

# BEST PRACTICE GUIDELINES FOR THE SAFE USE OF "LINED" ISO BOX CONTAINERS FOR MOVEMENT OF DRY BULK PRODUCTS







#### **DISCLAIMER**

This document is intended for information only and sets out guidelines for the safe use of "lined" ISO box containers for movement of dry bulk products. The information provided in these guidelines is provided in good faith and, while it is accurate as far as the authors are aware, no representations or warranties are made with regards to its completeness. It is not intended to be a comprehensive guide to the use of "lined" ISO box containers for movement of dry bulk products. No responsibility will be assumed by ECTA in relation to the information contained in these Guidelines.





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#### INTRODUCTION

With the ongoing globalisation of the supply chains, movement of dry bulk product is increasingly undertaken by utilising ISO (International Standards Organisation) box containers equipped with an inner liner.

The ISO box container is not specifically designed for the movement of dry bulk products, has no top loading hatches and has no specific designed discharge configuration for bulk products. The containers can be loaded anywhere in the world and the typical operation of one door/door transport can involve many different suppliers in relation to:-

- ISO Box Container selection
- Supply of the inner liner
- Fitting of the liner and the false bulkhead
- Loading of the ISO Box Container
- Ocean shipping
- Intermodal operations such as Trucking / Rail / Barge / Storage including lifts/Terminals
- The discharge operation
- Recycling of the used liner

ECTA feels it is imperative to develop guidelines that assist in the safe movement of these containers into, within and out of Europe.

With regards to the number of serious incidents, personal injuries and near-misses by the use of ISO box containers (not specifically designed for the transportation of bulk products) and the diversity of liners, false bulkheads used therein, these Guidelines are provided to offer and continually improve safety during maritime transport and the associated handling of dry bulk products, as part of the overall objective of both the chemical industry and the European logistics industry, to operate in accordance with the Guiding Principles of Responsible Care.

The following images are examples of unsafe containers, wrongful use and unsuitable liners and bulkheads and the likely consequences to these guidelines not being followed:



Burst liner with contents spilt



Container with contents spilt & liner down







Container fallen off trailer



Result of badly fitted bulkheads and bars



Trapped discharge sleeve



Container fallen off trailer



Tilting too quickly



Snapped Wooden Bulkhead

The above emphasises the need for training of operators within the supply chain and the continuing risk assessment of all activities associated within the supply chain. These should cover:

- Liner & Bulkhead Fitting
- Loading and Discharge
- Drivers
- Intermodal transport such as per road truck,, ship, barge, train
- All non-hazardous, and those products classified and approved according to ADR/IMDG for carriage in lined ISO box containers.





#### N.B.:

- When carrying dangerous goods in lined ISO box containers, it should be noted that additional rules and regulations may be applicable which are not covered in this document.
- Companies may decide to apply the guidelines either in full or part, taking into account specific circumstances and their own risk assessment on requirements.
- Compliance with any applicable national and international regulations always takes precedence over adhering to the recommendations made in the present Guidelines.

#### **OBJECTIVES AND SCOPE**

The objective of these guidelines is to describe the equipment specifications for ISO Box Containers and the movement, loading and discharging of dry bulk materials.

#### 1. RISK ASSESSMENT AND TRAINING

It is recommended that all activities associated with the movement of dry bulk products in ISO box containers are performed by professional companies that have a proven experience in handling and logistics of dry bulk products.

These companies have the ability to identify the critical activities in the supply chain and can:-

- Identify and mitigate all risks and hazards for each activity (such as static electricity and dust explosion etc.)
- Identify the severity of the risks for each activity by the use of a Risk Matrix
- Identify persons who may be involved in the work associated with known risks
- Develop training programmes for each Risk/Hazard
- Train all involved personnel and conduct refresher training when required including the recording and maintenance of personnel files that training has been conducted.

It is important to verify that the ISO box container and the Bulkhead Fitting have been tested and approved by the required technical authorities/personnel prior to tipping and unloading.

#### 2. RECEIVING SITE FACILITIES

Before any shipment of dry bulk products by use of ISO box containers can be undertaken, the facilities at the proposed receiver's premises suitability should be assessed for the safe delivery of bulk products, by the use of the "ECTA / ISO Box Container Bulk Solid Tipping (non-hazardous) Document)" see appendix 1.





#### 3. ISO BOX CONTAINER SELECTION

These ISO Box Container Selection guidelines apply to unpressurised dry bulk ISO box containers to be utilised by the fitment of a liner and false bulkhead, to carry dry bulk products.

#### 3.1. Legal requirements

- CSC (Container Safety Convention)/ ACEP (Approved Continuous Examination Programme) certification should be checked and verified to ensure that the ISO Box Container is fit-forpurpose for the duration of use.
- Always be aware that Iso Box Containers / and previous carried cargo could have been fumigated. Although the empty container will have been vented during discharge of previous discharge of cargo a residual fumigant may still be present.
- Good ventilation and following precautionary measures prior to entry is important. In case of any doubt additional ventilation and wearing adequate respiratory protection is recommended.

#### 3.2. Recommendations for ISO box container selection

The equipment should comply with the following specifications and conditions:

- 20' or 40' unpressurized container designed to ISO standard and according to international regulations
- External and internal condition to be checked for any damage that would make it unsuitable for use
- Door gaskets in good condition to prevent water ingress
- Equipped with the minimum lashing points to install the liner
  - o 20' container 1 in each corner plus 2 on each side
  - o 40' container 1 in each corner plus 3 on each side
- Undamaged flat steel or wooden floor without sharp edges, splinters, rough weld repairs, etc. to prevent damage to the liner
- Side panels/walls and roof without damage, such as sharp edges, rough weld repairs, etc. to prevent damage to the liner
- All internal upright shoring slots (front and rear) need to be straight to ensure that the metal bars at the defined length fit properly in the shoring slots, to ensure safe discharge during the tipping process.
- Container must be clean swept
- Rust inside must be avoided



**Rusty Container** 



Damaged Floor







**Rusty Damaged Floor** 



Sharp dents on walls



Debris behind lashing points

- Check the correctness of the documents incl. comparing the container number
- Report, if necessary, using the interchange form "Container Check List".

#### 4. PRODUCT CHARACTERISTICS

#### 4.1. Liner & Bulkhead Selection and Fitment

For selection of the correct Liner and Bulkhead design, take into account:

- Correct type of liner for product being carried has been selected
- Correct type of false bulkhead to ensure safe discharge during tipping has been selected, and the correct specification of bulkhead retaining bars for the safe discharge of the material has been selected.
- Suitable loading method and design
- Suitable discharge method and design

The following document "Liner & Bulkhead Selection Chart" may be of assistance, see appendix 3.

#### 5. LOADING & DISCHARGING

The following procedures need several actions to be taken for preparation. Included in this preparation is the container itself as well as the chassis that carries the container during the loading process. For this purpose a Container Check List is recommended including the following items:

- a) Basic requirements
- Check the container number matches with the order/loading paper
- Correctness of new fitted liner





- b) Additional (Container Check List)
- c) Stability:
- The product should be loaded into the ISO box container to ensure:-
- The bulk density of the product being contained should be taken into account to ensure that
  the maximum allowable gross weight at loading and during the total transport chain is not
  exceeded
- Maximum payload possible within the regulations applicable to the journey
- Maximum allowable axle weights are not to be exceeded
- · Gross vehicle weight not being exceeded

The aim of the above is to assist in the stability of the equipment during transit.

- d) After loading checks:
- Doors closed properly and securely locked and seals fitted





• Completion of documents and notation of seal numbers on documents

#### 5.1. Loading & Discharge equipment

The above sealing methods should ensure there has been no interference with the container content.

- Trailers should be designed to hold the container in the corner castings with twist locks according to "ECTA Recommendation for Tipping Dry Bulk Containers". Containers fixed by other means (e.g. chains, rope, etc.) are forbidden.
- For safe handling, it is recommended that tipping chassis should be designed / equipped with rear landing legs.
- Trailers should be equipped with a earthing point and / or earthing wire.
- Additional information can be found in the ECTA brochure <u>"Recommendations for tipping equipment"</u>. ECTA Website <u>www.ecta.be</u>

#### 5.2. Loading Methods

The loading of ISO Box Containers will be effected through the end doors of the container.

There are two ways in which to do this:

- With the container in a horizontal position.
- With the container in a tilted position.





By far the safest method is with the container horizontal, however, this may not always be the desired method when matters such as:

- Product damage
- Low dust creation

The following are horizontal methods of loading:

- A Pneumatic by using
  - A low pressure conveying system
- B Mechanical by using a
  - Belt conveyor
  - Screw conveyor
  - Belt thrower
  - Rotary Paddle Thrower
  - Jet-stream thrower

In choosing any of the above, the guidelines in 5c and 5.1. above should be followed.

The following are differing types of loading equipment for gravity feeding of product into the container, through the end doors:



Trailer with tilting ram



**Tilting Trailer Chassis** 



**Tilting Platform** 



Tilting frame





#### 6. DISCHARGE

It is important to verify that the ISO box container and the Bulkhead Fitting have been tested and approved by the required technical authorities/personnel prior to tipping and unloading.

Discharge and tipping with one of the two container doors closed is considered a safer method than with two open doors.

There are basically 2 supply chain choices:

- A Either by transfer of product from a 20ft ISO box container to 30ft container or silo road truck at a professional dry bulk transfer terminal for onward delivery to the receiving customer.
- B Or by direct delivery from port of entry to the receiving customer by use of either:
  - "On-board" delivering trailer delivery systems, or
  - "On-site" delivery systems

#### 6.1. Transfer of product from a ISO box container into a 30ft container or silo road truck (trailer)

With this method executed at a professional dry bulk transfer terminal the following is assured:

- Safe tilting (fixed installation, withstand wind forces)
- Payload & CO2 emission consideration
- Dedicated special equipment for dry-bulk loading/unloading at the final receiver (discharge via letterbox [doors closed], ventilation, hatches, ...)

The below guidelines would be applicable:

<u>"ECTA - Cefic Guidelines for Equipment for the Transport of Dry Bulk Cargo, to be Discharged by Tipping"</u> ECTA Website <u>www.ecta.be</u>

as well as

<u>"Behaviour Based Safety Guidelines for the Safe Loading and Unloading of Road Freight Vehicles"</u>
And ECTA Website www.ecta.be

"Tipping Equipment" ECTA Website www.ecta.be









#### 6.2. ISO Box Container Direct delivery from the port of entry to the receiving customer.

- a On arriving at the customer site:
  - Report to the person in charge and hand over documentation
  - Check with the person in charge what the correct procedure for receipt is, including weighing
  - In and weighing out.

#### b Before unloading:

- Check the security of the container (twist-locks) -> Refer to <u>"Recommendations For Tipping Dry Bulk Containers" and (Tipping Equipment)</u> ECTA Website <u>www.ecta.be</u>
- If applicable lower the supporting legs of the chassis -> Refer to <u>"Recommendations For Tipping Silo Trailers"</u> and (Tipping Equipment)ECTA Website <u>www.ecta.be</u>
- Earth the container.
- Make sure all of the unloading equipment is clean (if used or if required, rotary valve, hose(s) etc.)
- Unloading:
- There is particular risk in opening doors, so they need to be opened very carefully, (refer to Section 1. Risk Assessment and Training) with two people in attendance
- Check the bulkhead and bars immediately for correct positioning
- For the safe unloading of the container whether at the customer's installation receiving point
  or at a transfer station, ensure "ECTA / ISO Box Container Bulk Solid Tipping (non-hazardous)
  Document" is followed See appendix 1
- Discharge through progressive tilting, taking into account the flowability characteristics of the product, to ensure full and safe delivery of product should be followed.
- Supervise the unloading procedure at all times.

#### 6.2.1. With "on-board" chassis delivering system: (rotary valve etc. with the truck)







#### 6.2.2. Direct delivery to receiver with "on-site" systems











#### 6.2.3 Special considerations to be given to the discharge of "cohesive" products

Cohesive products are those of normally small particle size, which in conjunction with other factors such as moisture presence and temperature fluctuations, form agglomerates or even cohesive masses, which can possibly "surge" during discharge. Such products and circumstances can create a scenario during discharge, whereby the discharge operator sees very little movement of the product and consequently incorrectly tilts the container higher to facilitate the movement of product towards the discharge. The likelihood of such actions can result in the least case a sudden movement of product, such that it can flow over the top bar of the retaining bulkhead, as shown in the following photograph:



However, in the worst case scenario, on very cohesive products, instead of a flow of product flowing forward at the top of the loaded container, a quantity of product will move forward within the container as a solid mass and suddenly exert such great force on to the retaining bulkhead, that in the worst case scenario, the bulkhead gives way emptying the complete contents of the container on to the floor. Any discharge operator standing behind the container would be in serious danger in such an event. The following photograph shows such a scenario:



#### 6.2.4 Other considerations impacting on safety are because of:

- Many delivery points are not experienced in receiving bulk products in Iso Box Containers
- Various product characteristics that fail the ECTA / ISO Box Container Solid Tipping (non-hazardous) assessment document App 1.
- Currently many non-specialised and inexperienced LSP's in the supply chain.





#### It is therefore recommended:

- Only specialised / experienced LSP's are engaged in loading, transport and discharge of bulk products.
- Delivery points are assessed and approved for receiving product in bulk.
- Before final delivery to the end customer, transhipment of the products from the ISO Box Container into a specialised 30ft dry bulk container or silo truck, at a professionally operated dry bulk transfer terminal should be considered as the safer option.
- For delivery at the final receiver delivery point, specialised 30ft dry bulk containers in combination with specially designed discharge/tipping provide a safer option to discharge bulk products than the Standard ISO Box Container.

#### 7. RECYCLING

Guidelines on recycling can only refer to the Liner and Bulkhead packaging, along with the metal bars used for the safe discharge of ISO box containers. Shippers should therefore take into consideration the following:

- Selection of the materials of construction should take account of the environmental disposal
  of the materials e.g. the liner and bulkhead should be of the same material wherever
  possible
- Suppliers must meet EU Directive 94/62/EC concerning
- Packaging designed for the EU market
- Packaging waste released on to the EU market
- Compliance with applicable laws and regulations
- As much of the packaging materials as possible should be designed and considered for re-use within these guidelines as far as safe reuse is concerned.

"SAFETY IS OF PARAMOUNT IMPORTANCE WHEN USING ISO BOX CONTAINERS FOR THE MOVEMENT OF DRY BULK PRODUCTS"





## Appendix 1 - ECTA / ISO Box Container Bulk Solid Tipping (non-hazardous) Document

#### A. CUSTOMER INFORMATION Name Street + number Postal / Zip code City County Country Contact person (who to call) Telephone number E-mail address Visit report by: Date **B. GENERAL INFORMATION- SITE** Comments (please detail: video induction, time consumed, period of validity, .....) **General EHS rules and information** displayed/communicated clearly at YES □NO the entry (e.g. traffic rules, min. PPE, Smoking Policy, Emergency response number, Alarm procedure, Site introduction, etc.) Helmet (EN397), Safety spectacles (EN 166-3 with side protection), Safety goggles (EN166), Safety gloves EN388, Safety Specify the PPE needed to enter gloves EN 374, Overall EN533-EN1149/5- EN13034 type6, Warning vest EN471, Safety shoes EN20345S1/ EN20345S2, the site Hearing protection EN352 Languages spoken by (un)loading operators Transperanto used (\*) Yes **No** (ref. www.transperanto.org) Site location (e.g. industrial area, residential area, etc..) Are there any vehicle access restrictions? (e.g. limited height, weight, □No ☐Yes. If yes please specify: size, routing)





	Is sufficient parking space for trucks available outside the fence?	□Yes				□No				
	Are toilets available to drivers?	□Yes			□No					
C. SI	C. SITE RECEPTION AND DOCUMENTATION CHECK									
	General site opening hours		From:			To:				
			From:			To:				
	Slot booking (un)loading applied ?		□No		□Yes Tel/www : .					
	If slot booking is applied, is parking s available for early arrivals?	pace	□Yes			□No				
	Rush hours on site		From:			То:				
			From:			То:				
	Latest time of arrival									
	Location for drivers first reception		□at the gate			□at (un)l	oading	□at the plant		
	Driver Identification		□Official ID card □Company ID card			Drop down info				
	Specify the documents needed to ent the site	er	Drivers licens	se, BBS cei	rtificate, customs docun	nents, Certific	ate of Analysis, Ce	ertificate of Conformity,		
	Routing on site		□instructions given at the entry			□routing displaye	ı signs clearly d	□others		
	Are BBS guidelines for un/loading of embedded in company procedures?				□No (www.cefic.be)					
	Will a sample be taken?		□No	☐Yes b	y (operator, surveyor, driv		ers are taking samp dures apply? (BBS-	les: do supplementary guidelines)		
	Sampling location		Top/botton							
	Do you ascertain that the correct goods are unloaded by comparing the relevant information on the documents with the information on the original order					□Yes		□No		





inclination

□key / brake

inclination

□no

### D. SITE INCIDENT MANAGEMENT

Vehicle movement protection

Is an emergency system present and tested periodically?	□No	□Yes	☐Yes and tested every year
Is trained emergency response team available on-site?	☐Yes (doctor, first aid team, fire brigade,	□No, but readily available from outside	□No
Is there a (near)miss/incident reporting system applicable?	□No	□Yes	

## E. SPECIFIC INFORMATION OF (UN)LOADING AREA (Specify more that this is for a specific product)

	(Un)loadingproduct(s)					
	(Un)loading point (specific location)					
	Are several different points of (un)loading present per site?					
		□Visors				
		☐Breathing apparatus				
			Sp	ec.:		
			Sp			
			Sp	ec.:		
F. (U	IN)LOADING AREA / INSTALLATIONS / PROCEDURES		•			
	Is the area under cover?	□roofed / well protected	□so	me protection	□no protection	
	Type of surface on which the (un)loading activity is taking place	Concrete/bitumen/gravel				
	Is a spill containment present?	□Yes		□No		
	Is lighting present and of sufficient lux power?	□Yes		□No		
	Available clearance height for (un)loading?	meter				
	Position of vehicle	Level	□sli	ght	□very steep	

Wheel





	chocks/clamps/chain	s prot	ection	protection	
Is vehicle reversing necessary? (excluding loading docks)	□No		es, assisted operator	by ☐Yes, unassisted	
Driver Presence during (un)loading	☐YES, all the time		nly for )connecting	□NO	
Operator Presence during (un)loading	I VES 311 the time		nly for )connecting	□NO	
Is driver assistance required during (un)loading?	TES MIVARS"		□Only for (dis)connecting		
	* Additional activities: e.g	j. buttons, si	upervising a pu	ımp,	
Truck keys location during (un)loading	In truck, with the ope	rator, key	box,		
Is shelter provided when the driver is required to stay out of his truck during (un)loading?	□Yes		□ No		
(Un)loading instructions available to the driver?	□Yes		□ No		
Is the truck (un)loading on a public road?	□Yes		□ No		
Is their surrounding traffic (trucks, FLT, pedestrians ) in (un)loading area/	□Yes		□ No		
Is the connection clearly labelled?	□Yes		□ No		
Is the connection point locked?	□Yes	□ No			
Which couplings are required/used (type and size) - Specify					
Are adaptors available?	☐Yes Guidance what adapters are available				
Place of connecting: rear/middle/height and distance restrictions					
The (un)loading point is designed for :	One compartment/truck				
Type of bulk (un)loading:	E.g. pump, dedicated, compressed air,platf		mer, nitrogei	n, compressor,	
If nitrogen is used, are danger labels applied?	□Yes	$\square$ No		□N/A	





(Un)loading pressure range please clarify X or PSI, Bar,	□Minimu	□Maximum							
Bulk loading rate	M³/hr								
Bulk Unloading rate	M³/hr								
Unloading temperature (conveying air) idem	Minimu	□Minimum				□Maximum			
Way of unloading	□Rear/b	□Rear/bottom		☐flexib	le				
ACCESS to top (bulk equipment)	□ Fixed Gantry	Mobile stairca se	vehicle ladder with fall arrest harness and safe connection point	harness or safe connection point		rest afe			
WORK on top (bulk equipment)	☐ Fixed Gantry with full fall protecti on	Mobile stairca se with safety cage	vehicle handrails wit fall arrest harness and safe connection point	without	ls fall s or	□ No prote availa	ction		
Is the gantry suitable for ISO Box containers with regards to height and surrounding area?		meter	YES		NO				
Is a hose present (for discharging as well as air hose and connection)?				From driver					
Is hose lifting required to top of container?	NO a			If YES; carry out risk assessment to determine safe access with hose			nine		
Hose length	М								
Are other specific hose requirements applicable?	Special r		dditional lenç	•	l gask	kets,			
Is venting of liner and dust control considered?	□Yes		If NO, carr	ry out					





				risk assessment on venting and dust control			
Emergency stop for fixed installatraining on operation provided?	ation Identification, location and	<ul><li>Yes, in the discharge area at safe distance</li></ul>		,	☐ Yes, only in the discharge area		ot present
Earthing (Red/green light system	n applicable) availability			lly ning (by er/truck)	warning interlock		□earthing with interlock/fail safe system
Correctness and cleanliness of e hoses, twist locks, earthing, etc.		☐Yes by operato	or/driv	er/both	□No		
Residue checked by operator aft	er unloading	□Yes			□No		
Preloading and Equipment check (correctness of		□No		Yes			
container, liner, twist locks, earthing, loading equipment etc.)?							
Sufficient size/capacity of receivunloading?	ing storage silo checked before	YES / NO					
Is High level alarm available on r	□Yes			□No			
		1			1		
Is high level alarm properly set to al regularly tested?	·	□Yes □No					
Does the High level alarm/trip auton operation?	natically and stop the unloading	□Yes					
How is the emptying of the hose guard of an emergency stop?	Purge possible with: Other:						
Sealing required?	□Yes □No						
If sealing is required it is done by?	Operator/driver/surveyor/NA -						
Eye wash available and fit for purpo	□Yes □No			□No			
Fire extinguisher present near (un)le	□Yes			□No			
Is (un)loading done on a weighbridg	e?	□Yes □No					
Is a calibrated weighbridge present	at the site?	□Yes □No					





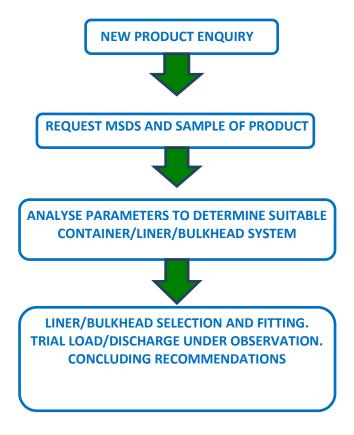
## Appendix 2 - H1 - Container Checklist

Date			Container n°				
Shipping line			Container size	20'	40'	_	
Delivery n°							
Inspection	require	ements			Yes	No	N/A
1			mages and overall conditi	_			
2	Contai objects	ner floor is strong a s	sharp				
3	Contai etc.	ner is clean from a	hemical,				
4	Contai condit	ner free from dirty ion	smell and wet				
5	Doors to ope	es (ready					
6	Seal la	tches under good ion					
7	Free fr repair	om extra welding /	,				
8	Free fr	om any sticker (Fla ctions)	mable or other				
CONTAINER	ACCEPT	TED		CONTAINE REJECTED	R		
Accepted by	, <b>.</b>			Rejected by:			
Signature:	•			Signature:			
Approved by	y:			Approved by:			
Remarks:							_





## **Appendix 3 - LINER AND BULKHEAD SELECTION PROCESS**







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