



GUIDE FOR

ERGONOMIC CONTAINER LASHING

JUNE 2017

**American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862**

**© 2017 American Bureau of Shipping. All rights reserved.
ABS Plaza
16855 Northchase Drive
Houston, TX 77060 USA**

Foreword

ABS has produced this *Guide for Ergonomic Container Lashing* to provide a single source for ergonomic criteria related to container lashing and unlashings operations.

Injuries, and sometimes fatalities, related to the lashing and unlashings of containers represent a significant amount of the incidents that occur onboard container carriers. Container lashing and unlashings is also the cause of many crew member and dockworker near misses (close calls). During the design and construction of container carriers the provision of safe work areas for lashing/unlashings personnel is essential.

The purpose of this Guide and the associated notations are to benefit Owners by facilitating a safer, more ergonomic, working environment. This Guide focuses on the design aspect of lashing access and working location layout and outfitting. It contains requirements addressing the design aspects of IMO circular MSC.1/Circ.1352 (CSS Code Annex 14).

The Guide offers two (2) optional notations as follows:

- **ERGO(LASH)-R** (Ergonomic Lashing – Restricted)
- **ERGO(LASH)** (Ergonomic Lashing)

The **ERGO(LASH)-R** notation is applicable to existing container carriers, prescribing requirements based on good ergonomic practice, relating to container lashing. It is awarded for compliance with the relevant requirements contained in Section 2 of this Guide. It is considered that it will be more practicable to apply this notation's requirements to existing container carriers with the understanding that existing ships are not required to be enlarged or undergo other major structural modifications.

The **ERGO(LASH)** notation is applicable to both existing and new container carriers prescribing enhanced ergonomic requirements based on the design guidelines contained in section 6 (Design) and section 8 (Specialized Container Safety Design), except subsection 6.3 (Lashing Systems), of Annex 14 of the Code of Safe Practice for Cargo Stowage and Securing (CSS Code) as adopted by MSC.1/Circ.1352. It is awarded for compliance with the relevant requirements contained in Section 2 of this Guide.

Research conducted by ABS as part of the ABS Mariner Safety Research Initiative (MSRI) has shown that leading causes of incidents (injuries and near misses) includes among other things, slips/trips and falls, dropped objects, and incomplete or incorrect lashing/unlashings. To respond to these issues, ABS has used the MSRI data repository to investigate and identify opportunities to improve working conditions for the lashing/unlashings activities on deck by addressing the above areas of concern. The different ergonomic notations can help reduce incidents (injuries and near misses), and improve worker safety and performance.

This Guide becomes effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of this Guide is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.



GUIDE FOR ERGONOMIC CONTAINER LASHING

CONTENTS

SECTION 1	General	5
1	Introduction	5
2	Application and Scope	6
3	Terminology	6
4	Notations	7
4.1	ERGO(LASH)-R Notation	7
4.2	ERGO(LASH) Notation	7
5	Documentation	8
5.1	Risk Assessment	8
5.2	Design Requirements	8
5.3	Results	8
6	Process for Obtaining a Notation	8
7	Alternatives	9
7.1	General	9
7.2	Other Regulations	9
7.3	Departures from Criteria	9
SECTION 2	Requirements for Notation	10
1	Introduction	10
2	Risk Assessment Requirements	10
2.1	List the Job Steps	10
2.2	Identify Hazards Associated with Each Job Step	11
2.3	Identify Existing Control Measures for Each Hazard	11
2.4	Performing Risk Analysis and Risk Evaluation	12
3	Design Requirements	13
3.1	General Provisions	13
3.2	Lashing Position Design (Platforms, Bridges and other Lashing Positions)	13
3.3	Fencing Design	18
3.4	Ladder and Manhole Design	19
3.5	Lashing Equipment Design	24
3.6	Lighting Design	24
3.7	Specialized (Reefer) Container Safety Design	26

TABLE 1	General Provisions.....	13
TABLE 2	Lashing Position Design	13
TABLE 3	Fencing Design	18
TABLE 4	Ladder and Manhole Design.....	20
TABLE 5	Lashing Equipment Design	24
TABLE 6	Reefer Container Safety Design	26
FIGURE 1	Sample Risk Matrix with Risk Tolerability Criteria	12
FIGURE 2	Work Area Between Container Stacks.....	14
FIGURE 3	Lashing Bridge	15
FIGURE 4	Lashing Platforms on Outboard Stanchions	16
FIGURE 5	Work Area Between Hatch Covers	17
FIGURE 6	Fencing Dimensions.....	19
FIGURE 7	Ladder Dimensions	21
FIGURE 8	Ladder Access from the Outside of the Lashing Platform	22
FIGURE 9	Ladder Access through the Lashing Platform.....	22
FIGURE 10	Lashing Platform Manhole Dimensions	23
FIGURE 11	Vertical Ladder Guard Hoops (Ladder Length $\geq$ 3 m (10 ft)).....	23
SECTION 3	Survey Requirements.....	27
1	General	27
2	Initial Survey During Construction (ERGO(LASH))	27
3	Surveys After Construction (ERGO(LASH)-R and ERGO(LASH))	27
3.1	Initial Survey for Existing Vessels Obtaining the ERGO(LASH)-R Notation	27
3.2	Initial Survey for Existing Vessels Obtaining the ERGO(LASH) Notation	27
3.3	Annual Surveys	27
3.4	Special Periodical Surveys (ERGO(LASH))	28
3.5	Requirements for Vessel Alterations.....	28
APPENDIX 1	References	29
APPENDIX 2	Risk Assessment Form Template	30



SECTION 1 General

1 Introduction

Ergonomics is defined as “the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design in order to optimize human well-being and overall system performance” (International Ergonomics Association, 2011).

Injuries (and sometimes fatalities) related to the lashing and unlashings of containers represent a significant amount of the incidents that occur onboard container carriers in port. These incidents occur to both permanent crew members and also to dockyard workers engaged in the container securing operations. Container lashing and unlashings has also been the cause of many crew member and dockworker near misses (close calls).

Container lashing is a strenuous, high risk, and dangerous activity. During lashing and unlashings activities, containers are secured to the ship by means of lashing rods, turnbuckles, twist-locks, and other lashing equipment. Lashing equipment limits container movement, and prevents containers from falling overboard.

During the design and construction of container carriers, the provision of safe work areas for lashing/unlashing personnel is important. Container carrier owners and designers are reminded of the dangers associated with container lashing and unlashings operations and are encouraged to develop and use container securing systems which are safe by design. The aim is to eliminate or at least minimize:

- Container top work
- Work in other hazardous locations; and
- The use of heavy and difficult to handle securing equipment.

The provision of safe working conditions for container lashing and unlashings operations requires a focus on vessel design, operation, and maintenance. Additionally, potential safety issues on large container carriers are not necessarily the same as on smaller ones.

As per SOLAS Reg. VI/5.6, all ships engaged in carrying cargoes other than solids and liquid bulk cargoes are to carry a Cargo Securing Manual (CSM). The CSM is to be approved by the Administration or a recognized organization acting on their behalf.

The IMO Guidelines for the preparation of the CSM (MSC.1/Circ. 1353) requires that ships which are specifically designed and fitted for the purpose of carrying containers to have an approved Cargo Safe Access Plan (CSAP) onboard. The CSAP demonstrates that personnel will have safe access for container securing operations. It is important for this plan to detail vessel arrangements necessary for conducting cargo stowage and securing operations in a safe manner. Guidelines for specific requirements are contained in the Code of Safe Practice for Cargo Stowage and Securing (CSS Code) Annex 14, “Guidance on Providing Safe Working Conditions for Securing of Containers on Deck, as adopted by MSC.1/Circ.1352.

In support of Annex 14 of the CSS Code, ABS has prepared this Guide with the intent of providing additional information regarding the safe working condition for securing of containers on deck, as well as the criteria for the **ERGO(LASH)-R** and **ERGO(LASH)** notations.

Annex 14 of the CSS Code addresses, in addition to design, operational and maintenance procedures which are not addressed in the Guide but are encouraged to be considered in order to improve safety and to satisfy the requirements of the Administration (when applicable).

2 Application and Scope

This Guide is applicable to existing and new container carriers for which the optional **ERGO(LASH)-R** or **ERGO(LASH)** notation has been requested.

The purpose of the ABS Guide and the associated notations is to provide the marine container transportation industry with guidance on the design of a more ergonomic working environment.

A review of injuries reported to the ABS Mariner Safety Research Initiative (MSRI) was conducted to evaluate the severity and reported cause of injuries sustained during container securing operations. The ABS MSRI data was also reviewed to analyze the container carrier near misses. The key near misses align well with the reported injuries. They include, but are not limited to:

- i) Leaving lashing gear hanging unsecured from containers and structure (struck by)
- ii) Loss of vigilance/situational awareness (slip/trip/fall)
- iii) Not following the proper processes or procedures (incomplete or incorrect lashing/unlashing)

To respond to these issues, ABS used the MSRI data to investigate and identify opportunities to improve the designs and layouts relating to the securing of containers on deck. The different ergonomic notations focus on improving safe working conditions for lashing and unlashing activities by addressing the key focus areas noted above. The different ergonomic notations can help reduce incidents (injuries and near misses), and improve worker safety and performance.

3 Terminology

Administration (Flag State): The Government of the State whose flag the ship is entitled to fly.

Cargo Safe Access Plan (CSAP): Ships which are specifically designed and fitted for the purpose of carrying containers are to 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 is to detail arrangements necessary for the conducting of cargo stowage and securing in a safe manner. It is to include the following for all areas to be worked by personnel (refer also to MSC.1/Circ.1353/Rev.1):

- Hand rails
- Platforms
- Walkways
- Ladders
- Access covers
- Location of equipment storage facilities
- Lighting fixtures
- Container alignment on hatch covers/pedestals
- Fittings for specialized containers, such as reefer plugs/receptacles
- First aid stations and emergency access/egress
- Gangways
- Any other arrangements necessary for the provision of safe access

Container Carrier: For application of this Guide, a container carrier is a vessel designed primarily for the carriage of containers on deck and those parts of other ships for which arrangements are specifically designed and fitted for the purpose of carrying containers on deck.

Fencing: A generic term for guardrails, safety rails, safety barriers and similar structures that provide protection against the falls of persons.

Fully Automatic Twistlock (FAT): A twistlock that is inserted and secured in the four bottom corner fittings on the quay before the container is stowed on top of another container onboard the vessel. The geometry of the twistlock design engages the corner fittings of the lower container and does not require stevedores to lock or unlock the fitting when stowing or discharging containers.

High-Cube Container: A container similar in structure to ISO standard containers, but taller. While a standard container has a maximum height of 2591 mm (8'-6"), a high-cube container is 2896 mm (9'-6") tall.

Illuminance: The luminous flux density at a surface (or the amount of light falling on an object or surface), i.e., the luminous flux incident-per-unit area. Illuminance is measured in units of Lux (lm/m^2) or foot-candles (fc; lm/ft^2). One foot-candle equals 10.76 Lux.

Lashing Positions: Refers to the following positions:

- In between container stows on hatch covers
- At the end of hatches
- On outboard lashing stanchions/pedestals
- Outboard lashing positions on hatch covers
- Any other position where people work with container securing

Lashing Rod: A tension element (typically made of steel) that has the appropriate strength and length that forms the lashing assembly used in conjunction with a tensioning device and lashing points. One end is fitted in a container corner casting and the other end is mated with the tensioning device.

Semi-Automatic Twistlock (SAT): A twistlock that is inserted and secured in the four bottom corner fittings on the quay before the container is stowed on top of another container on board the vessel. When the container is landed on top of another container, a spring mechanism in the twistlock automatically engages and secures the container above to the container below. This type of twistlock must be manually released or unlocked to discharge the container above.

Securing: Refers to container lashing and unlashings operations.

Stringers: The upright or sides of a ladder.

Tensioning Device: An adjustable device used to tighten a lashing (i.e., turnbuckle).

Turnbuckles: A specific type of *Tensioning Device*.

4 Notations

This Guide offers two (2) optional notations related to ergonomic container lashing, **ERGO(LASH)-R** and **ERGO(LASH)**.

4.1 ERGO(LASH)-R Notation

The **ERGO(LASH)-R** notation is applicable to existing container carriers, prescribing requirements based on good ergonomic practice, relating to container lashing. It is awarded for compliance with the relevant requirements contained in Section 2 of this Guide. It is considered that it will be more practicable to apply this notation's requirements to existing container carriers with the understanding that existing ships are not required to be enlarged or undergo other major structural modifications.

4.2 ERGO(LASH) Notation

The **ERGO(LASH)** notation is applicable to both existing and new container carriers prescribing enhanced ergonomic requirements based on the design guidelines contained in section 6 (Design) and section 8 (Specialized Container Safety Design), except subsection 6.3 (Lashing Systems), of Annex 14 of the Code of Safe Practice for Cargo Stowage and Securing (CSS Code) as adopted by MSC.1/Circ.1352. It is awarded for compliance with the relevant requirements contained in Section 2 of this Guide.

5 Documentation

Relevant plans and documentation are to be submitted for approval and review as follows. Plans are to generally be submitted electronically to ABS. However, hard copies will also be accepted.

5.1 Risk Assessment

For existing vessels requesting either the **ERGO(LASH)-R** or the **ERGO(LASH)** notation a risk assessment is not required to be carried out.

For new vessels requesting the **ERGO(LASH)** notation, a risk assessment is to be performed at the design stage as described in Subsection 2/2 of this Guide in order to confirm that securing operations can be safely carried out in all anticipated container configurations. This assessment is to be conducted with a view toward developing the Cargo Safe Access Plan (CSAP).

The risk assessment is to be prepared and submitted to ABS for review.

5.2 Design Requirements

5.2.1 For Vessels Requesting the **ERGO(LASH)-R** Notation

For vessels requesting the **ERGO(LASH)-R** notation, the following plans, reflecting the current configuration and covering all the relevant requirements, are to be prepared and submitted to ABS Engineering for approval in advance of ABS Surveyor verification.

- i) Arrangement and outfitting drawings
- ii) Reefer container electric power supply system drawings

5.2.2 For Vessels Requesting the **ERGO(LASH)** Notation

For vessels requesting the **ERGO(LASH)** notation, the following plans covering all the relevant requirements are to be prepared and submitted to ABS Engineering for approval:

- i) Cargo Safe Access Plan (*Note:* for existing vessels, alternatively, the arrangement and outfitting drawings)
- ii) Lighting Plan (only applicable to new vessels)
- iii) Reefer container electric power supply system drawings

5.3 Results

ABS Engineering will review and approve the submitted documentation. ABS Engineering is to report any deviation from the criteria to the Owner/shipyard for resolution and is to also identify any criteria that the ABS Surveyors is to field-verify.

The ABS Surveyor is to verify that the arrangements are in accordance with the approved documentation. The ABS Surveyor also is to verify resolution of outstanding comments noted from the ABS Engineering review and document deviations from criteria.

6 Process for Obtaining a Notation

At the request of the Owner, operator, or builder, a container carrier complying with the minimum criteria for ergonomic lashing provided in this Guide may be assigned the **ERGO(LASH)-R** or **ERGO(LASH)** notation, as applicable.

The process is divided into three (3) stages as follows:

1. *Risk Assessment.* A risk assessment (when applicable) is to be conducted, as prescribed in Subsection 2/2 of this Guide.
2. *Design Approval.* All required documents, as listed in Subsection 1/5 of this Guide, are to be submitted to ABS Engineering for review (risk assessment report, when applicable) and approval (design related documentation).

3. *Survey Verification of Design.* Follow-up physical verification of all prescribed ergonomic criteria is to be performed by an ABS Surveyor. For vessels requesting the **ERGO(LASH)** notation, lighting testing is to be performed as prescribed in 2/3.6 of this Guide

The ABS Engineering ergonomic assessment and ABS Surveyor verification and lighting testing (when applicable), are to be reviewed by the ABS Surveyor for notation confirmation.

7 Alternatives

7.1 General

ABS will consider alternative arrangements and criteria, which can be shown to satisfy the criteria directly cited or referred to in this Guide. The demonstration of an alternative's acceptability can be made through either the presentation of satisfactory service experience or systematic analysis based on valid engineering principles.

7.2 Other Regulations

ABS will consider for acceptance alternative arrangements and details which can be shown to comply with standards recognized in the country in which the container carrier is registered (flag State) provided they are deemed not less effective.

7.3 Departures from Criteria

It is recognized that unusual or unforeseen conditions may lead to a case where one or more of the parameters of interest in granting a notation may temporarily fall outside the range of acceptability.

When a departure from criteria is identified, during either the notation's initial issuance or reconfirmation process, it is to be reviewed by ABS in consultation with the shipyard or the Owner. When the ergonomic design contains departures from the stated criteria, these will be subject to special consideration upon the receipt of details about the departure. Depending on the degree and consequences of the departure, the shipyard or Owner may be required to provide an assessment and remediation plan to obtain or maintain the notation. Failure to complete the agreed remediation by the due date will lead to withdrawal of the notation.