6 Transport...

6.3 Containers

Source: Hapag-Lloyd.

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IMPORTANT NOTICE!

A general guide cannot take into account the specificity of all products, procedures, laws and regulations. We therefore recommend that this guide be used only as a complement to information from suppliers, whose safety, operating and maintenance procedures along with applicable local legal regulations always take precedence over this guide. This guide is and is intended to be a presentation of the subject matter addressed. Although the authors have undertaken all measures to ensure the correctness of the material, it does not purport to list all risks or to indicate that other risks do not exist. The authors, contributors, the represented associations and participating companies do not give any guarantee thereof and no liability is assumed by reason of this guide as it is only advisory in nature and the final decisions must be made by the stakeholder. It shall not be applied to any specific circumstance, nor is it intended to be relied on as providing professional advice to any specific issue or situation.

Always check machine is in its specified safe position before working on any component (e.g. with compressed air, electrical power and gas disconnected). Only trained maintenance personnel adhering to safety regulations should perform maintenance work.

Best Practice

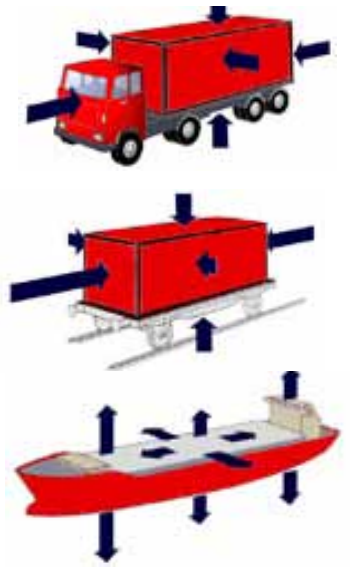
Poor Practice

Safety Issues

Environmental & Economic Impact

Container Care and Challenges

Transport Stress



Acceleration forces on a container. Cargo in containers must be secured to withstand all stresses resulting from their sea and land transport, as well as handling. Source: FMS Use No Hooks p 37 A B C

Source: Hapag Lloyd.

Dry cargo containers are widely used for transporting paper products. Initially, they seemed to offer unlimited advantages, but it has become increasingly difficult to organise smooth container transport because homogeneous cargos as a simple basis for form and friction-locking stowage are less and less common. Cargo unit sizes are highly variable and the sizes and weights of paper rolls rarely coincide with container dimensions.

Containers may be subject to harsh treatment both when handled at the shipping terminal and also by all types of transport from braking, sharp turns, and uneven ground. The stresses of sea transport pose a particular challenge to the safety of the cargo units and their securing. Bad conditions at sea have an effect similar to a truck braking sharply in normal traffic conditions; in addition, the container may also be subject to brief peak loads and repetitive stresses from a ship's rolling motion over a period of days. In serious cases, with each rolling motion some of the cargo units in the container can slide into the gaps between the cargo.

Van carrier for container transport around terminal. Source: HHLA.

If the entire cargo "settles", the existing voids can become one large cargo gap. This can cause the cargo to build up high kinetic energy. After a certain time, the container is no longer able to absorb these continuous forces and becomes seriously damaged. The paper (rolls, pallets, pulp) subjected to these conditions can be rendered unusable for use.

Even before the journey starts, a container could be set down so hard that its load securing method is compromised. After pre-carriage and transport by sea to the port of entry, the container is usually delivered to the receiver, who may or may not have an adequate understanding of suitable handling techniques and might be incorrectly equipped.

As their average service life has increased, along with difficult cargoes like waste metals and plastics that deteriorate containers and repairs that are often inadequate, the condition of containers is declining. For example, some floors may be too weak to support a loaded clamp truck.

Container wall damaged by the cargo within.
Source: FMS Use No Hooks p 64

Container door damaged by cargo within.
Source: FMS Use No Hooks p 65

Damage caused by cargo being unsecured.
Source: FMS Use No Hooks p 64

✔ Transport by a container vessel, truck or train begins with ordering the correct container and continues with their inspection, correct loading and securing of the cargo. Load planning should ensure that the legal maximum weight, per transportation unit is not exceeded.

Standard size containers

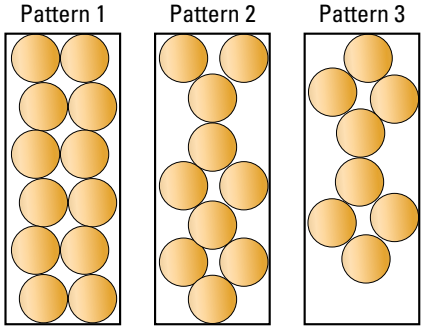
⚠ 34 000 kg maximum for 'heavy weight' containers

Standard containers sizes according to ISO 668 and ISO1496-1 for their doors. New pallet-wide containers are used in Europe for 40' and cube sizes with a wider internal dimension to allow two standard Euro pallets to be stowed side-by-side. Not all containers are standard sizes so it is important to verify dimensions when ordering. Dimension tolerances from production variations is 10 mm (3/8"). Source: Hapag-Lloyd.

Internal	20' Standard		40' Standard		40' High cube	
Length	5867 mm	19'3"	11 998 mm	39'4"	12 020 mm	39'5,25"
Width	2330 mm	7'7-3/4"	2330 mm	7'7-3/4"	2342 mm	7'8-1/8"
Height	2350 mm	7'8-1/2"	2350 mm	7'8-1/2"	2693 mm	8'10"
Door opening						
Width	2286 mm	7'6"	2286 mm	7'6"	2416 mm	7,93 ft
Height	2261 mm	7'5'	2261 mm	7'5'	2585 mm	8,48 ft
Weight						
Max. gross*	30 480 kg	67 200 lbs	30 480 kg	67 200 lbs	29370 kg	67 200 lbs
Tare	2250 kg	4960 lbs	3780 kg	8330 lbs	4630 kg	8860 lbs
Cubic	28 230 cu m	62 240 lbs	26 700 cu m	58 870 lbs	26 460 cu m	58 340lbs
Volume	33,2 cu m	1172 cu ft	67,7 cu m	2390 cu ft	79 cu m	2694 cu ft

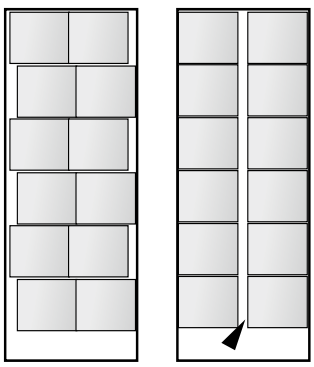
**34 000kg maximum for 'heavy weight' containers.*

'Container Specification' published by Hapag Lloyd has comprehensive information available from www.hapag-lloyd.com.



Loading patterns 2 and 3 require additional securing to ensure stability.
Source: UPM/OPHAL

Example of a CSC information plate fixed to container door. Source: Intakt.



Load pallets along the container walls if there are large gaps. Source: UPM. 3.3.3

Load Planning

✅ Load patterns should be determined for each roll diameter because larger and smaller sizes require different solutions. Actions to optimise container capacity and minimise lashing and securing costs include:

Total weight: Do not exceed the maximum weight limitations of the entire delivery chain and of the container's carrying capacity. This includes the maximum permitted container payload or gross weight, any special customer requirements, and the country (e.g. axle load road transport) or port of destination. A container's maximum weight limit is specified on the CSC plate fixed to the container door. A new IMO regulation requires the shipper to supply the Verified Gross Mass (VGM) of packed containers *(see page 16).*

Maximum payload: The maximum volume and mass that can be loaded in a container depends on the loading pattern. A suitable loading pattern should be used to achieve the maximum payload.

Lashing: The loading of the container should be planned effectively and safely so that the minimum amount of lashing is needed for safe cargo securing.

Weight distribution: The horizontal weight distribution should be as even as possible. The vertical centre of gravity should be in the middle by placing cargo units symmetrically. Heavy rolls must be loaded to both ends of container and not the centre. See also the 'CTU Code' (Code of Practice for Packing of Cargo Transport Units).

Standing (vertical) roll loading patterns: The effect of the loading pattern to the container payload is shown in the diagrams. The illustrated rolls have a diameter of 100 cm (39") loaded in a single layer in a 20' container.

Loading patterns of lying (horizontal) rolls: If rolls are to be manually unloaded, the width of lying loaded rolls must be smaller than the width of the container doorway. A reasonable space must be left between the roll end and the container wall/doorway.

Pallet loading patterns: Minimise the empty space between pallets and container sidewalls. It is preferable to split any remaining void space so that it is equal on both sides of the container. Correct loading techniques require a small handling space across the width of the container — this may vary slightly with handling method. Any larger gaps required for correct handling must be filled.

For larger gaps the pallets should be loaded along the container walls. The empty space in the middle allows access for securing.

✅ It is essential that the cargo cannot move and it is recommended to fill gaps with airbags.

Pallets per container

20' container			40' container		
Length mm	**Width mm**	**N° pallets**	**Length mm**	**Width mm**	**N° pallets**
600	400	53	600	400	108
800	600	26	800	600	53
1100	1100	10	1100	1100	20
1130	1130	10	1130	1130	20
1150	1150	10	1150	1150	20
1150	750	15	1150	750	31
1200	1000	10	1200	1000	20
1200	800	11	1200	800	24
1300	1100	8	1300	1100	18
1420	1120	8	1420	1120	16
2000	1250	4	2000	1250	9
2250	1250	4	2250	1250	9

The greatest moisture stresses occur in winter when transporting from a cold to a warmer climate.
Source: Hapag Lloyd.

Moisture & Condensation

There are several causes to manage. The greatest moisture stresses occur in winter when transporting from a cold to a warmer climate — frost turns to water when the temperature rises, and moisture in the air may condensate on a cold roll. Condensation will form inside the container if the temperature goes up after paper has been loaded and the doors closed. Moisture entering a container during a warm day will condense on the container's internal roof when the temperature falls at night and this moisture drops onto the paper — this effect can be repeated over many days of a voyage, particularly if the container is above deck, or in the container yard, and exposed to the sun with temperature variations of 20-30°C (68-86°F). Incomplete drying after washing is another cause.

- ✅ Minimise condensation by using practices adapted to prevailing climate conditions. Do not expose paper to rain or snow. Place moisture absorbing materials inside the containers, ensure proper ventilation and drainage before loading. The container has no ventilation once its doors are closed.

Source: Hapag-Lloyd.

Containers exposed to the sun can have temperature variations of 20-30°C (68-86°F). Any moisture trapped inside will evaporate and when the temperature falls at night condenses and drops onto the paper cargo.
Source: Hapag-Lloyd.

Container Inspection

Soiled container floor. Source: UPM 3.3.6

The condition of a container may make it unsuitable for paper use. Containers are subject to different stresses, for example on short voyages they may be loaded and unloaded every two days, whereas those used on longer routes may be handled only every few weeks and are, therefore, subject to less handling stress.

Control begins when the container is ordered by stating precisely the intended cargo. Some companies incorrectly assume that roll packaging (particularly end shields) is resistant to water, oil, dirt and moisture — this assumption may only be valid for palletised paper that does not come into contact with the container floor.

Shippers who pack containers at their own facility on their own responsibility should inspect the containers on receipt. The forwarding agent or the customer ordering the container should verify whether the depot carries out the appropriate inspections and document these in an interchange form.

⚠ / €² The risk of accepting a container without inspection is that it is generally assumed that any damage (not recorded at the time of delivery) was caused at a later date by someone else. This applies to all further transfers of the container to other persons within the transport chain. The lack of traceability makes regress very difficult and leads to disagreement. Most large container terminals inspect incoming and outgoing containers for damage, and increasingly use video technology for this.

Cargo residues in container.
Source: FMS Use No Hooks p 83A

✅ The condition of the empty container should be checked at delivery and any damage noted in writing on the interchange form. On transfer, the next responsible person (e.g. truck driver) should check the container is in the same condition and report any damage or sign a clean receipt.

Inspection

✅ The line between usability and unsuitability can be objectively addressed using a container checklist combined with photographic examples of different components.

Every container must be inspected for foreign bodies prior to loading. These are not only loose objects such as wood splinters, stones, etc., but also ingrained cargo residues such as plastic granulate, or a screw protruding from the floor that may penetrate the end of a paper roll.

Ensure there is adequate lighting for visual inspection.
Source: FMS Use No Hooks p 63

❌ Inspecting containers only externally on taking delivery and/or interior inspection limited to opening the right-hand door and glancing into the container is inadequate because inspection of the floor is particularly important for paper and pulp. Ensure there is adequate lighting for visual inspection.

✅ **The container should be thoroughly checked before loading starts. The following items must be inspected:**

Watertight: Check by going inside the container and closing the door — during daylight even the smallest beam of light indicates that the container is not completely watertight.

ACTION: Reject leaking containers.

⚠ Safety requires a second person must be present whenever a person goes inside a container.

Protruding floor screws may penetrate the end of the paper roll. Source: FMS Use No Hooks p 83B

Dry: The container should be completely dry inside. If not, there might be a leak in the floor, or small cracks in the structure or welding points etc

ACTION: Reject a leaking container.

Clean & no protrusions: The container must be clean inside. The floor should have no oil stains, and be free of nails, screws, bolt heads or other protrusions like differences in the thickness of the floor plates.

ACTION: Clean and accept, or reject.

Odour: Residual odour can easily adhere to paper. Unacceptable strong odours are those that are either nauseous or caustic.

ACTION: Reject containers with an odour.

General condition

The container must be strong enough to carry the loaded cargo. Hidden defects can be dangerous, e.g. bolted container floor joints may be defective or a repair may have been carried out incorrectly causing the container floor to bend after loading.

ACTION: Reject if in poor condition.

Floor: The floor must be capable of carrying a loaded clamp truck otherwise the floor could collapse under the vehicle. ISO 1496-1:2011(draft) stipulates a maximum axle load of 7260 kg (16 006 lbs) if the contact area per wheel is at least 142 cm^2 (22 sq. in.)

ACTION: Reject if inadequate repairs or the floor looks does not look strong enough.

Walls: Bent, dented, or bowed panels and frames are not acceptable if they reduce the internal dimensions in any direction, for example not being able to load two 1 m pallets side-by-side (container inner size 2,33 m], or if the shape of the deformation increases the risk of cargo damage. Damaged containers may be stopped by cargo inspectors, or refused by the ship, particularly the newer container ships with a tolerance of only about 2 cm (0,8") per container when loading.

ACTION: Reject if damaged

Doors: Must be in good condition and can be easily closed and locked. The opening and closing mechanism and door seals must be in good condition. Check for water tightness by going inside the container and closing the door — during daylight even the smallest beam of light indicates that the container is not completely watertight.

⚠ Safety requires a second person must be present whenever a person goes inside a container.

ACTION: Reject container with leaking doors.

External lifting points: Check they are complete and in good condition. (no cuts, incorrect repairs or welding etc.).

ACTION: Reject if in poor condition.

Internal lashing points: Normally found in almost all containers. Check they are in good order and complete.

The container must be rejected if it fails on any of the previous items and cannot be repaired. Unacceptable damage is that which is beyond normal wear and tear like dents, minor rust and scratches.

✘ **If container is only partially repaired after the first inspection, it should not be accepted until all required repairs are carried out.**

Examples of container that is not water tight. Source: UPM (3.35)

Is the repaired floor strong enough? Source: UPM 3.3.6

Examples of unacceptable walls. Source: UPM (3.3.8)

Examples unacceptable door condition. Source: UPM (3.3.9)

Inspection Checklist and Possible Faults

	Designation	Fault	Crack	Hole	Loose	Missing	Broken	Bent	Dent	Scratch	Rust	Dirty
1	Door sill		●	●	●		●	●	●	●	●	
2	Door header		●	●	●		●	●	●	●	●	
3	Door corner post with j-bar		●	●	●		●	●	●	●	●	
4	Door hinges		●	●	●	●	●	●	●	●	●	
5	Door locking bar with cam		●		●	●	●					
6	Door handle/linkage lever		●	●	●	●	●					
7	Door handle retainer with catch		●		●	●	●					
8	Bent door			●	●	●		●			●	
9	Door rubber gasket		●	●	●	●					●	
10	Data sign board				●	●				●	●	
11	Threshold door plate		●	●	●		●	●	●		●	●
12	internal side panel		●	●			●	●	●	●	●	●
13	Internal front panel		●	●			●	●	●	●	●	●
14	Roof internal		●	●			●	●	●	●	●	●
15	Floor		●	●	●		●	●	●	●		●
16	Lashing fittings/rings/shackles/eyes		●		●		●		●		●	
17	Top side rail		●	●	●		●	●	●		●	
18	Bottom side rail		●	●	●		●	●	●		●	
19	Fork lift pockets		●	●			●	●	●	●	●	
20	External side panel		●	●	●		●	●	●		●	
21	Front header		●	●	●		●	●	●		●	
22	Front sill		●	●	●		●	●	●		●	
23	Front corner post		●	●	●		●	●	●		●	
24	External front panel		●	●	●		●	●	●		●	
25	Roof external		●	●	●		●	●	●		●	
26	Cross member/rail		●	●	●	●	●	●	●		●	
27	External lifting points		●		●	●	●	●			●	

The type of faults that may effect the condition of a container and its fitness for use. Source: OPHAL.

Source: Hapag Lloyd.

CTU Code

The Code of Practice for Packing of Cargo Transport Units (CTU Code) is jointly developed by the International Maritime Organization (IMO), the International Labour Organization (ILO) and the United Nations Economic Commission for Europe (UNECE). It is a non-mandatory global code of practice for the handling and packing of cargo transport units for transportation by sea and land. See International Maritime Organization (IMO), http://www.imo.org/en/OurWork/Safety/Cargoes/CargoSecuring/Pages/CTU-Code.aspx

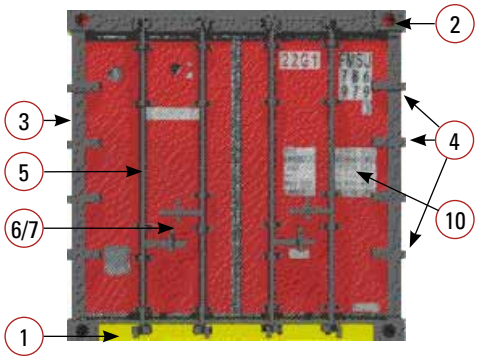
Within the CTU Code, there is comprehensive information and references on all aspects of loading and securing of cargo in containers and other intermodal transport, taking into account the requirements of all sea and land transport modes. The CTU Code applies to transport operations throughout the entire intermodal transport chain and provides guidance not only to those responsible for packing and securing cargo, but also to those who receive and unpack such units. The Code of Practice also addresses issues such as training and the packing of dangerous goods.

The CTU Code is intended to assist the industry, employers' and workers' organizations as well as governments in ensuring the safe stowage of cargo in containers. The CTU Code was recently issued as an MSC circular (MSC.1/Circ.1497) and it can also be downloaded from a dedicated website:

Code https://www.unece.org/fileadmin/DAM/trans/doc/2014/wp24/CTU_Code_January_2014.pdf

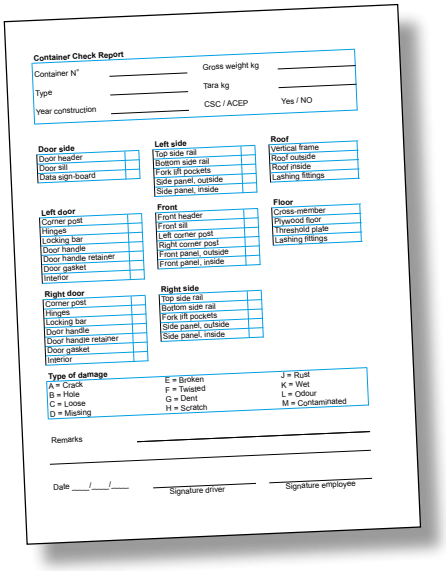
Related informative section https://www.unece.org/fileadmin/DAM/trans/doc/2014/wp24/IMO_Circular_1498_-_Informative_Material.pdf

What to inspect



Door p 90

Exterior p 96 A



Container Check Report

Container N° | Gross weight kg
Type | Tara kg
Year construction | CSC / ACEP | Yes / NO

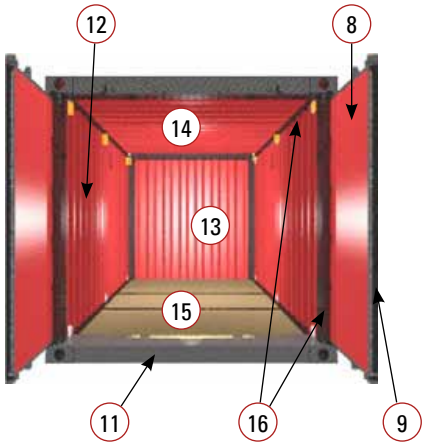
Door side: Door header, Door sill, Data sign-board
Left side: Top side rail, Bottom side rail, Fork lift pockets, Side panel, outside, Side panel, inside
Roof: Vertical frame, Roof outside, Roof inside, Lashing fittings
Left door: Corner post, Hinges, Locking bar, Door handle, Door handle retainer, Door gasket, Interior
Front: Front header, Front sill, Left corner post, Right corner post, Front panel, outside, Front panel, inside
Floor: Cross-member, Plywood floor, Threshold plate, Lashing fittings
Right door: Corner post, Hinges, Locking bar, Door handle, Door handle retainer, Door gasket, Interior
Right side: Top side rail, Bottom side rail, Fork lift pockets, Side panel, outside, Side panel, inside

Type of damage
A = Crack, B = Hole, C = Loose, D = Missing, E = Broken, F = Twisted, G = Dent, H = Scratch, J = Rust, K = Wet, L = Colour, M = Contaminated

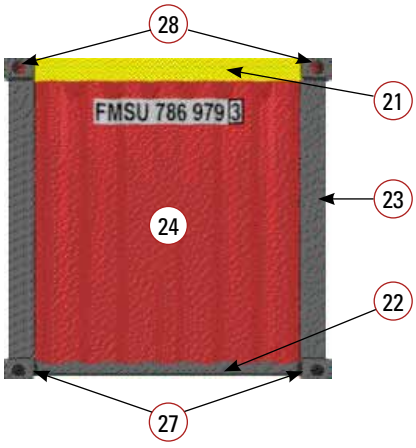
Remarks

Date ___/___/___ Signature driver Signature employee

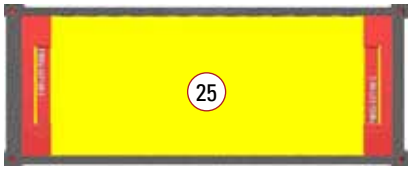
Example of a container check report as a systematic guide to inspection and to help ensure traceability and responsibility. Source: OPHAL



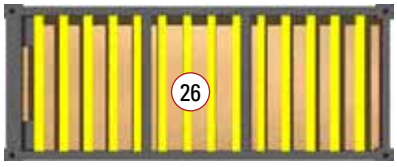
Inside p 108A



Front p 101



Roof p 106 A



Cross Member 109 A

Source all photos: FMS 'Use No Hooks'

✔ The condition of the empty container should be checked at delivery and any damage noted in writing on the interchange form.

Examples of Container Faults

These photographic examples courtesy of 'Use No Hooks' published 2007 by FR. MEYER'S SOHN (GMBH & CO.) KG, www.fms.de.

1 *Cracked door sill. Source: FMS p 87*

2 *Damaged door header. FMS p 86*

3 *Bent door corner post (with j-bar). Source: FMS p 89*

4 *Damaged hinges. . Source: FMS p 90*

5 *Bent locking bar. Source: FMS p 91*

6 *Bent door handle/linkage lever. Source: FMS p 92*

7 *Complete door handle retainer and missing handle catch. Source FMS p 93 A B*

Source all photos: FMS 'Use No Hooks'

8 *Bent door.*
Source: FMS p 95

9 *Loose door rubber gasket.*
Source: FMS p 94

10 *Data sign board unsatisfactory and/or missing (CSC/Customs/TCT/Owner & manufacturer's plates). Source: FMS p 88*

11 *Rusted threshold door plate.*
Source: FMS p 111

12 *Holed internal side panel.*
Source: FMS p 100

13 *Dented internal front panel.*
Source: FMS p 105

14 *Rusted internal roof.*
Source: FMS p 107

15 *Holed plywood floor.*
Source: FMS p 110

Source all photos: FMS 'Use No Hooks'

Examples of Container Faults

16 *Broken lashing fitting. Source: FMS p 108 A B*

16 *Missing bottom lashing fittings. Source FMS p 112 A B*

17 *Bent top side rail. Source: FMS p 96*

18 *Bent bottom side rail. Source: FMS p 97*

19 *Cracked forklift pockets. Source: FMS p 98*

20 *Dented external side panel. Source: FMS p 99*

Source all photos: FMS 'Use No Hooks'

21 *Dented front header.*
Source: FMS p 101

22 *Broken front sill.*
Source: FMS p 102

23 *Bent front corner post.*
Source: FMS p 103

24 *Dented external front panel.*
Source: FMS p 104

25 *Dented external roof.*
Source: FMS p 106

26 *Bent cross-member rail.*
Source: FMS Use No Hooks p 109

27 *Examples of external lifting points. Source: UPM (3.3.10 (for Ralf)*

Source all photos: FMS 'Use No Hooks'

Cargo Protection

Lower layer is not safely secured. Source: UPM.

✅ Protect cargo along the container sides (according to customer requirements and container condition) by using runners (plywood, corrugated honeycomb board, or hardboard) strong enough to resist transit forces.

• If the container has steel bars on the sides and near the front wall of the floor, they must be covered.

• During winter and in wet weather, the container floor may be covered with protective paper as a prevention measure, otherwise if floor is wet the container should be rejected. However, paper on a wet floor becomes very slippery and facilitates roll movement. Therefore, extra lashing or anti-slip mats may be required. Some companies also line the walls to reduce loading damage; however, this doubles preparation time, adds to cost and creates a waste disposal problem, while having only a limited ability to control moisture.

• All protruding objects, such as lashing points, should be covered to prevent edge/side damages. A roll of several tonnes will generally move during transport and the covering material used needs to be strong enough to prevent force going through it to damage the roll.

Plywood or corrugated cardboard (5 or 10 layers) protection can be placed on all sides. On the bottom it is placed parallel with the wall. The same protection is used in front and around the sides when needed.

Horizontal belts are commonly used to secure the cargo but this may have safety limitations. There are varying recommendations from different shipping agents. Lashing needs to be calculated with criteria that includes: if anti-slip mats are used; resistance of internal lashing points (specified by CTU guidelines as 500 daN for upper, and 1 tonne for lower point — shipping organisations may have their own limits); and the stretch of belts. The result may be that more belts may be required, e.g. after 6 m (20') first set of belts, then another set after each 10 tonnes (11 t) of cargo. It is recommended to refer to CTU for different securing methods.

Plywood protection placed around all sides and in front of the door. Source UPM (3.3.11/12)

Insufficient blocking.
Source: Use No Hooks p 40

Loading

The container must be loaded in accordance with the loading instructions. Load must be uniform with the container's centre of gravity to ensure its balance. It is important not to damage the paper's wrapping protection when loading.

Lying (horizontal) rolls must be particularly well secured, see CTU guidelines. The bottom layer must start from the back wall. Unloading rolls in a lying position involves rolling them in the container. Therefore, it is very important that the floor of the container is smooth, clean and free of nails, etc.

Pallets of different heights risk that their top covers may damage the adjacent pallets when loading. If so, secure them with boards, timber or corner profiles.

Incorrect centre of gravity may cause cargo to shift. Source: FMS p 36

Securing

✅ The cargo must be secured so that it does not move in transit. This needs to be particularly effective if the products do not fill the whole of the container space. Good planning of the loading pattern may considerably reduce the need for securing. The securing method depends on the cargo and cargo mix in the container, and must always be considered on an individual basis. Do not secure against doors or container walls if they are not meant for it — (punctual, linear loads) — let the corners take the forces. Form lock system are ok, the problem is only the linear roll load.

⚠ Caution, belt flexibility of up to 10-13% means that long belts have a high elasticity, which may be insecure.

Lower layer is not safely secured. Source: UPM.

Step-down securing: Can be used when rolls of equal widths or pallets are loaded in two or more layers in part of the container. Secure them by lifting the adjacent roll/pallet higher by placing timber risers or honeycomb corrugated cardboard underneath them. The adjacent roll/pallet secures the top layer. Step-down securing can take place at both ends of the container, or every other roll/pallet can be lifted. The container must always maintain its balance. The timber used underneath the lifted roll/pallet should be at least 100 mm (4"), two or three planks should be used to avoid roll end damage. The timber must not overlap the roll diameter otherwise damage is caused to adjacent rolls. The stepping roll height difference should be a minimum 15 cm (6") for rolls and 30-40 cm (12-16") for pallets. The quality of pallet wrapping is critical, e.g. a strong loading unit has a wooden top secured with four straps; while simple plastic wrapping means the load is vulnerable to movement — in this case vertical plywood barriers should be used as a barrier to movement. Step-down securing only is insufficient and belts must be used to keep the cargo in place.

Depending on the friction factor, it may be necessary to use anti slipping mats. There are some certified systems available.

Rolls will tilt during an emergency stop, but a block of rolls lashed together resists tilting. They can be secured with a horizontal belt that is often taped (or uses belt holders) to the rolls to keep the belt from dropping down progressively to the floor. The problem is that rolls rotate continuously during transport (worst is rail, followed by road), making the taping ineffective for anything other than short distances. The load may look very secure when loaded but is often a mess when delivered. Sliding of the load may be prevented by securing the load to the side of the container.

Lashing belts fastened to the container's lashing points. Source: UPM.

When rolls are secured to the lashing points in a container, the belts should be fastened diagonally across the doorway. The CTU-Code requires cargo be secured to prevent it from falling out when opening the door.

✅ When tightening a disposable belt to secure a complete load, the buckle should be placed so that there is 30-40 cm (12-16") of free belt remaining — this end should be bound around the locking device to prevent it from opening during transport — if in doubt request belt manufacturer for information. Belts should be prepared and lashed to the container's lashing points before loading the last rolls.

Standing rolls secured with lashing belts. Source: UPM.

Verified Gross Mass of Loaded Container

A new regulation from the International Maritime Organisation (IMO) requires the shipper to supply the Verified Gross Mass (VGM) of packed containers. The reason for this is that discrepancies between notified and actual container weights are a security risk for the vessel and its crew.

The shipper is responsible for determining and documenting the VGM and providing it in due time prior to the shipment to the vessel master or its representative. The document has to be signed by the shipper or somebody appointed by the shipper. Without this information containers may not be shipped on vessels any more. These rules are valid for all container types, but not for bulk or out of gauge shipments.

The two methods to determine the VGM are:

1: Weighing the packed and sealed container using calibrated and certified weighing equipment.

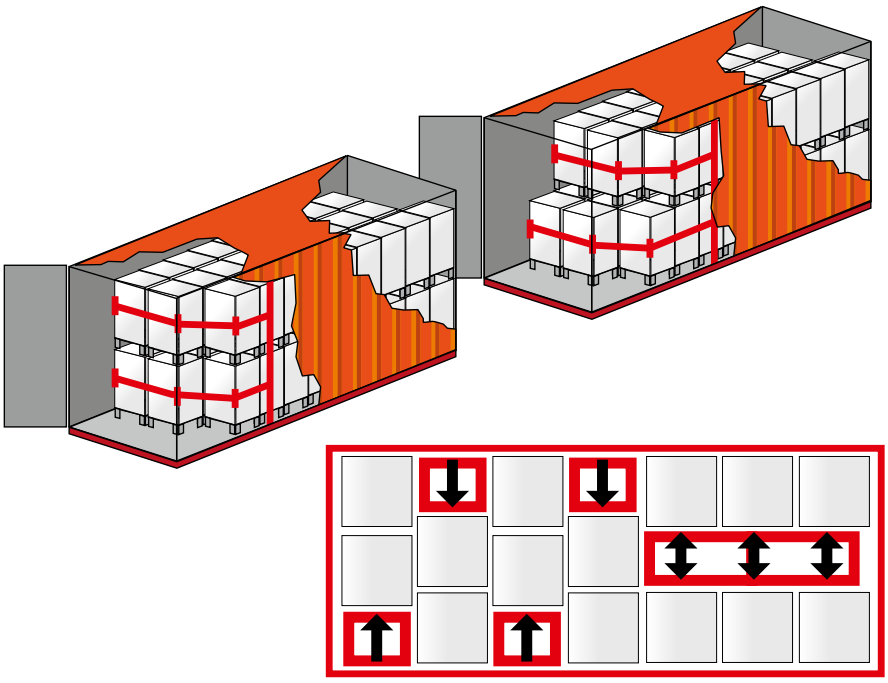
2: Calculation by weighing all packages and cargo items (including pallets, dunnage and other securing material) and adding the tare mass of the container using an approved certified method. It is not allowed to estimate the VGM and it is to be expected that the competent authority will randomly perform spot tests.

Securing lying (horizontal) rolls: There is a high risk that lying loaded rolls move during transport. A securing method is to use chocks in every row on top of which belts are extended over the load. Some companies may extend this to every second or third row after testing. The height of the chocks has to be at least 1/8 of the roll diameter. A plank fixed across the container, is used to prevent the chock from moving during transport. A wooden frame supported by the doorway corners, can be used. The lying rolls should be placed so that the empty space is left to both sides in turn. Wooden structures, airbags, etc., should be used to give support in the cross direction.

Nailing: The CTU code recommends against this technique. It can only be used with specific permission of container owner. This technique requires caution because a container floor is generally only 25 mm (1") thick meaning that 75% of a 100 mm (4") nail is unattached and has limited resistance. The term "fix" is often used instead of "nail" but without explanation of alternate techniques. (*Nailing is forbidden for trucks because of risk to damage of electrical, pneumatic and hydraulic systems. Nailing is also a problem for railcars unless recommended by the railway company.

Securing pallets: Horizontal belts are fastened to the container's fastening loops and every pallet load unit layer is kept in place with horizontal belts. Corner profiles should be used between the belts and pallet edges. Prevent slippage of horizontal belts by using an additional belt over the load. (If the container has no securing loops the load can be secured by binding the pallets at the rear end of the container in a large block.) If there is a large empty space in the container, timber can also be used for securing the pallets. The empty space should be left in the middle of the container. When pallets are loaded partly in one, and partly in two layers, the uppermost layer should be lashed, if not with belts then fixed with timber or boards. The CTU code states the acceptable total horizontal empty space is 15 cm on the condition that the cargo does not move — which is unlikely in a container.

When copy paper pallets are loaded two-high, a board must be used between the layers. The correct size board is slightly smaller than the pallet. Corner profiles must be used. The end of the second layer has to be independently secured by a horizontal belt. Loading patterns must be designed so that the load supports itself as much as possible.



Pallet loading.
Source: UPM Drawing 3.3.18

Securing the load end with timber: A crosswise protection should be placed against the corner posts of the doorway. Securing is carried out with vertical planks fastened to the horizontal ones — nail the planks to the container floor if it is permitted. If there is an empty space between the horizontal planks and the doors, additional timber should be used to prevent the securing from becoming loose.

Airbags for securing: The bags must generally be placed between the cargo units — not between the cargo and the container walls because the airbags can buckle the wall when inflated. Airbags have to be filled carefully as the pallet top covers can break the bag. To prevent this place hardboard sheets against the pallets, this also helps avoid deformation from direct pressure on to sheets.

Checklist after loading (extract 'Container Packing' Hapag Lloyd)

- The container is packed to meet the requirements of the cargo, to withstand the probable stress during transport and meet the requirements of the container itself.
- The weight of the cargo must not exceed the maximum load limit of the container.
- Determining and documenting the Verified Gross Mass (VGM) of the packed container *see page 16.*
- A copy of the packing list is helpful for customs inspections, etc. must be displayed at an easily visible place in the container.
- If timber is used as packaging material, it may, under some circumstances, be necessary to comply with the quarantine regulations of the country of destination. A fumigation certificate or certification that the wood has been treated may have to be displayed conspicuously on the container.
- Doors as well as detachable roofs of containers must be closed carefully.
- The seal number must be noted. Strong steel cable and container locks can protect the cargo from theft.
- Old self-adhesive labels must be removed.
- The entire documentation must be punctually and properly completed.

€² If a container is overloaded or cargo incorrectly secured, the transport is interrupted and the insurance will not compensate for any possible damage.

Once a container has been closed it is no longer possible to inspect it, or adjust cargo securing. It is therefore essential that containers are packed correctly to avoid the risk of damage.

Correctly inflated airbag. Source: UPM 3.3.19

Airbag in a wrong position.
Source: FMS 'Use No Hooks' p 41

'Container Packing' published by Hapag Lloyd provides general packing information and is available from www.hapag-lloyd.com