in cargo securing operations should be trained to develop the knowledge and mental and physical manual handling skills that they require to do their job safely and efficiently, and to develop general safety awareness to recognize and avoid potential dangers.

4.4.4 Personnel should be trained in safe systems of work. Where personnel are involved in working at heights, they should be trained in the use of relevant equipment. Where practical, the use of fall protection equipment should take precedence over fall arrest systems.

4.4.5 Personnel who are required to handle thermal cables and/or connect and disconnect temperature control units should be given training in recognizing defective cables, receptacles and plugs.

4.4.6 Personnel engaged in containership cargo operations should be familiarized with the ship's unique characteristics and potential hazards arising from such operations necessary to carry out their duties.

5 RESPONSIBILITIES OF INVOLVED PARTIES

5.1 Administrations should ensure that:

.1 lashing plans contained within the approved Cargo Securing Manual are compatible with the current design of the ship and the intended container securing method is both safe and physically possible;

.2 the Cargo Securing Manual, lashing plans and the CSAP are kept up to date; and

.3 lashing plans and the CSAP are compatible with the design of the vessel and the equipment available.

5.2 Shipowners and operators should ensure that:

.1 portable cargo securing devices are certified and assigned with a maximum securing load (MSL). The MSL should be documented in the cargo securing manual as required by the CSS Code;

.2 the operational recommendations of this annex are complied with;

.3 correction, changes or amendments of the Cargo Securing Manual, lashing plans and the Cargo Safe Access Plan (CSAP) should be promptly sent to the competent authority for approval; and

.4 only compatible and certified equipment in safe condition is used.

5.3 Designers should follow design recommendations of these guidelines.

5.4 Shipbuilders should follow design recommendations of these guidelines.

5.5 Containership terminal operators should ensure that the recommendations of relevant parts of this annex are complied with.

6 DESIGN

6.1 General design considerations

6.1.1 *Risk assessment*

6.1.1.1 Risk assessments should be performed at the design stage taking into account the recommendations of this annex to ensure that securing operations can be safely carried out in all anticipated container configurations. This assessment should be conducted with a view toward developing the Cargo Safe Access Plan (CSAP). Hazards to be assessed should include but not be limited to:

.1 slips, trips and falls;

.2 falls from height;

.3 injuries whilst manually handling lashing gear;

.4 being struck by falling lashing gear or other objects;

.5 potential damage due to container operations. High-risk areas should be identified in order to develop appropriate protection or other methods of preventing significant damage;

.6 adjacent electrical risks (temperature controlled unit cable connections, etc.);

.7 the adequacy of the access to all areas that is necessary to safely perform container securing operations;

.8 ergonomics (e.g. size and weight of equipment) of handling lashing equipment; and

.9 implications of lashing 9'6" high, or higher, containers and mixed stows of 40' and 45' containers.

6.1.1.2 Shipbuilders should collaborate with designers of securing equipment in conducting risk assessments and ensure that the following basic criteria are adhered to when building containerships.

6.1.2 Ship designers should ensure that container securing operations performed in outer positions can be accomplished safely. As a minimum, a platform should be provided on which to work safely. This platform should have fencing to prevent workers falling off it.

6.1.3 The space provided between the containers stows for workers to carry out lashing operations should provide:

.1 a firm and level working surface;

.2 a working area, excluding lashings in place, to provide a clear sight of twist lock handles and allow for the manipulation of lashing gear;

.3 sufficient spaces to permit the lashing gear and other equipment to be stowed without causing a tripping hazard;

.4 sufficient spaces between the fixing points of the lashing bars on deck, or on the hatch covers, to tighten the turnbuckles;

.5 access in the form of ladders on hatch coamings;

.6 safe access to lashing platforms;

.7 protective fencing on lashing platforms; and

.8 adequate lighting in line with these guidelines.

6.1.4 Ship designers should aim to eliminate the need to access and work on the tops of deck stows.

6.1.5 Platforms should be designed to provide a clear work area, unencumbered by deck piping and other obstructions and take into consideration:

.1 containers must be capable of being stowed within safe reach of the workers using the platform; and

.2 the work area size and the size of the securing components used.

6.2 Provisions for safe access

6.2.1 ***General provisions***

6.2.1.1 The minimum clearance for transit areas should be at least 2 m high and 600 mm wide (see table in supplement, dimensions B, J, K1).

6.2.1.2 All relevant deck surfaces used for movement about the ship and all passageways and stairs should have non-slip surfaces.

6.2.1.3 Where necessary for safety, walkways on deck should be delineated by painted lines or otherwise marked by pictorial signs.

6.2.1.4 All protrusions in access ways, such as cleats, ribs and brackets that may give rise to a trip hazard should be highlighted in a contrasting colour.

6.2.2 ***Lashing position design (platforms, bridges and other lashing positions)***

6.2.2.1 Lashing positions should be designed to eliminate the use of three high lashing bars and be positioned in close proximity to lashing equipment stowage areas. Lashing positions should be designed to provide a clear work area which is unencumbered by deck piping and other obstructions and take into consideration:

.1 the need for containers to be stowed within safe reach of the personnel using the lashing position so that the horizontal operating distance from the securing point to the container does not exceed 1,100 mm and not less than 220 mm for lashing bridges and 130 mm for other positions (see table in supplement, dimensions C1, C2, C3);

.2 the size of the working area and the movement of lashing personnel; and

.3 the length and weight of lashing gear and securing components used.

6.2.2.2 The width of the lashing positions should preferably be 1,000 mm, but not less than 750 mm (see table in supplement, dimensions A, GL, GT, I, K).

6.2.2.3 The width of permanent lashing bridges should be:

.1 750 mm between top rails of fencing (see table in supplement, dimension F); and

.2 a clear minimum of 600 mm between storage racks, lashing cleats and any other obstruction (see table in supplement, dimension F1).

6.2.2.4 Platforms on the end of hatches and outboard lashing stations should preferably be at the same level as the top of the hatch covers.

6.2.2.5 Toe boards (or kick plates) should be provided around the sides of elevated lashing bridges and platforms to prevent securing equipment from falling and injuring people. Toe boards should preferably be 150 mm high, however, where this is not possible they should be at least 100 mm high.

6.2.2.6 Any openings in the lashing positions through which people can fall should be possible to be closed.

6.2.2.7 Lashing positions should not contain obstructions, such as storage bins or guides to reposition hatch covers.

6.2.2.8 Lashing positions which contain removable sections should be capable of being temporarily secured.

6.2.3 ***Fencing design***

6.2.3.1 Bridges and platforms, where appropriate, should be fenced. As a minimum, fencing design should take into consideration:

.1 the strength and height of the rails should be designed to prevent workers from falling;

.2 flexibility in positioning the fencing of gaps. A horizontal unfenced gap should not be greater than 300 mm;

.3 provisions for locking and removal of fencing as operational situations change based on stowage anticipated for that area;

.4 damage to fencing and how to prevent failure due to that damage; and

.5 adequate strength of any temporary fittings. These should be capable of being safely and securely installed.

6.2.3.2 The top rail of fencing should be 1 m high from the base, with two intermediate rails. The opening below the lowest course of the guard rails should not exceed 230 mm. The other courses should be not more than 380 mm apart.

6.2.3.3 Where possible fences and handrails should be highlighted with a contrasting colour to the background.

6.2.3.4 Athwartships cargo securing walkways should be protected by adequate fencing if an unguarded edge exists when the hatch cover is removed.

6.2.4 ***Ladder and manhole design***

6.2.4.1 Where a fixed ladder gives access to the outside of a lashing position, the stringers should be connected at their extremities to the guardrails of the lashing position, irrespective of whether the ladder is sloping or vertical.

6.2.4.2 Where a fixed ladder gives access to a lashing position through an opening in the platform, the opening shall be protected with either a fixed grate with a lock back mechanism, which can be closed after access, or fencing. Grabrails should be provided to ensure safe access through the opening.

6.2.4.3 Where a fixed ladder gives access to a lashing position from the outside of the platform, the stringers of the ladder should be opened above the platform level to give a clear width of 700 to 750 mm to enable a person to pass through the stringers.

6.2.4.4 A fixed ladder should not slope at an angle greater than 25° from the vertical. Where the slope of a ladder exceeds 15° from the vertical, the ladder should be provided with suitable handrails not less than 540 mm apart, measured horizontally.

6.2.4.5 A fixed vertical ladder of a height exceeding 3 m, and any fixed vertical ladder, from which a person may fall into a hold, should be fitted with guard hoops, which should be constructed in accordance with paragraphs 6.2.4.6 and 6.2.4.7.

6.2.4.6 The ladder hoops should be uniformly spaced at intervals not exceeding 900 mm and should have a clearance of 750 mm from the rung to the back of the hoop and be connected by longitudinal strips secured to the inside of the hoops, each equally spaced round the circumference of the hoop.

6.2.4.7 The stringers should be carried above the floor level of the platform by at least 1 m and the ends of the stringers should be given lateral support and the top step or rung should be level with the floor of the platform unless the steps or rungs are fitted to the ends of the stringers.

6.2.4.8 As far as practicable, access ladders and walkways, and work platforms should be designed so that workers do not have to climb over piping or work in areas with permanent obstructions.

6.2.4.9 There should be no unprotected openings in any part of the workplace. Access opening must be protected with handrails or access covers that can be locked back during access.

6.2.4.10 As far as practicable, manholes should not be situated in transit areas, however, if they are, proper fencing should protect them.

6.2.4.11 Access ladders and manholes should be large enough for persons to safely enter and leave.

6.2.4.12 A foothold at least 150 mm deep should be provided.

6.2.4.13 Handholds should be provided at the top of the ladder to enable safe access to the platform to be gained.

6.2.4.14 Manhole openings that may present a fall hazard should be highlighted in contrasting colour around the rim of the opening.

6.2.4.15 Manhole openings at different levels of the lashing bridge should not be located directly below one another, as far as practicable.

6.3 Lashing systems

6.3.1 *General provisions*

Lashing systems, including tensioning devices, should:

.1 conform to international standards*, where applicable;

.2 be compatible with the planned container stowages;

.3 be compatible with the physical ability of persons to safely hold, deploy and use such equipment;

.4 be uniform and compatible, e.g. twistlocks and lashing rod heads should not interfere with each other;

.5 be subject to a periodic inspection and maintenance regime. Non-conforming items should be segregated for repair or disposal; and

.6 be according to the CSM.

6.3.2 *Twistlock design*

6.3.2.1 Shipowners should ensure that the number of different types of twistlocks provided for cargo securing is kept to a minimum and clear instructions are provided for their operation. The use of too many different types of twistlocks may lead to confusion as to whether the twistlocks are locked.

* Refer to standard ISO 3874 – The Handling and Securing of Type 1 Freight Containers, annex A-D.

6.3.2.2 The design of twistlocks should ensure the following:

.1 positive locking with easy up and down side identification;

.2 dislodging from corner fitting is not possible even when grazing a surface;

.3 access and visibility of the unlocking device is effective in operational situations;

.4 unlocked positions are easily identifiable and do not relock inadvertently due to jolting or vibration; and

.5 unlocking poles are as light as possible, of a simple design for ease of use.

6.3.2.3 Where it is not feasible to entirely eliminate working on the tops of container stows, the twistlock designs used should minimize the need for such working, e.g. use of SATLs, fully automatic twistlocks or similar design.

6.3.3 ***Lashing rod design***

6.3.3.1 The design of containership securing systems should take into account the practical abilities of the workers to lift, reach, hold, control and connect the components called for in all situations anticipated in the cargo securing plan.

6.3.3.2 The maximum length of a lashing rod should be sufficient to reach the bottom corner fitting of a container on top of two high cube containers and be used in accordance with the instructions provided by the manufacturers.

6.3.3.3 The weight of lashing rods should be minimized as low as possible consistent with the necessary mechanical strength.

6.3.3.4 The head of the lashing rod that is inserted in the corner fitting should be designed with a pivot/hinge or other appropriate device so that the rod does not come out of the corner fitting accidentally.

6.3.3.5 The rod's length in conjunction with the length and design of the turnbuckle should be such that the need of extensions is eliminated when lashing high cube (9'6") containers.

6.3.3.6 Lightweight rods should be provided where special tools are needed to lash high cube containers.

6.3.4 ***Turnbuckle design***

6.3.4.1 Turnbuckle end fittings should be designed to harmonize with the design of lashing rods.

6.3.4.2 Turnbuckles should be designed to minimize the work in operating them.

6.3.4.3 Anchor points for turnbuckles should be positioned to provide safe handling and to prevent the bending of rods.

6.3.4.4 To prevent hand injury during tightening or loosening motions, there should be a minimum distance of 70 mm between turnbuckles.

6.3.4.5 The turnbuckle should incorporate a locking mechanism which will ensure that the lashing does not work loose during the voyage.

6.3.4.6 The weight of turnbuckles should be minimized as low as possible consistent with the necessary mechanical strength.

6.3.5 ***Storage bins and lashing equipment stowage design***

6.3.5.1 Bins or stowage places for lashing materials should be provided.

6.3.5.2 All lashing gear should be stowed as close to its intended place of use as possible.

6.3.5.3 The stowage of securing devices should be arranged so they can easily be retrieved from their stowage location.

6.3.5.4 Bins for faulty or damaged gear should also be provided and appropriately marked.

6.3.5.5 Bins should be of sufficient strength.

6.3.5.6 Bins and their carriers should be designed to be lifted off the vessel and restowed.

6.4 Lighting design

A lighting plan should be developed to provide for:

.1 the proper illumination† of access ways, not less than 10 lux (1 foot candle)*, taking into account the shadows created by containers that may be stowed in the area to be lit, for example different length containers in or over the work area;

.2 a separate fixed or temporary (where necessary) lighting system for each working space between the container bays, which is bright enough, not less than 50 lux (5 foot candle)*, for the work to be done, but minimizes glare to the deck workers;

.3 such illumination should, where possible, be designed as a permanent installation and adequately guarded against breakage; and

.4 the illumination† intensity should take into consideration the distance to the uppermost reaches where cargo securing equipment is utilized.

† For the upper tier of a lashing bridge, lights at the port and starboard extremities are generally adequate.
* Refer to Safety and Health in Ports, ILO Code of Practice, section 7.1.5.

7 OPERATIONAL AND MAINTENANCE PROCEDURES

7.1 Introduction

7.1.1 Procedures for safe lashing and securing operations should be included in the ship's Safety Management System as part of the ISM Code documentation.

7.1.2 Upon arrival of the ship, a safety assessment of the lashing positions and the access to those positions should be made before securing work commences.

7.2 Operational procedures

7.2.1 *Container deck working*

7.2.1.1 Transit areas should be safe and clear of cargo and all equipment.

7.2.1.2 Openings that are necessary for the operation of the ship, which are not protected by fencing, should be closed during cargo securing work. Any necessarily unprotected openings in work platforms (i.e. those with a potential fall of less than 2 m), and gaps and apertures on deck should be properly highlighted.

7.2.1.3 The use of fencing is essential to prevent falls. When openings in safety barriers are necessary to allow container crane movements, particularly with derricking cranes, removable fencing should be used whenever possible.

7.2.1.4 It should be taken into account that, when lifting lashing bars that can weigh between 11 and 21 kg and turnbuckles between 16 and 23 kg, there may be a risk of injury and severe illness as a result of physical strain if handled above shoulder height with the arms extended. It is therefore recommended that personnel work in pairs to reduce the individual workload in securing the lashing gear.

7.2.1.5 The company involved with cargo operation should anticipate, identify, evaluate and control hazards and take appropriate measures to eliminate or minimize potential hazards to prevent in particular with harmful lumbar spinal damage and severe illness as a result of physical strain.

7.2.1.6 Personnel engaged in containership cargo operations should wear appropriate Personnel Protective Equipment (PPE) whilst carrying out lashing operations. The PPE should be provided by the company.

7.2.1.7 Manual twistlocks should only be used where safe access is provided.

7.2.1.8 Containers should not be stowed in spaces configured for larger sized containers unless they can be secured under safe working conditions.

7.2.2 *Container top working*

7.2.2.1 When work on container tops cannot be avoided, safe means of access should be provided by the container cargo operation terminal, unless the ship has appropriate means of access in accordance with the CSAP.

7.2.2.2 Recommended practice involves the use of a safety cage lifted by a spreader to minimize the risk to personnel.

7.2.2.3 A safe method of work should be developed and implemented to ensure the safety of lashers when on the top of container stows on deck. Where practical, the use of fall prevention equipment should take precedence over fall arrest equipment.

7.2.3 *Failure to provide safe lashing stations on board/carry out lashing by port workers*

7.2.3.1 Where there are lashing and unlashing locations on board ship where no fall protection, such as adequate handrails are provided, and no other safe method can be found, the containers should not be lashed or unlashed and the situation should be reported to shoreside supervisor and the master or deck officer immediately.

7.2.3.2 If protective systems cannot be designed to provide safe protected access and lashing work positions, in all cargo configurations then cargo should not be stowed in that location. Neither crew nor shore workers should be subjected to hazardous working conditions in the normal course of securing cargo.

7.3 Maintenance

7.3.1 In line with section 2.3 (Inspection and maintenance schemes) of the *Revised guidelines for the preparation of the cargo securing manual* (MSC.1/Circ.1353) all ships should maintain a record book, which should contain the procedures for accepting, maintaining and repairing or rejecting of cargo securing devices. The record book should also contain a record of inspections.

7.3.2 Lighting should be properly maintained.

7.3.3 Walkways, ladders, stairways and fencings should be subject to a periodic maintenance programme which will reduce/prevent corrosion and prevent subsequent collapse.

7.3.4 Corroded walkways, ladders, stairways and fencings should be repaired or replaced as soon as practicable. The repairs should be effected immediately if the corrosion could prevent safe operations.

7.3.5 It should be borne in mind that turnbuckles covered with grease are difficult to handle when tightening.

7.3.6 Storage bins and their carriers should be maintained in a safe condition.

8 SPECIALIZED CONTAINER SAFETY DESIGN

8.1 Temperature controlled unit power outlets should provide a safe, watertight electrical connection.

8.2 Temperature controlled unit power outlets should feature a heavy duty, interlocked and circuit breaker protected electrical power outlet. This should ensure the outlet can not be switched "live" until a plug is fully engaged and the actuator rod is pushed to the "On" position. Pulling the actuator rod to the "Off" position should manually de-energize the circuit.

8.3 The temperature controlled unit power circuit should de-energize automatically if the plug is accidentally withdrawn while in the "On" position. Also, the interlock mechanism should break the circuit while the pin and sleeve contacts are still engaged.

This provides total operator safety and protection against shock hazard while eliminating arcing damage to the plug and receptacle.

8.4 Temperature controlled unit power outlets should be designed to ensure that the worker is not standing directly in front of the socket when switching takes place.

8.5 The positioning of the temperature controlled unit feed outlets should not be such that the flexible cabling needs to be laid out in such a way as to cause a tripping hazard.

8.6 Stevedores or ship's crew who are required to handle temperature controlled unit cables and/or connect and disconnect reefer units should be given training in recognizing defective wires and plugs.

8.7 Means or provisions should be provided to lay the temperature controlled unit cables in and protect them from lashing equipment falling on them during lashing operations.

8.8 Defective or inoperative temperature controlled unit plugs/electrical banks should be identified and confirmed as "locked out/tagged out" by the vessel.

9 REFERENCES

ILO Code of Practice – Safety and Health in Ports

ILO Convention 152 – Occupational Safety and Health in Dock Work

ISO Standard 3874 – The Handling and Securing of Type 1 Freight Containers

International Convention on Load Lines, 1966, as modified by the 1988 LL Protocol

Revised Recommendation on safety of personnel during container securing operations (MSC.1/Circ.1263)

Revised Guidelines for the preparation of the Cargo Securing Manual (MSC.1/Circ.1353/Rev.1).

SUPPLEMENT

CONTAINER SECURING DIMENSIONS

Dimension (see Figures)	Description	Requirement (mm)
A	Width of work area between container stacks(see figure 1)	750 minimum
B	Distance between lashing plates on deck or on hatch covers (see figure 1)	600 minimum
C1	Distance from lashing bridge fencing to container stack (see figure 2)	1100 maximum
C2	Distance from lashing plate to container stack (lashing bridge) (see figure 2)	220 minimum
C3	Distance from lashing plate to container stack (elsewhere) (see figures 1 and 4)	130 minimum
F	Width of lashing bridge between top rails of fencing (see figure 2)	750 minimum
F1	Width of lashing bridge between storage racks, lashing cleats and any other obstruction (see figure 2)	600 minimum
GL	Width of working platform for outboard lashing – fore/aft (see figure 3)	750 minimum
GT	Width of working platform for outboard lashing – transverse (see figure 3)	750 minimum
I	Width of work platform at end of hatch cover or adjacent to superstructure (see figure 4)	750 minimum
J	Distance from edge of hatch cover to fencing (see figure 4)	600 minimum
K	Width of lashing bridge between top rails of fencing (see figure 2)	750 minimum
K1	Width of lashing bridge between the pillars of the lashing bridge (see figure 2)	600 minimum

NOTES

B - Measured between the centres of the lashing plates.
C1 - Measured from inside of fencing.
C2, C3 - Measured from centre of lashing plate to end of container.
F, K - Measured to inside of fencing.
GL - Measured from end of container to inside of fencing.
GT - Measured to inside of fencing.
I - Measured to inside of fencing.
J - Measured to inside of fencing.

Figure 1

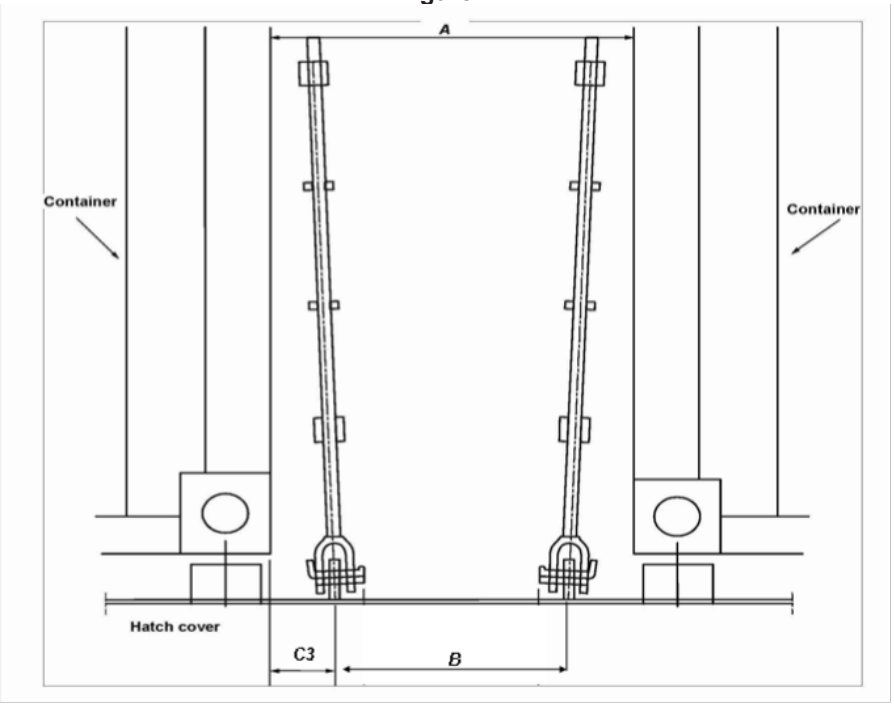
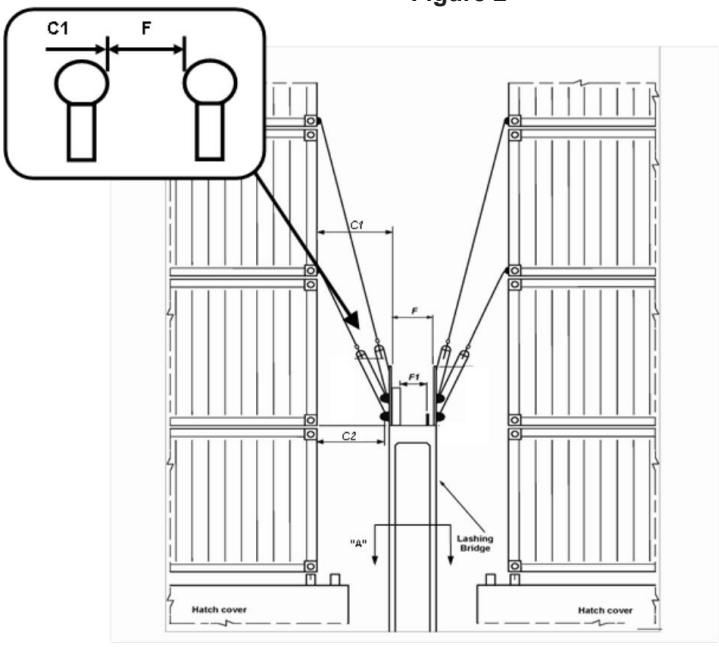


Figure 2



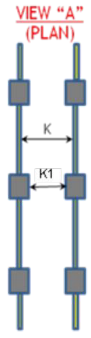


Figure 3

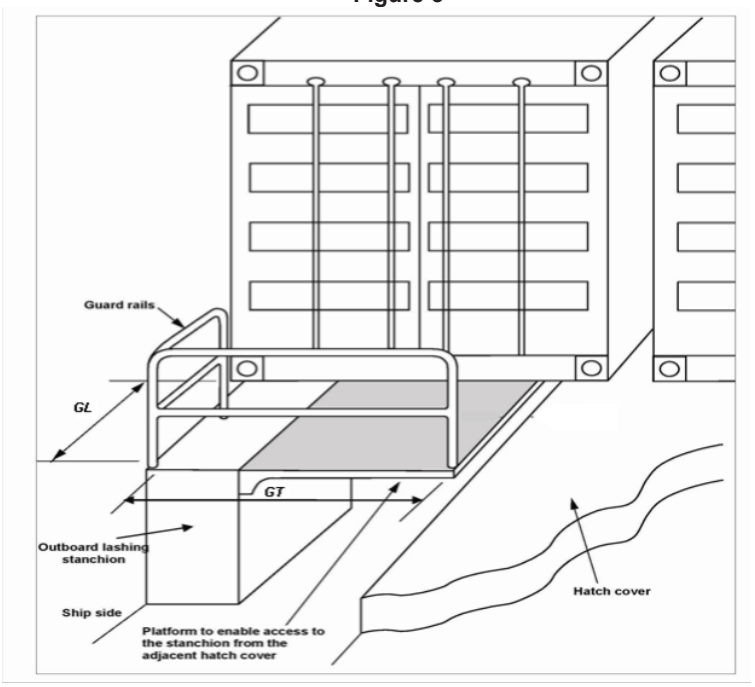
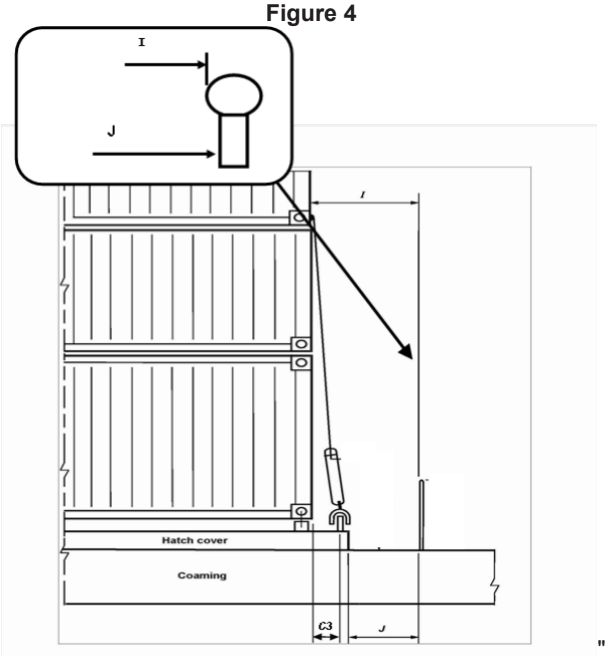


Figure 4



Bilaga 9. Beräkning av lastsäkring för sjötransport av gods i eller på lastbärare

Allmänt

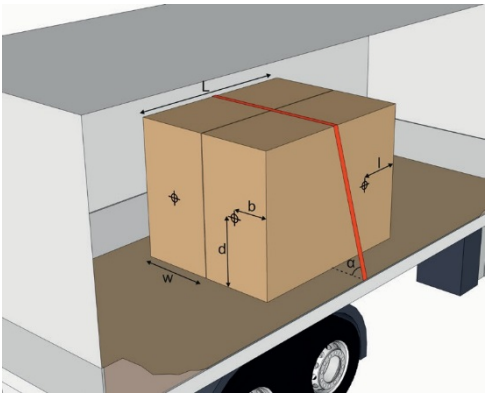
Dimensionering av lastsäkring visas i denna bilaga för de fem vanligast förekommande lastsäkringsmetoderna. Kombinationer av metoderna kan vara nödvändigt i vissa situationer och för vissa laster.
Accelerationsfaktorerna enligt Tabell 3, med stöd av Tabell 2, påverkar lasten med krafter och moment som medför att lasten kan glida eller tippa. Med lämpligt vald lastsäkringsmetod i Tabell 1 bör lastförskjutning kunna förhindras.
Friktionskoefficienten mellan last och lastens underlag ingår i beräkningarna för förhindrande av glidning. Friktionsfaktorerna för ett antal olika materialkombinationer framgår av Tabell 4.
För lastsäkringsmetoderna Loopsurrning, Grimma och Rak surrning, som medger viss rörelse är kännedom om MSL för surrningsutrustningen viktig. I avsnittet Säkerhetsfaktorer och Tabell 5 framgår relationen mellan MBL och MSL.
Begreppen ”sidled” och ”längdled” i denna bilaga refererar till att lastbäraren är stuvad i fartygets längdriktning.

Definitioner

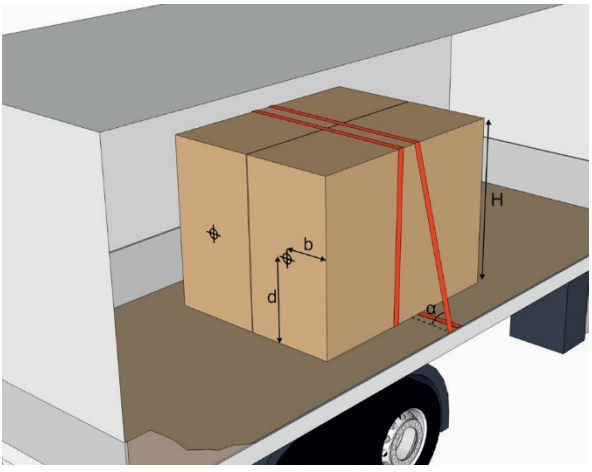
b	[m]	= godsets tyngdpunkt i sidled från godsets tippunkt
cx	[-]	= accelerationsfaktor i längdled
c_y	[-]	= accelerationsfaktor i sidled
c_z	[-]	= accelerationsfaktor vertikalt
d	[m]	= godsets tyngdpunkt i höjdled från godsets tippunkt
F_b	[kN]	= förstängningskraft (t.ex. 300 daN = 3 kN)
F_T	[kN]	= förspänning i surrningsutrustningen
g	[m/s^2]	= 9,81 m/s^2 (jordaccelerationen)
H	[m]	= godsets höjd
k	[-]	= k-faktor (= 1,8)
L	[m]	= godsets längd
l	[m]	= godsets tyngdpunkt i längdled från godsets tippunkt
m	[ton]	= lastenhetens massa; hela den lastsäkrade sektionen
MSL	[kN]	= Säker belastning (märkning, Maximum Securing Load)
N	[-]	= antalet rader i sidled, vid beräkning av tippning i sidled
n	[-]	= antal surrningar som motverkar rörelser i aktuell riktning
p	[m]	= avstånd i längdled från godsets tippunkt och surrningsfästet på godset
q	[m]	= avstånd i sidled från godsets tippunkt och surrningsfästet på godset
s	[m]	= avstånd i höjdled från godsets tippunkt och surrningsfästet på godset
w	[m]	= lastradens bredd

α	[°]	= vinkel mellan surrningsutrustning och underlaget, mindre än 90°
β	[°]	= vinkel mellan surrningsutrustning och lastbärarens längdaxel, mindre än 90°
μ	[-]	= friktionsfaktor (=0,925*$\mu_{statisk}$)
μ_d	[-]	= dynamisk friktionsfaktor (=0,75*μ)
μ_i	[-]	= inre friktionsfaktor (= 0,25)
$\mu_{statisk}$	[-]	= statisk friktionskoefficient

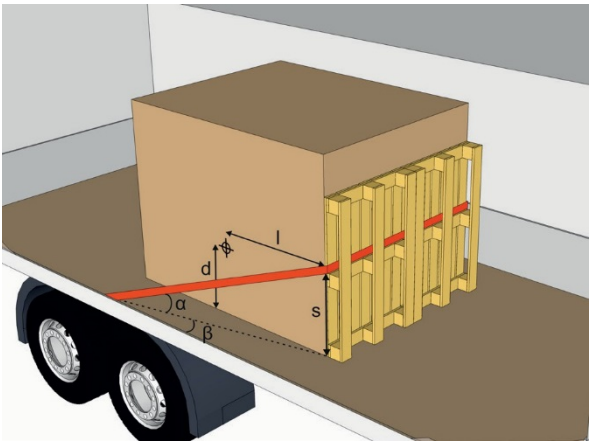
Överfallssurrning



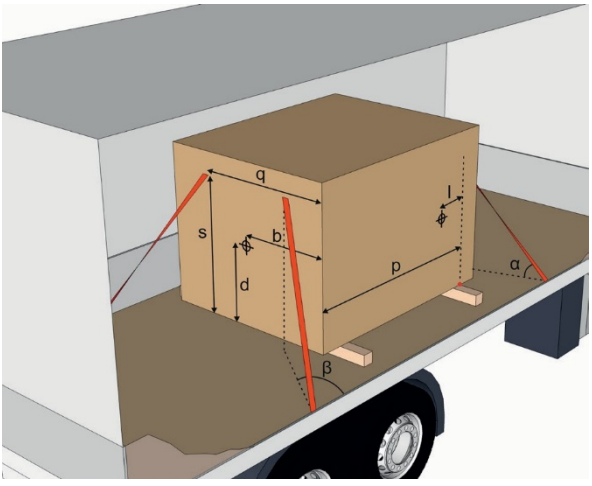
Loopsurrningspar



Grimma



Rak surrning



Dimensionering av lastsäkring

I Tabell 1 hänvisas till uttryck, Nr 1–12, för beräkning av faktorn **m** för respektive lastsäkringsmetod. Faktorn **m** anger vilken massa lastenheten får ha för att inte glida eller tippa.
Faktorn **m** har lösts ut ur jämviktsberäkningar för respektive lastsäkringsmetod där krafter och moment som påverkar lasten är ställda mot krafter och moment som förhindrar glidning och tippning.
Notera att om **m < 0** föreligger ingen risk för glidning eller tippning.
De lastsäkringsmetoder som inte anses medge någon rörelse av godset är:

– förstängning
– överfallssurrning

De lastsäkringsmetoder som medger viss rörelse av godset är:
– loopsurrning
– grimma
– rak surrning.

Tabell 1. Lastsäkringsmetoder och beräkning av **m.**

	Glidning		**Tippning**	
Lastsäkringsmetod	Sidled	Längdled	Sidled	Längdled
Förstängning	Nr. 1	Nr. 1		
Överfallssurrning	Nr. 2	Nr. 2	Nr. 3	Nr. 4
Loopsurrningspar	Nr. 5		Nr. 6	
Grimma		Nr. 7		Nr. 8
Rak surrning	Nr. 9	Nr. 10	Nr. 11	Nr. 12

Nr. 1 $$m = \frac{F_b}{g \cdot (c_{x,y} - \mu \cdot c_z)}$$

Nr. 2 $$m = \frac{k \cdot \mu \cdot n \cdot F_T \cdot \sin(\alpha)}{g \cdot (c_{x,y} - \mu \cdot c_z)}$$

Nr. 3 $$m = \frac{k \cdot n \cdot F_T \cdot w \cdot (\sin(\alpha) + \mu_i \cdot (N-1))}{2 \cdot g \cdot (c_y \cdot d - c_z \cdot b)}$$

Nr. 4 $$m = \frac{k \cdot n \cdot F_T \cdot L \cdot \sin(\alpha)}{2 \cdot g \cdot (c_x \cdot d - c_z \cdot l)}$$

Nr. 5 $$m = \frac{n \cdot MSL \cdot (\mu_d \cdot \sin(\alpha) + 1 + \cos(\alpha))}{g \cdot (c_y - \mu_d \cdot c_z)}$$

Nr. 6 $$m = \frac{n \cdot MSL \cdot (\cos(\alpha) \cdot H + \sin(\alpha) \cdot w + \mu_i \cdot (N+1) \cdot w)}{2 \cdot g \cdot (c_y \cdot d - c_z \cdot b)}$$

Nr. 7 $$m = \frac{2 \cdot n \cdot MSL \cdot (\mu_d \cdot \sin(\alpha) + \cos(\alpha) \cdot \cos(\beta))}{g \cdot (c_x - \mu_d \cdot c_z)}$$

Nr. 8 $$m = \frac{2 \cdot n \cdot MSL \cdot \cos(\alpha) \cdot \cos(\beta) \cdot s}{g \cdot (c_x \cdot d - c_z \cdot l)}$$

Nr. 9 $$m = \frac{n \cdot MSL \cdot (\cos(\alpha) \cdot \sin(\beta) + \mu_d \cdot \sin(\alpha))}{g \cdot (c_y - \mu_d \cdot c_z)}$$

Nr. 10 $$m = \frac{n \cdot MSL \cdot (\cos(\alpha) \cdot \cos(\beta) + \mu_d \cdot \sin(\alpha))}{g \cdot (c_x - \mu_d \cdot c_z)}$$

Nr.11 $$m = \frac{n \cdot MSL \cdot (\mathrm{q} \cdot \sin(\alpha) + s \cdot \cos(\alpha) \cdot \sin(\beta))}{g \cdot (c_y \cdot d - c_z \cdot b)}$$

Nr. 12 $$m = \frac{n \cdot MSL \cdot (\mathrm{p} \cdot \sin(\alpha) + s \cdot \cos(\alpha) \cdot \cos(\beta))}{g \cdot (c_x \cdot d - c_z \cdot l)}$$

Accelerationsfaktor

Tabell 2. Sjöområden. CTU-koden kap 5, 5.5.
Dessa farvatten kan omfatta samtliga fartområden enligt 1 kap 3 § fartygssäkerhetsförordningen (2003:438).

A	B	C
$H_s \leq 8$ m	8 m < $H_s \leq 12$ m	12 m < $H_s \leq 19{,}6$ m
Östersjön inkl Kattegatt	Nordsjön	Oinskränkt fart
Medelhavet	Skagerak	
Svarta havet	Engelska kanalen	
Röda havet	Japanska sjön	
Persiska viken	Okhotska sjön	
Resa i kustfarvatten eller inomskärs i följande områden:	*Resa i kustfarvatten eller inomskärs i följande områden:*	
Centralatlanten (mellan 30° N och 35° S)	Syd-centrala Atlanten (mellan 35° S och 40° S)	
Centrala Indiska oceanen (ner till 35° S)	Syd-centrala Indiska oceanen (mellan 35° S och 40° S)	
Centrala Stilla havet (mellan 30° N och 35° S)	Syd-centrala Stilla havet (mellan 35° S och 45° S)	

Tabell 3. Accelerationsfaktorer (faktorer för g; ex 0,7·g = 0,7·9,81 m/s^2) vid Sjötransport. CTU-koden kap 5, 5.3.

Kraftriktning:	**Sidled**		**Längdled**	
	sidled (c_y)	samtidigt vertikalt nedåt (c_z)	längdled (c_x)	samtidigt vertikalt nedåt (c_z)
Sjöområde				
A	0,5	1,0	0,3	0,5
B	0,7	1,0	0,3	0,3
C	0,8	1,0	0,4	0,2

Friktionsfaktor

Tabell 4 nedan anger riktvärden på friktionsfaktorer (μ) för rena, torra eller våta ytor, fria från frost, is och snö.

- Då friktion för aktuell materialkombination inte finns upptagen i Tabell 4, eller om den inte på annat sätt kan styrkas, ska en friktionsfaktor på maximalt 0,3 användas.
- Friktionsfaktorn μ i Tabell 4 är beräknad som 92,5 % av den statiska friktionskoefficienten, d.v.s. $\mu=0{,}925*\mu_{statisk}$, och används vid dimensionering av lastsäkringsmetoder som inte anses medge någon rörelse av godset.
- Då viss rörelse av godset kan förväntas för vald lastsäkringsmetod sätts friktionsfaktorn för glidfriktion till 75 % av μ, d.v.s. $0{,}75*\mu = 0{,}75*0{,}925*\mu_{statisk}$.
- Då kontaktytorna inte är rensopade är maximalt tillåten friktionsfaktor 0,3 om inte tabellen anger lägre värde, som då istället ska användas.
- Om kontaktytorna inte är fria från frost, is och snö kan den statiska friktionsfaktorn sättas till 0,2 om inte tabellen visar ett lägre värde.
- För oljiga och infettade ytor eller vid användning av glidark sätts friktionsfaktorn till 0,1.

Tabell 4. Friktionsfaktorer. CTU-koden Annex 7 Appendix 2.

Materialkombination i kontaktytan	**Friktionsfaktor Torr** ***μ***	**Friktionsfaktor Våt** ***μ***
Sågat trä/träpall		
Sågat trä mot plyfa/plywood/trä	0,45	0,45
Sågat trä mot räfflad aluminium	0,4	0,4
Sågat trä mot stålplåt	0,3	0,3
Sågat trä mot krympfilm	0,3	0,3
Hyvlat trä		
Hyvlat trä mot plyfa/plywood/trä	0,3	0,3
Hyvlat trä mot räfflad aluminium	0,25	0,25
Hyvlat trä mot rostfri stålplåt	0,2	0,2
Plastpall		
Plastpall mot plyfa/plywood/trä	0,2	0,2
Plastpall mot räfflad aluminium	0,15	0,15
Plastpall mot rostfri stålplåt	0,15	0,15
Kartong (obehandlad)		
Kartong mot kartong	0,5	–

Materialkombination i kontaktytan	Friktionsfaktor Torr μ	Friktionsfaktor Våt μ
Kartong mot träpall	0,5	–
Storsäck		
Storsäck mot träpall	0,4	–
Stål och plåt		
Omålad grovplåt mot omålad grovplåt	0,4	–
Målad grovplåt mot målad grovplåt	0,3	–
Målad slät plåt mot målad slät plåt	0,2	–
Omålad slät plåt mot omålad slät plåt	0,2	–
Stålhäck		
Stålhäck mot plyfa/plywood/trä	0,45	0,45
Stålhäck mot räfflad aluminium	0,3	0,3
Stålhäck mot rostfri stålplåt	0,2	0,2
Betong		
Grov betongyta mot sågat trä	0,7	0,7
Slät betongyta mot sågat trä	0,55	0,55
Friktionsmatta		
Gummi mot andra material med rena kontaktytor	0,6	0,6
Material annat än gummi mot andra material	Enligt intyg eller fastställt genom praktiska prov	

Säkerhetsfaktor

Vid dimensionering av lastsäkringsutrustning och fästen för dessa används i första hand Maximum Securing Load (MSL) som är angivna för utrustningen. I vissa fall kan utrustning vara märkt med maximal tillåten belastning, LC, som motsvarar MSL. Saknas sådana uppgifter kan nedanstående tabell användas som ledning vid direkta beräkningar av maximal tillåten belastning enligt formeln:

$$MSL = \frac{MBL}{säkerhetsfaktor}$$

där MBL är lastsäkringsutrustningens brottstyrka.

Tabell 5. Säkerhetsfaktorer. CTU-koden Annex 7 punkter 2.3.8, 2.4.2, 4.2.7.

Utrustning	**MSL**	**Säkerhetsfaktor f_s**
Vantskruv, schackel, ringar	50 % av MBL	2
Spännmutter (speed lash)	50 % av MBL	2
Tågvirke	33 % av MBL	3
Spännband, engångsanvändning	75 % av MBL 1)	1,3
Spännband, återanvändningsbar	50 % av MBL	2
Wire, ny	80 % av MBL	1,3
Wire, återanvänd	30 % av MBL	3,4
Stålband, engångsanvändning	70 % av MBL 2)	1,4
Kätting, klass 8	50 % av MBL	2
Luftkudde, ny	75 % av MBL	1,3
Luftkudde, återanvändningsbar	50 % av MBL	2
Överfallssurrning		1,8

1) Maximum 9 % förlängning vid MSL är tillåtet.
2) 50 % rekommenderas.

Bilaga 10. Dimensionering av lastsäkring genom praktiska prov

Praktiska prov

Praktiska fullskaleprov kan utföras dels för att bestämma friktionsfaktorn för olika materialkombinationer och dels för att kontrollera säkringsmetodens funktion. Observera att fullskaleprov kan medföra betydande risker om lasten börjar glida eller tippa. Prov bör utföras under väl kontrollerade former och med nödvändiga skyddsåtgärder för de medverkande.

Bestämning av friktionsfaktor (μ)

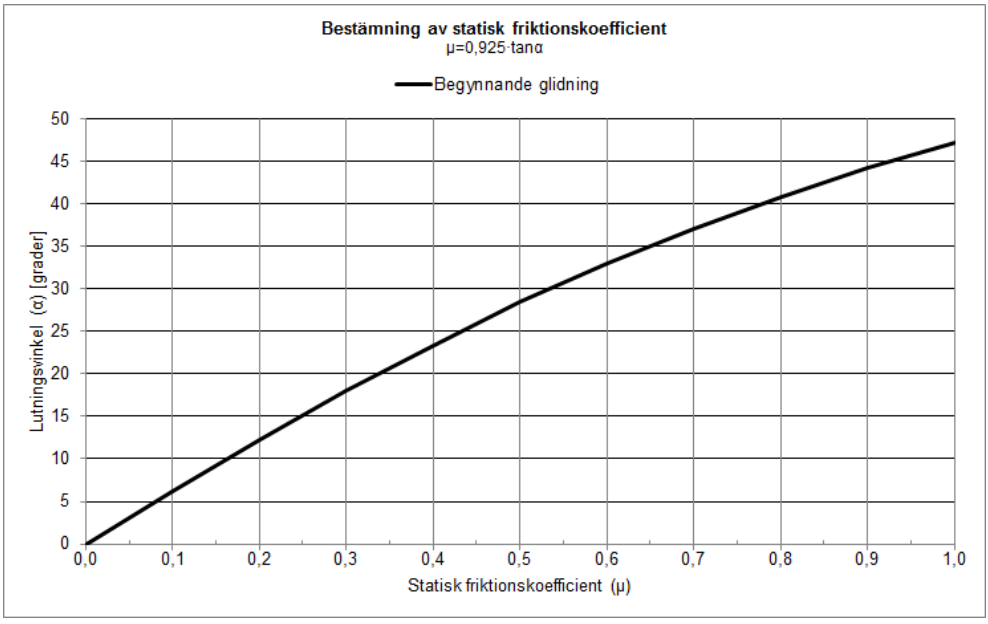
Vid bestämning av friktionsfaktorn placeras lasten osäkrad i lastbäraren och lastbäraren lutas med successivt ökande vinkel (α). Friktionsfaktorn (μ) bestäms enligt följande samband:

$\mu = 0{,}925 * \mu_{statisk} = 0{,}925 * \tan \alpha$

där

$\mu_{statisk}$ är den statiska friktionskoefficienten
α är lutningsvinkeln vid begynnande glidning

Vid bestämning av en friktionsfaktor upprepas testet fem gånger under praktiska och realistiska omständigheter. Det högsta och lägsta värdet stryks och medelvärdet av de återstående tre värdena utgör friktionsfaktorn (μ).



Funktionskontroll av lastsäkringsmetod genom praktiska prov

Vid funktionskontroll av lastsäkringsmetoden placeras lasten med avsedd säkring applicerad i eller på lastbäraren och lastbäraren lutas till en vinkel som motsvarar de dimensionerande accelerationer som anges nedan.

Erforderlig lutningsvinkel α för en känd friktionsfaktor μ bestäms ur sambandet:

$$m \cdot g \cdot (\sin\alpha - \mu \cdot \cos\alpha) = m \cdot g \cdot (c_{x,y} - \mu \cdot c_z)$$

där vänsterledet representerar säkringskrafter för den provade konditionen och högerledet krafter för den dimensionerande konditionen, och där

$c_{x,y} \cdot g$

är dimensionerande acceleration i horisontell led (tvärskepps eller långskepps) och

$c_z \cdot g$

är dimensionerande acceleration i vertikal led.

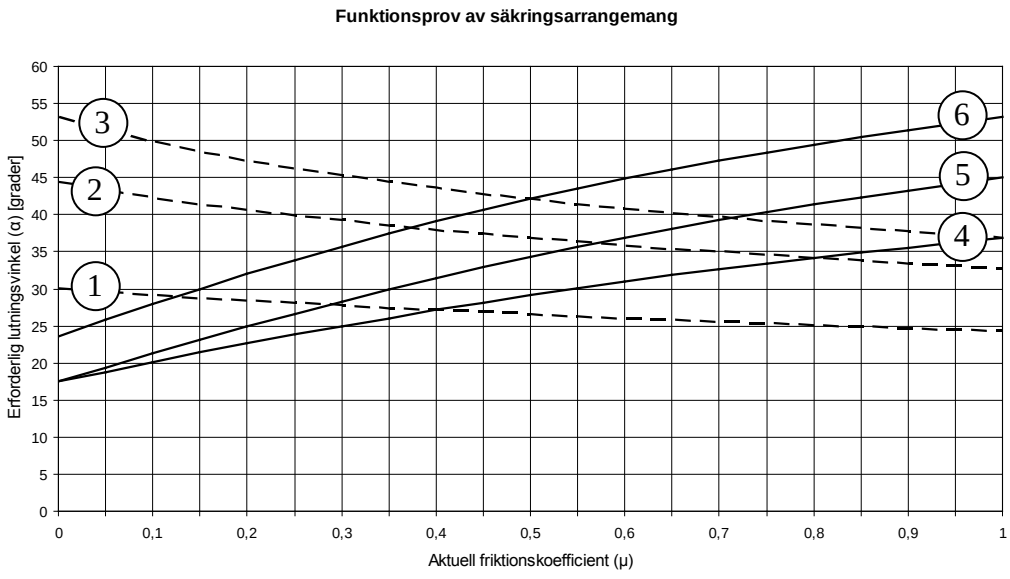
Erforderlig lutningsvinkel kan beräknas ur nedanstående formler eller bestämmas med hjälp av diagrammet nedan.

$$\alpha = 2 \cdot \tan^{-1}\left[\frac{-1+\sqrt{1+\mu^2-\mu^2 \cdot c_z^2+2 \cdot \mu \cdot c_z \cdot c_{x,y}-c_{x,y}^2}}{\mu+\mu \cdot c_z-c_{x,y}}\right]$$

$$\mu \neq \frac{c_{x,y}}{1+c_z}$$

$$\alpha = 2 \cdot \tan^{-1}\left[\frac{c_{x,y}}{1+c_z}\right]$$

$$\mu = \frac{c_{x,y}}{1+c_z}$$



Tvärskeppsled		**Långskeppsled**	
Kurva	*Farvatten*	*Kurva*	*Farvatten*
1	A	4	A
2	B	5	B
3	C	6	C