Revision: 1 Date: 03 AUG 2026

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BUP500 Shipper Built ULDs

Shipper Built ULDs

BUP500 Manual
- English -

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0 Editorial

0.1 Revisions **2**
0.1 List of Changes 2

0 Editorial

0.1 Revisions

Layout

This Manual is edited in a content management tool that allows a standardized and consistent layout.

Some content, such as a table of content before each chapter, is part of this standardized layout.

Updates

This Manual is updated twice a year, usually in February and August.

If safety relevant changes occur, more updates are possible.

List of Changes

Revision No.	Status	Subject	Reason for Revision

First Revision in new format, hence manual List of Changes.

Chapter	Topic	Change
1.2.1/2/3	DG Training Requirements	▪ DG Training Requirements clarified
6.3	Max Floor Load Calculator	▪ New application that assists in the assessment, if weight spreading is required.
8.3.2	Standard Lashing under the Pallet Net	▪ Details added.
9.1.2	ELI / ELM	▪ Packages containing only button cell batteries installed **in equipment** (including circuit boards) are excempted from the declaration on the ULD-tag and the restrictions for Main Deck transport. ▪ New regulations: ELI / ELM are allowed for main deck transport if loaded in Fire Resistant Containers (FRC) or under Fire Containment Covers (FCC). ▪ Application of FCCs.
10.1 9.2 9.3	Special Load Codes	Special Load Codes that must be entered on the ULD-tag under Remarks

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1 Introduction

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1.2.2 Personnel not entrusted with Build-Up activities 5
1.2.3 Personnel entrusted with combined activities 5

1 Introduction

1.1 Your Responsibility

Your responsibility

Every day hundreds of aircraft of the Lufthansa Group take off and land. They carry thousands of passengers, tons of cargo and airmail.

Our **customers** rely on Lufthansa Cargo (referred to as LCAG hereafter) to transport their cargo and mail without undue delay or damage.

Our **passengers** rely on Lufthansa to transport them and their baggage in order that they reach their destination safely.

Our **crews** rely on the correct and safe loading of the cargo in our aircraft.

All of them expect that whatever has been loaded inside the aircraft has been done so according to the regulations.

This Manual

With this manual, you will get to know the safety factors involved when building up ULDs, as well as **YOUR responsibility** towards your/our customers, our passengers, crew and aircraft.

The content of this document must be followed whenever agents, shippers respectively their B/U agents build up ULDs that are tendered unter LCAG's 020 AWB for any flight operated by Lufthansa Group or partner airlines.

It must be accessible in its newest version to the personnel responsible for build-up the ULDs.

These guidelines are based on the Lufthansa Group GOM (Ground Operations Manual) and LCAG CHM (Cargo Handling Manual).

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1.2 Training Requirements

General Requirements

- In order to keep the license for tendering Shipper Built ULDs to LCAG, the customer must make sure that sufficient staff, who supervise build-up activities and sign the ULD-tag, are qualified as per the below training plan.
- Qualifications are always applicable to the individual participant, not the company.
- It is consented that supporting staff assists in build-up activities under supervision of BUP-qualified staff. However it is reserved for the BUP-qualified staff to
  - supervise the build-up,
  - finalize the lashing,
  - sign the ULD tag for correct build-up.
- Training records of BUP-qualified staff as well as trainings / onboardings of supporting staff must be documented and presented to LCAG upon request.

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1.2.1 Personnel responsible for Build-Up

BUP500

Allows for Shipper Built ULDs containing single pieces weighing up to 500 kg.

1) Valid DG license
- IATA 7.4; OR
- CBTA equivalent; OR
- function-specific license as per requirements of the National Authority (*).

Refresher training intervals as per IATA DGR 1.5 CBTA or as per requirements of the National Authority must be followed.

2) "BUP500 Standard" (Web-Based Training available online) including successful completion of the assessment.

Refresher course (same WBT) must be done latest every 24 months.

3) Additionally, for tendering Special Cargo such as VUN or PER in Shipper Built ULDs:

"BUP500 Specials" (Web-Based Training available online) including successful completion of the assessment.

Refresher course (same WBT) must be done latest every 24 months.

BUP500+

Allows for Shipper Built ULDs containing single pieces weighing up to 9500 kg.

1) Valid DG license
- IATA 7.4; OR
- CBTA equivalent; OR
- function-specific license as per requirements of the National Authority(*).

Refresher training intervals as per IATA DGR 1.5 CBTA or as per requirements of the National Authority must be followed.

2) "BUP500+" training (2 days classroom training) including successful completion of the assessment.

The Refresher (same classroom training or self-assessment in the BUP500+ Manual) must be done latest every 24 months.

BUP500+ for BU-staff

Allows for Shipper Built ULDs containing single pieces weighing up to 9500 kg.

1) Valid DG license
- IATA 7.4; OR
- CBTA equivalent; OR
- function-specific license as per requirements of the National Authority(*).

Refresher training intervals as per IATA DGR 1.5 CBTA or as per requirements of the National Authority must be followed.

2) LCAG Training BU1+2 or Build-Up training recognized by LCAG.

Refresher course must be done latest every 24 months.

3) "BUP500+ For BU Staff" training (Web-Based Training available online) including successful completion of the assessment.

Refresher course (same WBT) must be done latest every 24 months.

1.2.2 Personnel not entrusted with Build-Up activities

Acceptance of dangerous goods including dry ice

Personnel with this function must have a valid DG license

- IATA 7.3; OR
- CBTA equivalent; OR
- function-specific license as per requirements of the National Authority(*).

Refresher training intervals as per IATA DGR 1.5 CBTA or as per requirements of the National Authority must be followed.



This license resp. the equivalent is also valid for the Acceptance of general cargo or airmail (see below).

Acceptance of general cargo or airmail

Personnel with this function must have a valid DG license

- IATA 7.2; OR
- CBTA equivalent; OR
- function-specific license as per requirements of the National Authority(*).

Refresher training intervals as per IATA DGR 1.5 CBTA or as per requirements of the National Authority must be followed.

1.2.3 Personnel entrusted with combined activities

DG Licenses for Combined Activities

Personnel entrusted with Acceptance activities as well as Build-up activities must hold valid DG licenses for both activities.

Example:

- IATA 7.2 resp 7.3 (whatever applies) and IATA 7.4
  OR
- CBTA equivalents
  OR
- function-specific licenses as per requirement of the National Authority(*)

for both activities.

(*) function-specific licenses as per requirement of the National Authority:

provided that the training explicitly covers the transport of cargo by air and is equivalent in scope to the applicable ICAO TI / IATA DGR.

2 General

2.1 **Definitions** 2

2.2 **Forbidden Items** 3

2.3 **AWB completion** 4

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2 General

2.1 Definitions

Lufthansa Cargo offers the following types of Shipper Built ULDs and all regulations outlined in this manual must be followed for all types.

BUP

- Bulk Unitisation Program
- 1 AWB built-up on 1 or more ULDs.
- The ULD(s) are tendered "Ready for Carriage" (R4C) at the point of origin.
- The ULD(s) remains intact from acceptance to delivery, no breakdown is carried out at any time during the entire transport.

MMB

- Multi-Master BUP
- More than 1 AWB built-up on 1 or more ULDs.
- The ULD(s) are tendered "Ready for Carriage" (R4C) at the point of origin.
- The ULD(s) remains intact from acceptance to delivery, no breakdown is carried out at any time during the entire transport.

This means that all AWBs within an MMB must have

- the same destination
  AND
- the same consignee.

SMU

- Shipper Mixed Unit
- 1 or more AWBs built-up on 1 or more ULDs.
- The ULD(s) are tendered "Ready for Carriage" (R4C) at the point of origin.
- Breakdown is carried out in transit or at final destination.

If the consingee at import cannot handle ULDs on dollies or rollerbeds, BUP or MMB must not be sent. Instead, SMU shall be booked.

2.2 Forbidden Items

The Shipper Built ULDs shall not contain any of the following items:

- ✖ All weapons, weapons parts and ammunition (SWP)
- ✖ Cargo subject to special security measures, e.g. valuable cargo (VAL), for example gold and precious stones, as well as vulnerable goods (VUN), for example cellular phones and silver
- ✖ Perishable goods (PER)
- ✖ Live Animals (AVI), except AVP or day-old-chicken (AVX)
- ✖ Dangerous goods, except the items and articles as per Dangerous Goods Regulations IATA-DGR 9.1.4.1
- ✖ Cargo exceeding the base dimensions of the ULD (Overhang);

  F- and H-contours may only be built with a BUP500+ license.
- ✖ Metal sheets and metal plates; plates made out of other materials with individual weight of more than 20 kg
- ✖ Metal pipes and metal bars

  pipes and bars made out of other material are allowed as per loading requirements stated in this Training Manual
- ✖ Unsecured cargo from unknown sources which would require security control at acceptance by LCAG
- ✖ Intermediate Bulk Container (IBC)
- ✖ Cargo loaded on wheels

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2.3 AWB completion

Air Waybill

The shipper / agent must ensure that the required details in the Air Waybill are correct and complete according to IATA TACT Rules

- Chapter 6 – The Air Waybill
- Chapter 8 – Carriers Special Regulations 8.3 Lufthansa - Information by Carrier

---

No. of pieces

- **BUP**

  The MAWB must show the number of R4C built ULDs.

  Exceptions, where the actual number of pieces is required, as per country-specific customs regulations.

  The list can be requested at the local LCAG Sales or Handling office.
- **MMB, SMU**

  The individual MAWBs must show the total number of pieces.

SLAC

SLAC (Shipper Loads and Counts)

It is required that the actual number of pieces contained in each unit is given in the Air Waybill (MAWB, additionally in the HAWB is OK).

This information can be transmitted

- in the structured fields of the FWB (adittionally in the FHL is OK)

OR

- in the Nature of Goods field, e.g.

  SLAC - PMC12345LH – 47 pieces

  SLAC – AKE12345LH – 20 pieces

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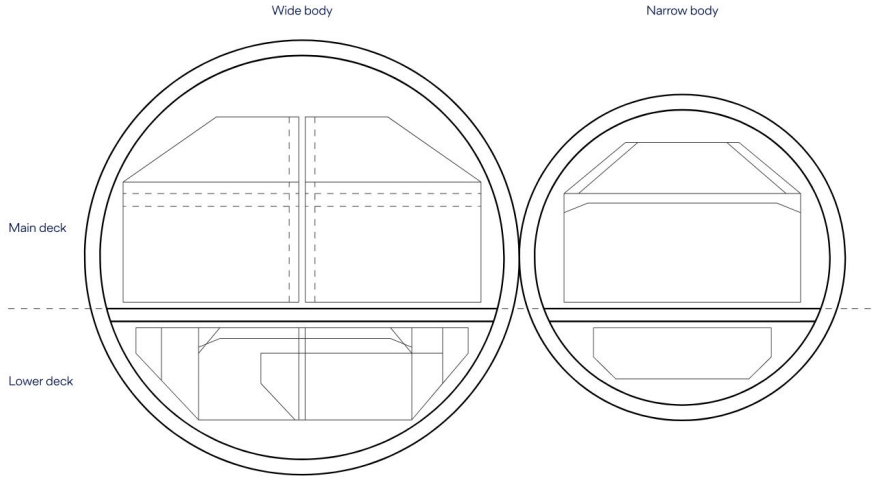
3 Aircraft Terminology

Passenger / Freighter

Passenger Aircraft carry passengers and cargo. Freighter aircraft carry only cargo and air-mail.

Narrow Body / Wide Body

This picture shows only a generalized cross section layout. Neither all wide body nor all narrow body aircraft types have exactly the same size.



Examples of narrow body aircraft, that hold ULDs, are the A320, A321 and A321F.

Examples of wide body aircraft are: A330, A340, A350, A380, B747, B787 and B777.

Main Deck / Lower Deck

Every aircraft has at least two decks: Main Deck and Lower Deck.

In a passenger aircraft, the passenger cabin is located on the Main Deck (and in the B747 and A380 on the Upper Deck). In the Lower Deck of passenger aircraft, baggage, cargo and airmail are transported.

In freighter aircraft, only cargo and airmail are transported in the Main Deck and Lower Deck.

Lower Deck Holds

The Lower Deck on both the passenger and freighter aircraft is broken into 2 holds:

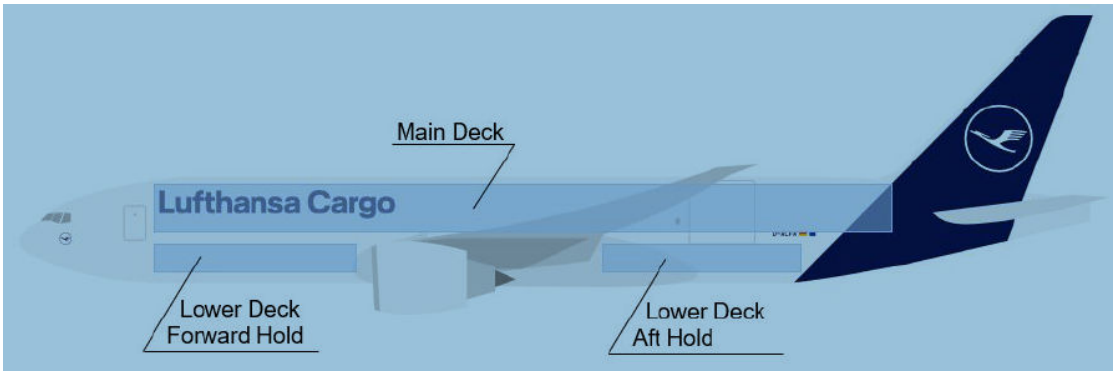
Forward and Aft hold.

The Forward and Aft hold are broken down further into compartments, which may be numerically different depending on the aircraft type

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Example

Here the example of the B777 freighter aircraft:



4 ULDs, Fleet, and Contours

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4 ULDs, Fleet, and Contours

The following ULDs and Contours have been selected according to their relevance for Shipper Built ULDs. This might differ from the usage within LCAG when LCAG is doing the build-up.

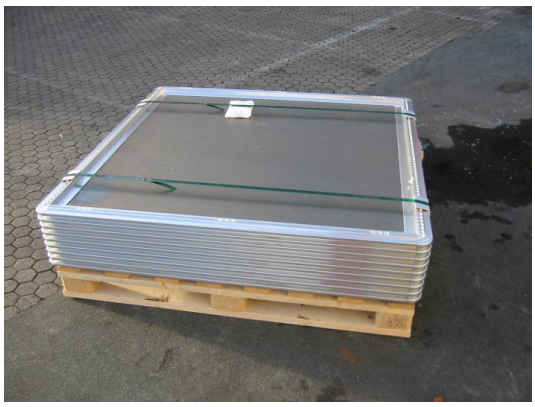
4.1 ULDs and Contours for Narrow Body Aircraft

4.1.1 ULDs for the A320/A321/A321F Lower Deck

Code	**AKH / AKW**	
Type	Container	
Base dimensions	153 x 156 cm	60.4 x 61.5 in
Height	114 cm	45 in
Max Gross Weight	1000 kg	



Code	**PKC**	
Type	Pallet (60.4")	
Base dimensions	153 x 156 cm	60.4 x 61.5 in
max. Height (incl. base of pallet)	114 cm	45 in
Max Gross Weight	1000 kg	
Contour	straight up, no overhang	



4.1.3 ULDs for the A321F Main Deck

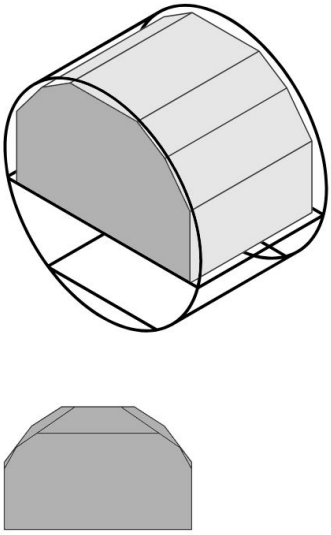
Code	PAJ	
Type	Pallet (88")	
Base dimensions	224 x 318 cm	88 x 125 in
max. Height (incl. base of pallet)	208 cm	88 in
Max Gross Weight	1800 kg	
Contour	K, Y or Z	

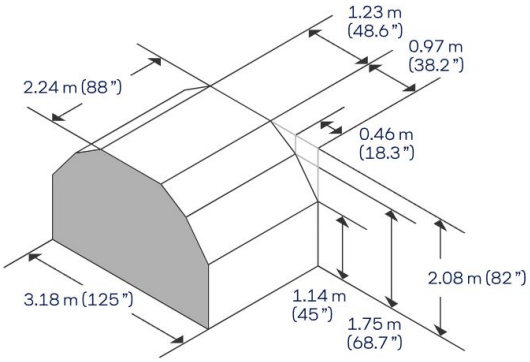
Code	AAY	
Type	Container (fire resistant)	
Base dimensions	224 x 318 cm	88 x 125 in
Height	208 cm	88 in
Max Gross Weight	1800 kg	
Contour	Y	

4.1.4 Maximum Contour for the A321F Main Deck

Y-Contour

The Y contour is the maximum contour on the main deck of the A321F.





Unlike on wide body freighters such as the B777F, there is no useable walkway on the sides of the A321F Main Deck.

The Fuselage accommodates only properly built Y contours. Even the smallest overlap of cargo onto the rim of the pallet and beyond the Y contour will cause the ULD to be offloaded.

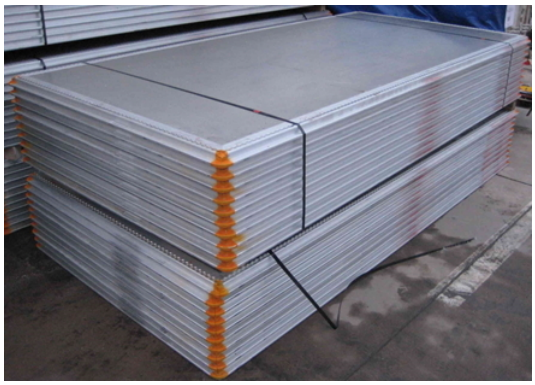
4.2 ULDs and Contours for Wide Body Aircraft

4.2.1 ULDs for Wide Body Aircraft Lower Deck

Code	AKE (LD3)	
Type	Container	
Base Dimensions	153 x 156 cm	60.4 x 61.5 in
Height	163 cm	64 in
Max Gross Weight	1500 kg	
Contour	E	

Code	AMP	
Type	Container	
Base dimensions	244 x 318 cm	96 x 125 in
Height	163 cm	64 in
Max Gross Weight	5000 kg	
Contour	P	

Code	PLA	
Type	Pallet (60.4")	
Base dimensions	153 x 318 cm	60.4 x 125 in
Lower Deck all Wide Body Aircraft (only passenger, not B777F)		
max. Height (incl. base of pallet)	163 cm	64 in
Max Gross Weight	3000 kg	
Contour	P	



Code	PLW	
Type	Pallet (60.4" with side extensions)	
Base dimensions	153 x 318 cm	60.4 x 125 in
Lower Deck all Wide Body Aircraft (only Passenger, not on B777F)		
max. Height (incl. base of pallet)	163 cm	64 in
Max Gross Weight	3000 kg (350 kg per side extension)	
Contour	P	



Code	PAJ	
Type	Pallet (88")	
Base dimensions	224 x 318 cm	88 x 125 in
Lower Deck all Wide Body Aircraft		
max. Height (incl. base of pallet)	163 cm	64 in
Max Gross Weight	4000 kg	
Contour	P	



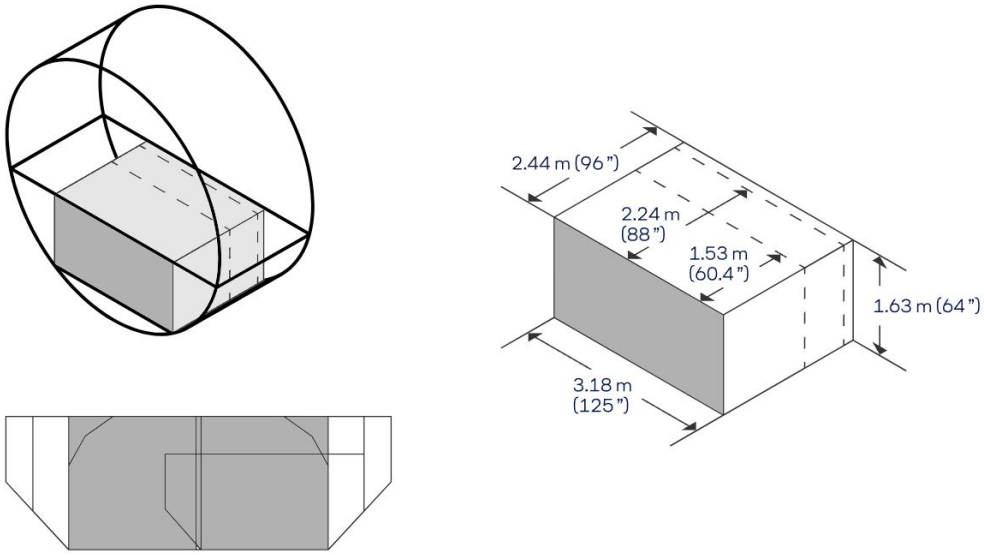
Code	PMC	
Type	Pallet (96")	
Base dimensions	244 x 318cm	96 x 125in
Lower Deck all Wide Body Aircraft		
max. Height (incl. base of pallet)	163 cm	64 in
Max Gross Weight	5000kg	
Contour	P	



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4.2.2 Contours for Wide Body Aircraft Lower Deck

P-Contour



Example of a P-contour.



4.2.3 ULDs for Freighter Aircraft Main Deck

Code	AMJ	
Type	Container	
Base dimensions	244 x 318 cm	96 x 125 in
Height	244cm	96 in
Max Gross Weight	5800 kg	
Contour	J	

Only the AMJ containers with IDs AMJ 49000 LH - AMJ 49999 LH are fire resistant.

Code	PAJ	
Type	Pallet (88")	
Base dimensions	224 x 318 cm	88 x 125 in
Main Deck B777F		
max. Height (incl. base of pallet)	300 cm	118 in
Max Gross Weight	5000 kg	
Contour	J4	

Code	PMC	
Type	Pallet (96")	
Base dimensions	244 x 318 cm	96 x 125 in
Main Deck B777F		
max. Height (incl. base of pallet)	300 cm	118 in
Max Gross Weight	5800 kg	
Contour	J4	

Code	PZA	
Type	Pallet (16ft)	
Base dimensions	498 x 244 cm	196 x 96 in
Main Deck B777F		
max. Height (incl. base of pallet)	300 cm	118 in
Max Gross Weight	10000 kg	
Contour	J4	



Code	PGE	
Type	Pallet (20ft)	
Base dimensions	606 x 244 cm	298.5 x 96 in
Main Deck B777F		
max. Height (incl. base of pallet)	300 cm	118 in
Max Gross Weight	10000 kg	
Contour	J4	



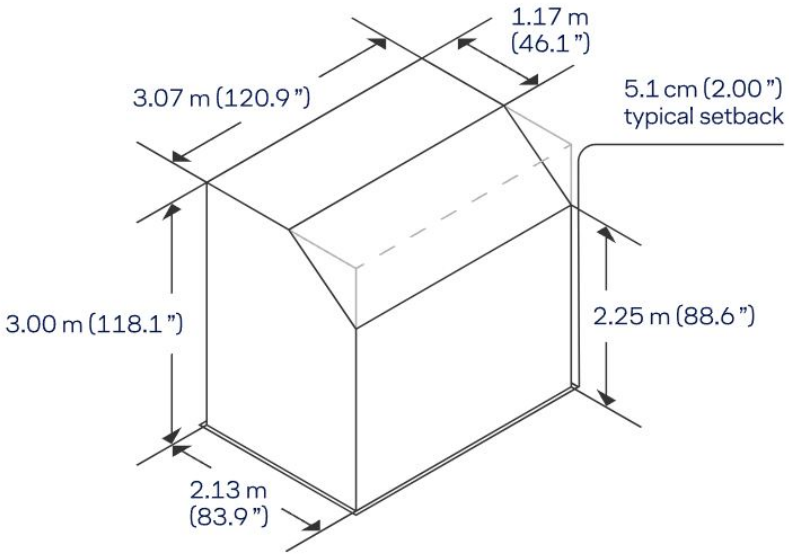
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4.2.4 Maximum Contour for the B777 Freighter Main Deck

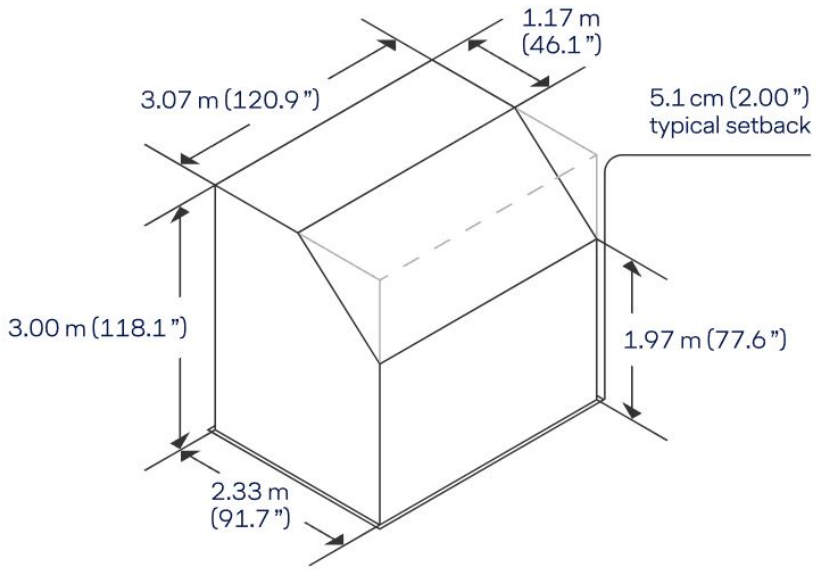
J4-Contour

Consider the different measures of the outer height when building a J4-contour on a 88" resp. 96" pallet (on the right of each picture below).

J4-contour on a 88" pallet.



J4-contour on a 96" pallet.



Example of a J4-contour.



4.3 Summary ULDs and Contours

4.3.1 Summary of Pallets and Containers

Pallets	Code	Base Dimensions	Net Type	Loadability / Notes
	PKC	153 x 156 cm 60.4 x 61.5 in	NKA	Lower Deck A320, A321, A321F
	PLA	153 x 318 cm 60.4 x 125 in	NLA	Lower Deck all wide body passenger aircraft A330, A340, A350, A380, B747, B787, B777(pax)
	PLW	153 x 318 cm 60.4 x 125 in	NLA	Lower Deck all wide body passenger aircraft A330, A340, A350, A380, B747, B787, B777(pax) 350kg maximum per side extension
	PAJ	224 x 318 cm 88 x 125 in	NME	Lower Deck or Main Deck all wide body aircraft A330, A340, A350, A380, B747, B787, B777, B777F Main Deck A321 Freighter
	PMC	244 x 318 cm 96 x 125 in	NME	Lower Deck or Main Deck all wide body aircraft A330, A340, A350, A380, B747, B787, B777, B777F
	PZA	498 x 244 cm 196 x 96 in	NGE	Main Deck B777 Freighter
	PGE	606 x 244 cm 238,5 x 96 in	NGE	Main Deck B777 Freighter

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Containers	Code	Base Dimensions	Height	Loadability / Notes
	AKW / AKH	153 x 156 cm 60.4 x 61.5 in	114 cm 45 in	Lower Deck A320, A321, A321F
	AKE (LD3)	153 x 156 cm 60.4 x 61.5 in	163 cm 64 in	Lower Deck all wide body aircraft A330, A340, A350, A380, B747, B787, B777, B777F
	RKN	153 x 156 cm 60.4 x 61.5 in	163 cm 64 in	Lower Deck all wide body aircraft A330, A340, A350, A380, B747, B787, B777, B777F LD3 Cool container
	AMP (LD9)	244 x 318 cm 96 x 125 in	163 cm 64 in	Lower Deck all wide body aircraft A330, A340, A350, A380, B747, B787, B777, B777F
	RAP	224 x 318 cm 88 x 125 in	163 cm 64 in	Lower Deck all wide body aircraft A330, A340, A350, A380, B747, B787, B777, B777F LD9 Cool Container (Dry Ice max 320 kg Unicooler, n/a Opticooler)
	RLP	153 x 318 cm 60.4 x 125 in	163 cm 64 in	Lower Deck all wide body aircraft A330, A340, A350, A380, B747, B787, B777, B777F LD11 cool Container
	AMJ	244 x 318 cm 96 x 125 in	244 cm 96 in	Main Deck B777 Freighter Containers with IDs AMJ 49000 LH - AMJ 49999 LH are fire resistant.
	AAY	224x 318 cm 88 x125 in	208 cm 88 in	Main Deck A321 Freighter Fire Resistant Container

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4.3.2 Summary of the Maximum Gross Weight and Contours on Pallets

Lower Deck	max Gross Weight				Contour	max Height
	PKC (60.4“)	PLW/PLA (60.4“)	PAJ (88")	PMC (96")		
A320, A321, A321F	1000 kg				straight up	114 cm (45 in)
A330, A340, A350, A380 B747, B777pax, B787		3000 kg	4000 kg	5000 kg	P	163 cm (64 in)
B777F			4000 kg	5000 kg	P	163 cm (64 in)

Main Deck	max Gross Weight				Contour	max Height
	PAJ (88")	PMC (96")	PZA (16ft)	PGA (20ft)		
A321F	1800 kg				Y	208 cm (88 in)
B777F	5000 kg	5800 kg	10000 kg	10000 kg	J4	300 cm (118 in)

4.3.3 Summary of the Maximum Gross Weight of Containers

Lower Deck	max Gross Weight			max Height
	AKH/AKW	AKE	AMP	
A320, A321, A321F	1000 kg			114 cm (45 in)
A330, A340, A350, A380, B747, B787, B777pax, B777F		1500 kg	5000 kg	163 cm (64 in)

Main Deck	max Gross Weight		max Height
	AAY	AMJ	
A321F	1800 kg		208 cm (88 in)
B777F		5800 kg	244 cm (96 in)

5 Serviceability, Storage and Transportation of ULDs and Loading Material

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5 Serviceability, Storage and Transportation of ULDs and Loading Material

Always check ULDs for serviceability

LCAG checks ULDs prior to their release to an Agent/Customer. Nevertheless, you must double check any ULD for their serviceability before loading.

The person signing the ULD-tag for the correct build-up is responsible to check the serviceability of ULDs and loading material.

- ✔ Unserviceable ULDs may only be carried onboard either empty or as part of a pallet stack when being shipped to FRA for repair.
- ✖ Never load cargo on / into unserviceable ULDs.
- ✖ Provisional fixes to ULDs are not allowed.

Handle with care

Also, ULDs must be handled (stored, transported) with utmost care in order to avoid damages.

Any damage to a ULD, making it unserviceable

- can affect the safety of the cargo loaded within the ULD,
- can affect the safety of the aircraft on which it is loaded,
- produce high repair cost for LCAG.



5.1 Serviceability Check of ULDs and Loading Material

5.1.1 Serviceability Check of ULDs

All regulations of this subsection are also valid for ULDs (pallets and containers) povided by other airlines when transported on Lufthansa Group aircraft.

Damages within the limits of this subsection are only acceptable if
- the function of the restraint system is not restricted, **and**
- containers: the door can still be closed properly.

Certificate

- Type label or type markings must be fixed or engraved **and** readable as proof of certification.
- All ULDs must be certified by either ETSO (JTSO) or TSO.

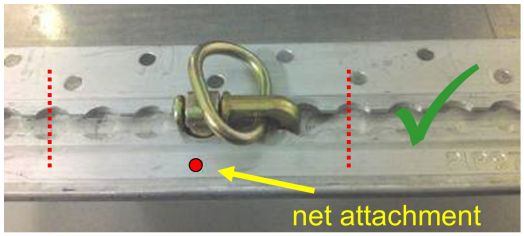
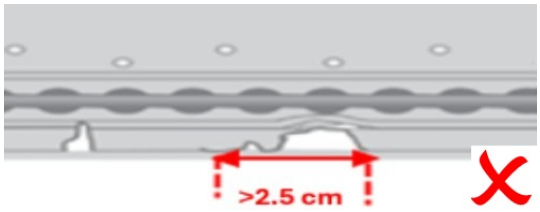




Base Plate

✔ No deformation larger than 2.5 cm (1 in). This includes the lower outbord panel of an AKE or AKH (following the F- resp. H-contour) ✔ No deformation that prevents any lock being raised properly over the ULD edge.	
✔ No holes or cracks in the ULD base. 5 small holes are drilled into pallets, this is intended and for water drainage.	

Base Edge Profiles

✔ Min 3 adjacent pairs of tie-down tracks on the right or left side of each net attachment point are undamaged.	 
✔ Max. 2 missing fasteners (screw or rivet) per edge profile.	
✔ No missing fastener (screw or rivet) at the corner.	
✔ Max. one deformation up to 2.5 cm (1 in) per 1 m (3 ft 3 in), **OR** ✔ max. three deformations up to 2.5 cm (1 in) per 2 m (6 ft 6 in).	

Corners

✔ No damaged or missing corner.		

Container Panels (walls, roof)

- ✔ No crack or hole larger than 10 cm (4 in).
- ✔ No more than 2 holes or cracks less than 30 cm (12 in) apart from each other.

Serviceability requirements for wall and roof panels are also applicable for all light weight containers





Container Gussets

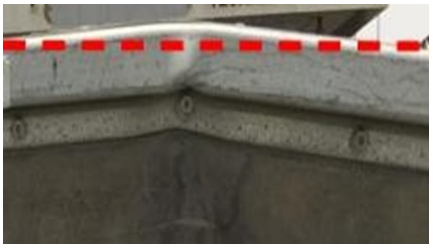
- ✔ No gusset is missing, loose, bent or broken.



Containers Extrusions (Frame Profile)

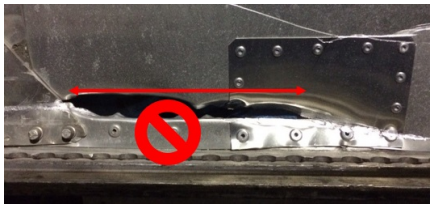
The green lines show the extrusions (frame profiles) of a container:	
✔ No hole larger than 2 cm (0.8 in) per each frame profile ✔ No crack or deformation longer than 8 cm (3 in) in the longitudinal direction of the frame profiles (extrusions).	
No crack or deformation longer than 0.5 cm (0.2 in) in the transverse direction of frame profiles (extrusions).	

Container Roof (Extrusion and Panel)

✔ No cracks in the upper extrusion. ✔ No deformation of the roof panel greater than 5 cm (2 in).	

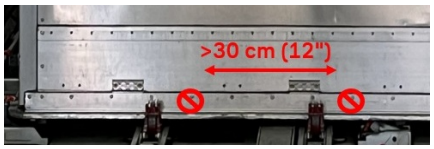
Container Base

- ✔ No crack longer than 8 cm (3 in);
- ✔ No hole greater than than 2 cm (0.8 in) in diameter.



Container Base Fasteners

- ✔ No more than 2 missing or damaged fasteners (rivets or screws) per side;
- ✔ The distance between two missing fasteners must be greater than 30 cm (12 in).

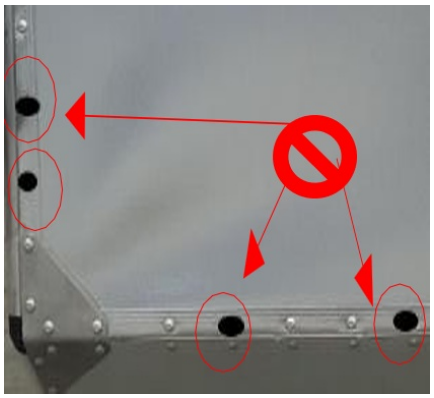


Container Panel Fasteners

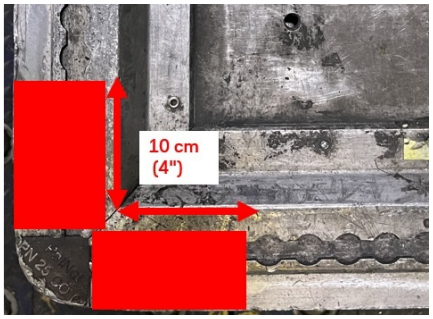
- ✔ Lightweight and Aluminum containers:

  Max. 1 fastener (rivet, screw) per extrusion (frame profile) is missing or damaged.
- ✔ Aluminum containers only:

  No missing or damaged fastener on the roof.



No Damage Zones

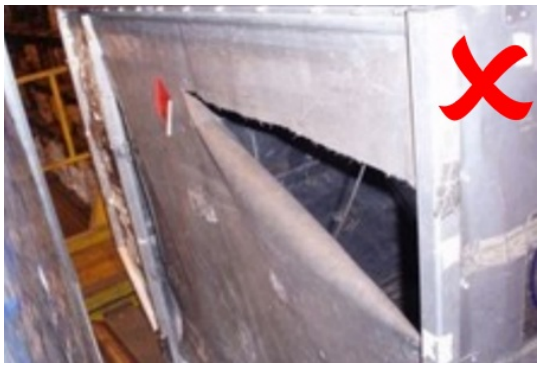
✔ No damage within 10 cm (4 in) from the corner of the edge rail.	
✔ No damage within 10 cm (4 in) of fastener line (rivet line).	
✔ No damage within 5 cm (2 in) on curtain edge and locking.	

Containers: Door Tarpaulins

Containers equipped with a door strap net remain serviceable even if the tarpaulin is damaged.

Applicable only to containers in which the tarpaulin serves as load securing:

- ✔ Max. two holes or cracks up to 10 cm (4 in) with a min. distance of 50 cm (19.5 in).



- ✔ All door hooks and tarpaulin eyes must be in place.

  Deflections of the hooks are allowed, if the door can still be locked properly at all hooks.



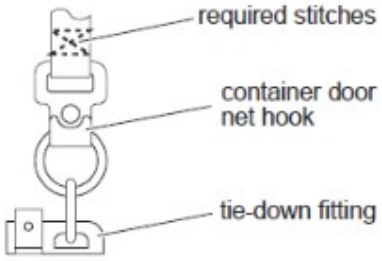
- ✔ Velcro or other straps used to lock the doors must not be damaged or worn out.





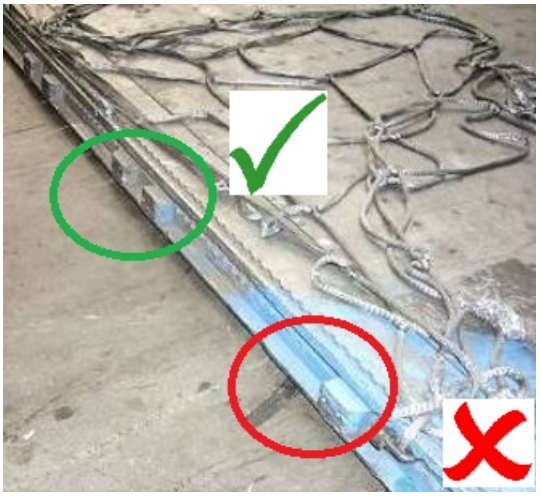
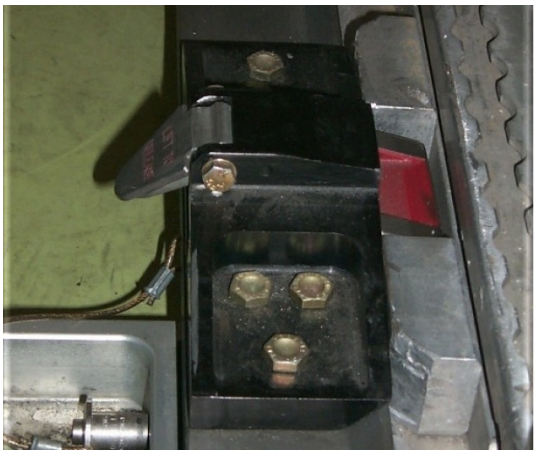


Containers: Door Strap Nets

✔ No strap must be torn or cut	
✔ No tie-down hook or fitting is missing, damaged or distorted.	
✔ No stitches at strap connecting fittings are torn or missing.	

Only the stitches at the connecting fittings as shown in the picture are relevant. Stitches which connect the crossing horizontal and vertical straps are only for stabilization to avoid tangling when folding and unfolding the net.

16/20 ft ULD (PZA/ PGE)

✔ No holes or cracks ✔ No delaminations of more than 25% of the surface ✔ No loose or missing fasteners in the edge rail area	
✔ No missing restraint block. These restraint blocks are required to secure a PGE / PZA in the aircraft.	

Pallets with permanent fixed net

Please do not try to remove, cut or exchange the nets.

A damaged permfix-net equals a damaged pallet. Consequently, mark the ULD with a damage tag and file a damage report.

The ULD may be loaded with cargo, but a serviceable pallet net must be used for securing the cargo.

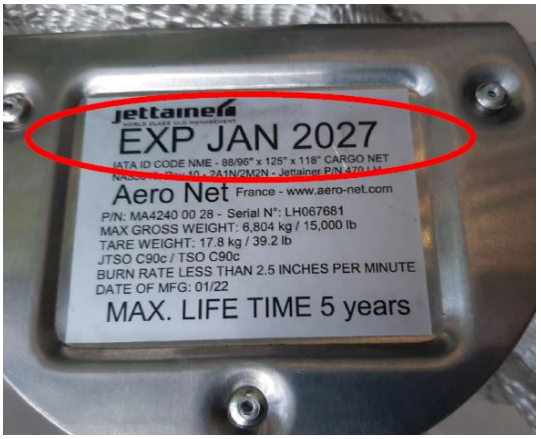
5.1.2 Serviceability Check of Nets and Straps

Expiry Date of LH Nets

This regulation is only valid for Pallet Nets of the LH Group (jettainer).

- ✔ The expiry date ("EXP") must not be exceeded which means, the net is not older than 5 years





Expiry Date and Weight Limit of OAL Nets

This regulation is only valid for Pallet Nets of Other Airlines.

- ✔ Nets of other airlines must not be older than 3 years, starting from the Date of Manufacturing (DATE OF MFG).
- ✔ Min. one type label must be fixed for proof of certification, and the label must show markings that it fulfils NAS 3610 or JTSO C90 or TSO C90.
- ✔ The weight limit when using OAL nets is 3000 kg.

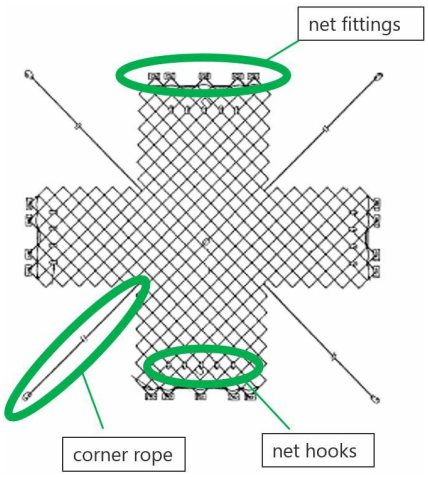
  If the cargo is heavier, either use a second net or use an LH net.

All Nets (LH and OAL)

Nets are serviceable and may be used if:

- ✔ All double studs (net fittings) and all net hooks are attached and undamaged.
- ✔ All corner lashing lines are attached and undamaged.

  If a corner lashing line is damaged or too short (less than 3.7 m, 145 in) it may be replaced by a serviceable red-and-white lashing line from LCAG.
- ✔ Min. one type label is fixed and readable.
- ✔ **No** cords or meshes are torn.





Weight Limitation for Minor Damages

- 2 minor damages are acceptable, if not adjacent to each other.
- Refer to below table for details and the applicable weight limitation for LH nets.
- **Preferrably use an undamaged LH net!**

Net type	Studs for Net type	# missing / damaged ...	... Studs / Meshes	... Hooks (*)
NME (PMC/PAJ)	Double Studs	1	3400 kg	unchanged
		2	2310 kg	5780 kg
NKA (PKC)	Single Studs	1	790 kg	unchanged
		2	539 kg	1110 kg
NLA (PLA/PLW)	Single Studs	1	1580 kg	unchanged
		2	1079 kg	2698 kg
NGE (PGE/PZA)	Double Studs	1	6800 kg	unchanged
		2	4625 kg	12510 kg

(*) As long as the net can still be secured tightly.

Tie-down Straps (PN035 or OAL)

- ✔ Tie-down straps must be certified (ETSO or TSOC172).
- ✔ The expiry date on the label must be present / legible and must not be exceeded.
- ✔ Tie-down straps must not be torn or cut.
- ✔ Stitches must not be torn or missing.
- ✔ Studs must not be missing, damaged or distorted.





Tie-down Fittings

- ✔ Tie-down Fittings (PN001) must not be damaged or distorted.
- ✔ No missing parts.
- ✔ The ring must not be open.





Tie-down Ropes

- ✔ Tie-down ropes (PN040) must not be torn or cut.
- ✔ Tie-down ropes must not have fibres that are torn or cut.





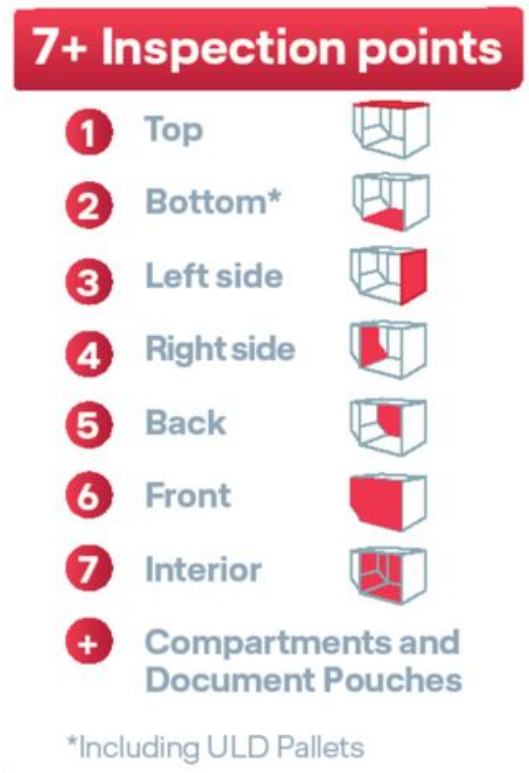
5.2 Security Check of ULDs

ULD Security Check

All inner and outer sides of a container can be manipulated, and must be checked.

Pay attention to:

- ✖ Tare weight discrepancies
- ✖ Abnormal characteristics, dimensions, contours
- ✖ Unusual wider outer walls or double floorings
- ✖ Unusual repairs
- ✖ Grinded / cut / removed parts
- ✖ Manipulated seams







If there is suspicion of manipulation, please report findings to your superior and security office.

5.3 Storage of ULDs and Nets

5.3.1 Storage of Containers

Empty Containers

- ✔ Store empty containers preferably on roller racks or ball mats.
- ✔ Storage of empty containers on ground is only allowed if 2 spacers of either plastic foam material or wooden planks or skids are used underneath
- ✔ Make sure to have container doors (both tarpaulin or solid) closed to avoid damages of the doors and contamination of the interior.



Stacking:

- ✔ Container stacks must be protected against strong winds.
- ✔ Stacking of empty containers on the ground is only allowed if 2 spacers of either plastic foam material or wooden planks or skids are used underneath and in between.
- ✔ In a rack up to 4 containers may be stacked using spacers.
- ✖ AMJ / AMH containers must not be stacked on ground.





Loaded Containers

✔ Store loaded containers only on slave pallets, roller racks, ball point mats or dollies. ✖ Do not store loaded containerson the ground, not even on spacers!	
✖ Never use a forklift for lifting or moving of loaded containers.	

5.3.2 Storage of Pallets

Empty Pallets

✔ Use a pallet rack (funnel) for proper alignment of the pallets. ✔ Stack a maximum of 50 pallets in a rack. ✔ On a shelf, without a rack, a maximum of 20 pallets may be stacked.	
✔ Wings pallets (PLW): avoid excessive bending of wing pallets by using spacers after every 5th pallet.	

Loaded Pallets

✔ Store loaded pallets only on slave pallets, roller racks, ball point mats or dollies.	
✖ Do not store loaded pallets on the ground, not even on spacers!	
✖ Never use a forklift for lifting or moving of loaded pallets.	

5.3.3 Storage of Nets

Serviceable Nets

- ✔ Serviceable nets may be kept attached to the pallet on one of the long sides:

  position the net on the pallet surface and ensure that no part of the net is hanging outside the pallet edge.

- ✔ Serviceable nets may be packed in a net bag (PN115, one net per sack) and be stored in dry rooms.



Unserviceable Nets

- ✔ Unserviceable nets must be collected in a separate container (packed in PN0115) and be returned to Lufthansa Cargo.

PermFix Nets

- ✖ Never cut off nets that are permanently fixed to a pallet!

  Keep them attached to the pallet as descibed above also for the return to Lufthansa Cargo.

  They are marked with several red signs.



5.4 Transportation of ULDs

Empty Containers

- ✔ Preferably on dollies or slave pallets, but allowed by forklift.
- ✔ On trucks spacers must be used underneath if no roller beds or similar exist.
- ✔ On trucks stacking of up of two containers is allowed (except AMJ) using spacers underneath and in between.



Empty Pallets

- ✔ A stack of maximum 40 pallets using slave pallets or dollies only.

Loaded Containers and Pallets

- ✔ The transportation of loaded Containers or Pallets is allowed only on dollies, roller beds or ball point mats.
- ✔ On trucks/trailers slave pallets, roller beds or ball point mats are mandatory .
- ✖ Never forklift loaded Containers or Pallets unless a slave pallet is used.







5.5 Return of ULDs and Loading Material

ULDs

- ✔ Pallets and containers must be returned principally cleaned.

Straps

- ✔ Straps have to be rolled up for return.

Pallet Nets

- ✔ Nets **that are not permanently fixed to a pallet** must be packed into net sacks for return. One net per sack is allowed.

6 Maximum Floor Load Limit

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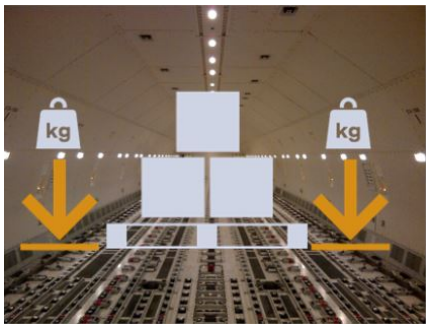
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6 Maximum Floor Load Limit

6.1 Importance of the Maximum Floor Load Limit

What does it mean?

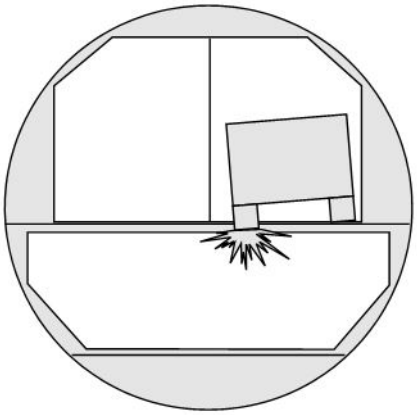
The Maximum Floor Load Limit is the maximum allowed weight pressure of cargo per suqare meter (m^2) on an aircraft or ULD.



Why is it important?

The Maximum Floor Load Limit must be considered

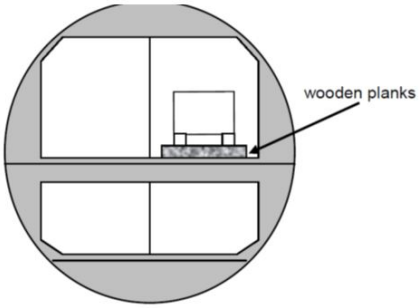
- to protect the floor area from being overloaded;
- to avoid structural damage to the aircraft.



Solution if exceeded

If the Maximum Floor Load Limit is exceeded

- the cargo weight must be spreaded over a larger contact area
- by using supporting material before loading the ULD.



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6.2 Manual Calculation If Spreading Is Needed

Whether a shipment needs spreading or not, can be calculated with the following 3 steps.

6.2.1 Step 1: Calculate the Floor Contact Area

Floor Contact Area

The floor contact area of a piece is defined as the area which is in direct contact with the ULD. The **entire** weight

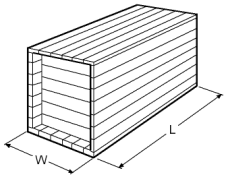
- of the piece itself
- as well as of all pieces loaded on top

rest on this floor contact area.

Rectangular Shaped Pieces

For a rectangular shaped piece the floor contact area can be calculated as follows:

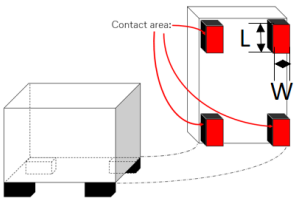
length of piece (L) x width of piece (W)



Pieces with Legs or Feet

For pieces with legs or feet the floor contact area is the sum of the contact area of all legs or feet:

length of foot (L) x width of foot (W) x number of feet



The Floor Contact Area must be calculated in m^2. Lengh (L) or Width (W) given in "cm" or "in" must first be converted into "m":

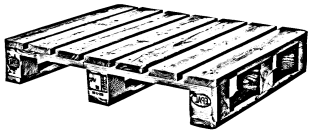
cm / 100 ⇒ m

in / 39.37 ⇒ m

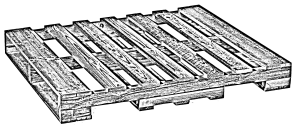
Euro Pallet (EUR 1, EPAL1)

The floor contact area of Euro Pallets (EUR 1 or EPAL1) is 0.414 m²	 (120 cm x 80 cm)

Half-size Euro Pallet (EUR 6, EPAL6)

The floor contact area of Half-size Euro Pallets (EUR 6 or EPAL 6) is 0.144 m²	 (80 cm x 60 cm)

GMA pallet (USA)

The floor contact area of GMA pallets (USA) is 0.558 m²	 (48 in x 40 in)

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6.2.2 Step 2: Calculate the Maximum Piece Weight

Maximum Piece Weight

The Maximum Piece Weight, that can be loaded onto a ULD without spreading, is calculated as follows:

Floor Contact Area of the piece [m^2] x Floor Load Limit of the ULD [kg/m^2]
calculated above as per below table

Floor Load Limit for ULDs

ULD	Loading Deck (Contour)	ULD Type	ULD Floor Load Limit [kg / m^2]
Pallet	Lower Deck	PKC	488
Pallet	Lower Deck	PAJ/PMC/ PLA/PLW	659
Pallet	Main Deck (J4 Contour)	PAJ/PMC PZA/PGE	1464
Pallet	Main Deck (Y Contour)	PAJ	1033
Container	Lower Deck	AKH/AKW	488
Container	Lower Deck	AKE/AMP RAP/RKN/RLP	659
Container	Main Deck	AMJ	1464
Container	Main Deck	AAY	1033

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6.2.3 Step 3: Compare With Actual Piece Weight

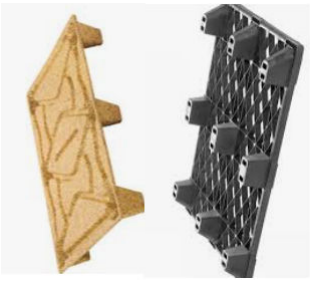
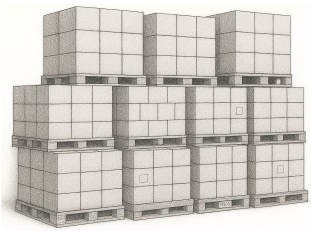
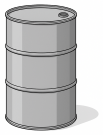
Is Spreading Required?

The piece requires spreading if:

the Actual Piece Weight exceeds the Maximum Piece Weight calculated above.

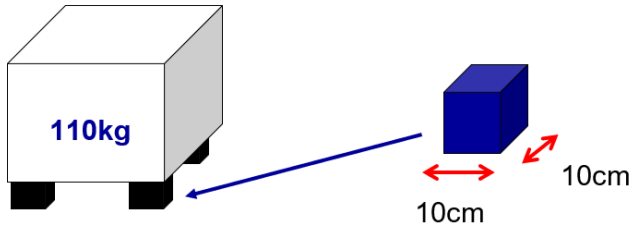
If pallets are loaded exactly one onto each other, consider the sum of weights of all the pieces for the Actual Weight.	

Spreading Is Always Required Here:

In case of one way skids with smaller feet (e.g. with six or nine smaller feet) spreading is always required, as their floor contact area is small.	
If pallets are loaded in multiple layers or briklayer loading spreading is always required, as the calculation of the exact floor load is not possible.	
In case of drums or barrels spreading is always required, as the floor contact area cannot be calculated in many cases (barrels often stand only on the edge of their bottom). Loading of metal pieces directly onto a ULD is not permitted.	

6.2.4 Example Calculation

Example Calculation

A shipment with a weight of 110 kg sits on 4 chocks. It is planned to be loaded on a PMC with a lower deck contour. Does it need spreading?	

Step 1

Contact Area	Lengh (m) x Width (m) of all chocks or legs = 0.1 m x 0.1 m x 4 = 0.04 m^2

Step 2

Maximum Shipment Weight	Floor Contact Area x Floor Load Limit of a PMC (lower deck!) = 0.04 m^2 x 659 kg/m^2 = 26.36 kg

Step 3

Compare	The Actual Weight of the Piece (110 kg) is greater than the Maximum Piece Weight allowed on the PMC in the lower deck (26.36 kg). **The piece requires spreading!**

Max Floor Load Calculator

LCAG offers an application that calculates if weight spreading is required. The usage is described in the next chapter

6.3 Usage of the Max Floor Load Calculator

LCAG offers an application that assess if weight spreading is required.

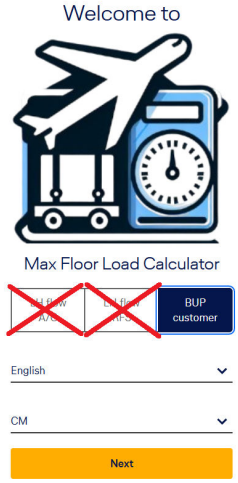
The application runs on devices such as desktop computers, notebooks, tablets, Android warehouse scanners or mobile phones. It requires one-time connectivity when opened (WiFi or mobile data) and can then be used without the connection.

Link: https://www.lufthansa-cargo.com/en/max-floor-calculator.

Welcome Screen

- As a BUP customer, please select the "BUP customer" workflow;
- Select your Measurement Unit;
- Click "Next".

✖ Do not select any of the LH flows unless advised by LCAG.



Basic Cargo Properties

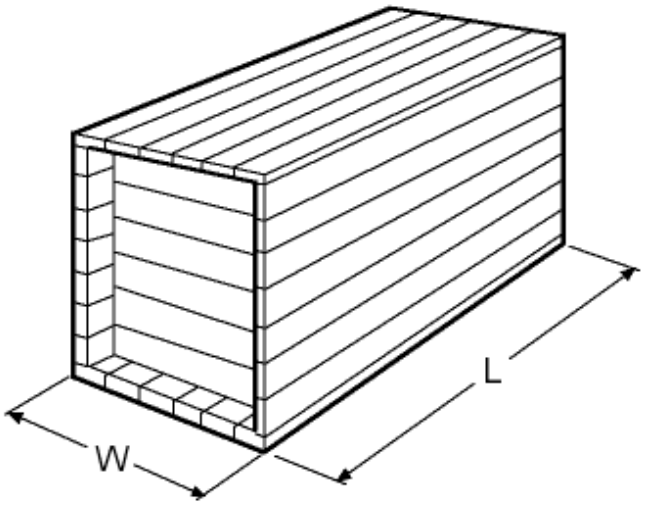
- Select how the cargo is loaded.
  When clicking the tiles, images help to understand the details.

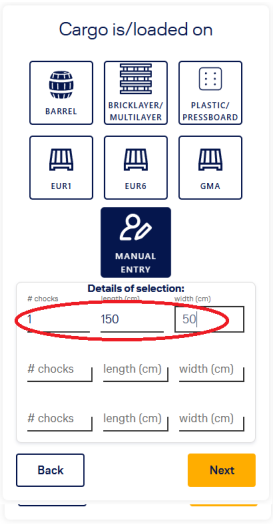




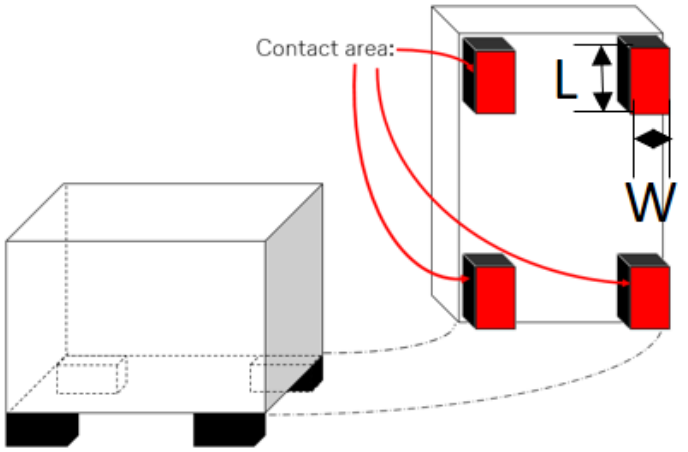


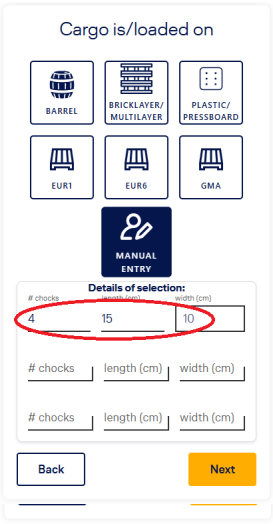
- Select "MANUAL ENTRY" for **pieces with a rectangular basis:**
  enter 1 for # chocks and enter the length and width of the piece.





- Select "MANUAL ENTRY" for **pieces sitting on legs / chocks:**
  enter the number of chocks and the length / width of the chocks.



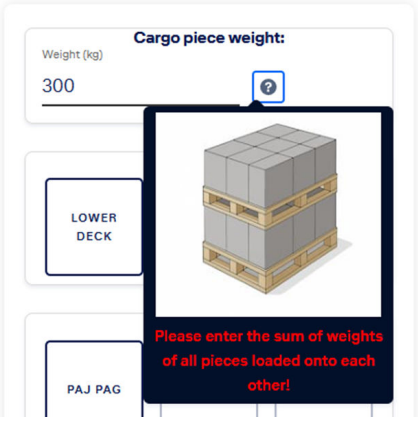
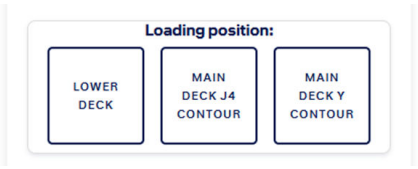


- Enter the Length and Width in CM / IN (depending on the unit selected before).
- If required, use a "." as the decimal-separator.

- Click "Next".

Weight and Loading

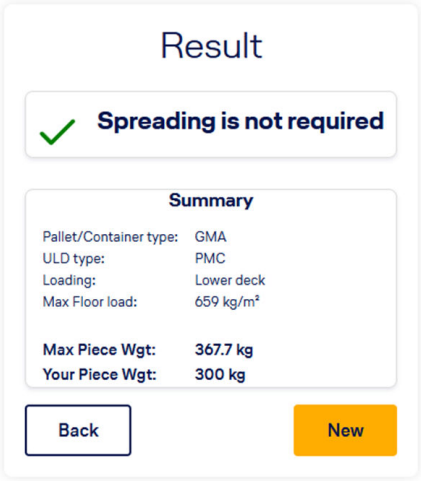
This step is skipped for some loads (barrels, bricklayer, plastic / pressboard skids), and the application directly shows the result.

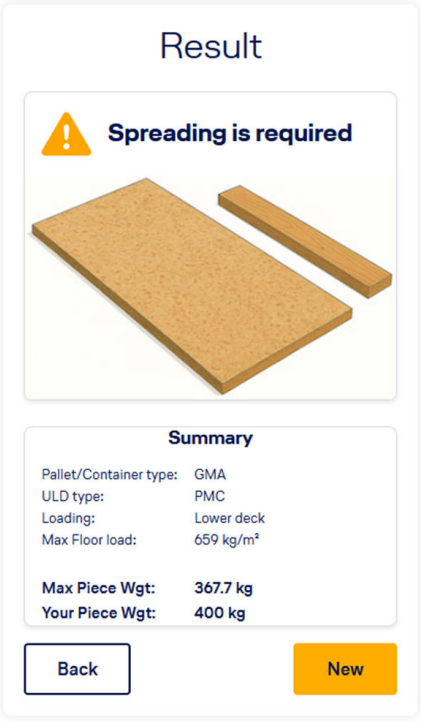
▪ Enter the Weight of the piece. ▪ If required, use a "." as the decimal-separator. If pieces are loaded **exactly** onto each other, enter the sum of weights.	
▪ Select the Loading position.	
▪ Select the ULD Type ULD-types are enabled / disabled depending on the selected Loading Position.	
Select "BUP" if you are in the wrong workflow showing Aircraft types.	
▪ Click "Next".	

Result

- The application tells you if Weight Spreading is required or not.

For the correct usage of the Spreading Material see chapter → 6.4.





Click

- "New" to start a new calculation, or
  "Back" if you want to correct your entries.

6.4 Weight Spreading on ULDs

6.4.1 Supporting Material

Supporting Material

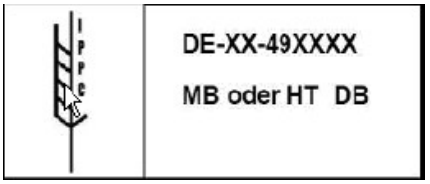
For weight spreading, Lufthansa Cargo offers the following Supporting Material:

Part	Length	Width	Thickness	Area	Tare Weight
Supporting Planks					
PN050	100 cm	15 cm	2.7 cm / 1.1 in	0.15 m²	2.2 kg
PN051	150 cm	15 cm	2.7 cm / 1.1 in	0.23 m²	3kg
Supporting Platforms					
PN061	125 cm	75 cm	2.7 cm / 1.1 in	0.94 m²	15 kg
PN062	200 cm	75 cm	2.7 cm / 1.1 in	1.5 m²	22 kg

Other planks may be used, if they have a minimum thickness of 2.7cm and are made of good quality timber.

IPPC Symbol

Any wood used in build-up must wear this IPPC symbol.



Any wood with signs of pest-infectation is forbidden for transportation:

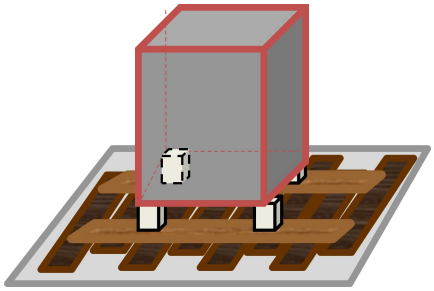
- animals, insects, invertbrates (alive or dead)
- organic material of animal origin (blood, bones, hair, flesh)
- plant or plant products (fruit, seeds, leaves, twigs, roots)
- any other organic material (fungi, soil, water)

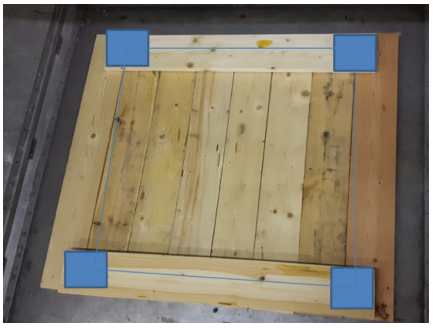
6.4.2 Usage of the Supporting Material

Approach

The weight of a shipment must be spread over the largest possible area.

PKC, AKH, AKE





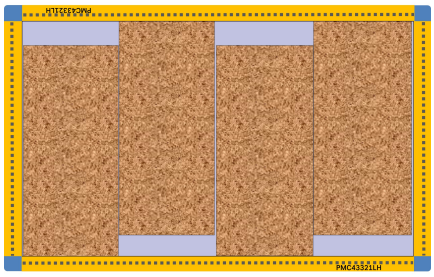
8 x PN050 plus 2 x PN050 to distribute the load pressure on the lower planks





1 x PN061 plus 4 x PN050 (best place them offset to each other).

PMC, AMP, AMJ etc





4 x PN062 (offset to each other)

7 Build-Up Principles

7.1 **Build-Up of ULDs** 2

7.2 **Weather Protection on Pallets** 4

7.3 **Loading of Barrels** 5

7.5 **Usage of SquAir Timber support material** 6

7 Build-Up Principles

7.1 Build-Up of ULDs

General

- Before using a ULD, check its **Serviceability** (chapter → 5.1) and **Security** (→ 5.2).
- ULDs must be handled with utmost care.
- Loading of ULDs must only happen on on slave pallets, roller racks, ball point mats or dollies (chapter → 5.3).
- All shipments loaded on a ULD must be destined to the same unloading station.
- Use supporting material if a piece exceeds the maximum floor load (chapter → 6). Supporting material must also be used, when loading pieces with a base of metal.
- Big and heavy pieces should be on pallets and small handy pieces in containers.
- Heavy and sturdy pieces are to be loaded as a first or bottom layer. Lighter pieces are loaded on top.
- Use the bricklayer method to stabilise the load, whenever possible.

✖ It is not permitted to use air or gas filled dunnage bags to secure the load inside a ULD.







Containers

- Cargo must be stacked well-built so that it does not fall out of the container when the door is opened.
- Cargo loaded in containers which have a flexible door must be skillfully loaded to avoid pressing against the tarpaulin door.



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Pallets

- Secure small pieces properly so that they cannot slide through the pallet net meshes.
- If necessary, cover the load with a plastic net with small meshes (not provided by LCAG) before applying the normal pallet net.
- Keep the pallet edge (tie down rail) free of load to enable the attachment of the tie down equipment.

  This is also important for the correct locking of the ULD in the aircraft.



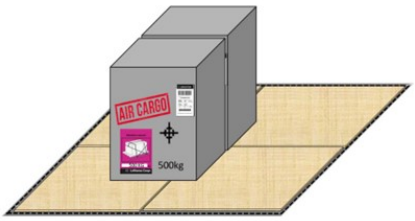
Heavy Pieces

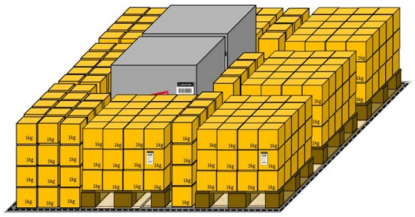
- Heavy pieces are often marked with this symbol:





- Build this mark as close as possible to the middle of the pallet.
- Lighter cargo can then be added to it.









7.2 Weather Protection on Pallets

Weather Protection

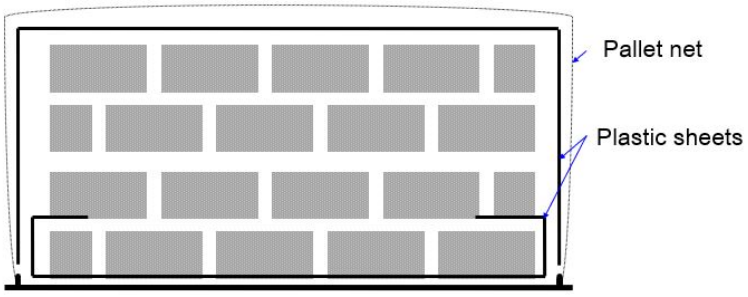
Any load on a pallet must be protected against rain and snow with **transparent** plastic foil or sheeting.

Exceptions exist for special loads such as day-old chicken AVI (see chapter → 9.2), Perishables PER and Passive Temp Support PAS (see → 9.4) as well as for Batteries ELI / ELM (see → 9.1.2).

- Cover the base of the pallet with plastic.
- The plastic sheeting underneath must be tucked in between the first and second layer loaded.
- The plastic sheeting over the top must be pulled down so that it covers the plastic protecting the bottom layers.
- Use adhesive tape in order to keep the plastic in place and to avoid it hanging over the edge of the pallet.
- Make sure that there are no tears or holes in the plastic;
  otherwise start over again.
- Finally, apply the pallet net (chapter → 8.2).







7.3 Loading of Barrels

Spreading MAterial

Always use supporting material when loading drums or barrels.

See → 6.4.2.

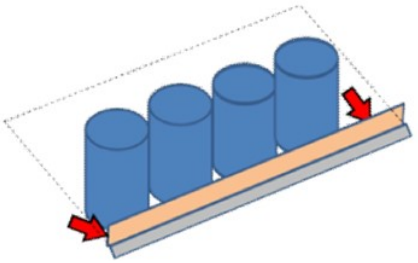


Securing of Drums and Barrels on Pallets

Use supporting planks (PN050/051) between the tie-down track (net) and the drums / barrels to prevent them from sliding onto the tie-down track of the pallet.

This is required on the two pallet edges that run **transverse to the flight direction**.

For the flight direction see → 8.3.1.



Stacking

- Stacking of steel barrels is only permitted if the lower layer is sufficiently stable.
- If necessary use supporting platforms or planks between the layers.

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7.5 Usage of SquAir Timber support material

Not for Weight Spreading

- ✖ SquAir Timber may not be used to spread the weight of cargo due to a floorload limit.
- ✔ It may only be used when raising up cargo for the build-up of a contour, e.g. for accomodating 8 Euro-pallets on a PMC.

3 Different Sizes

- PN064: 1.5 m
- PN065: 2.2 m
- PN066: 3.0 m

Weighgt Limits

The following weight limits apply:

- Weight of cargo ≤ 3 t
  min. 4 beams lengthwise + 2 sidewise
- Weight of cargo > 3 t
  min. 6 beams lengthwise + 2 sidewise

Serviceability Check

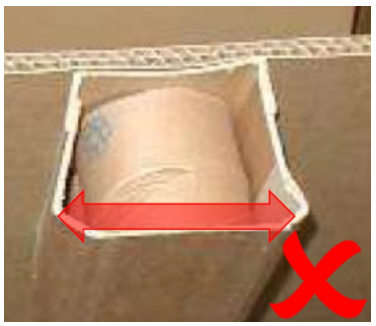
Before use, check the material for damage.

The material is un-serviceable and **may not be used** if

- ✖ the inner rollers are crushed, OR
- ✖ the width of the bars increases, OR
- ✖ the material has gotten wet .

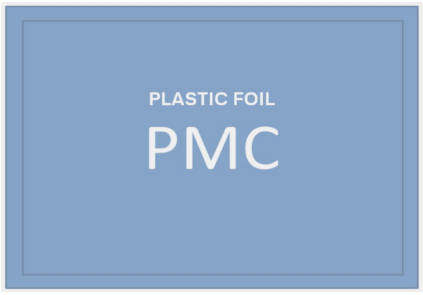
Please dispose of unserviceable material locally.





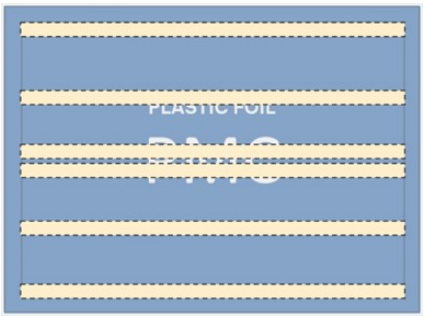
Build-Up of 8 Euro-Pallets

Place plastic foil on the PMC.

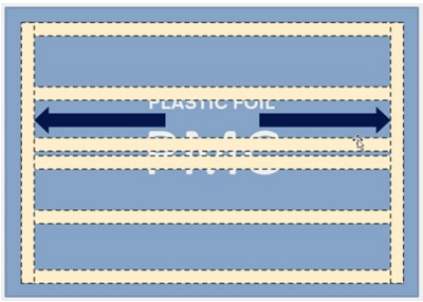


Distribute 6 PN066 evenly on the PMC.

There must be two bars next to each other in the middle.

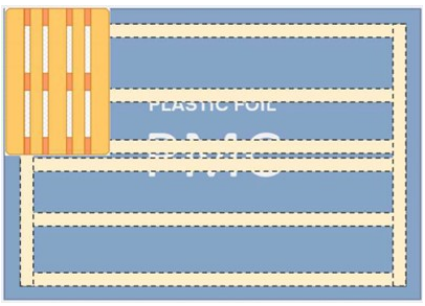


Place 2 PN065 crossways at the ends of the long beams.

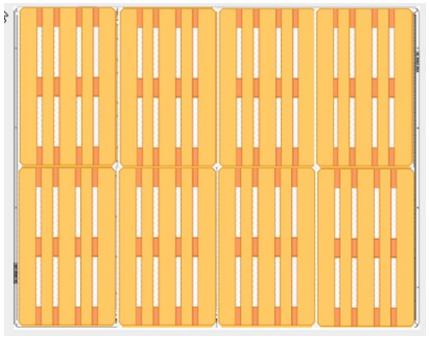


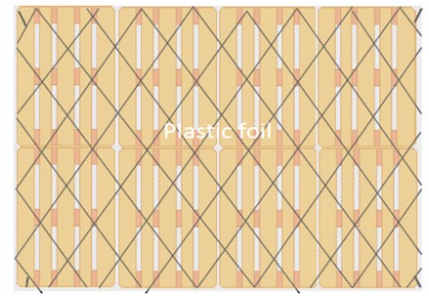
Load the Euro pallets flush with the PMC on the right and left.

The outer bars of the Euro pallet hang in the air, but inside they rest on the PN065.



The outer bars of the Euro pallet hang in the air, but inside they rest on the PN065.	

Load all 8 Euro pallets onto the PMC	

Cover the cargo with plastic foil and lash the PMC with a net.	

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8 Lashing

8.1 Primary Lashing versus Standard Lashing 2

8.2 Primary Lashing on a Pallet 3

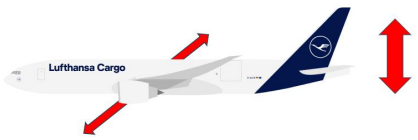
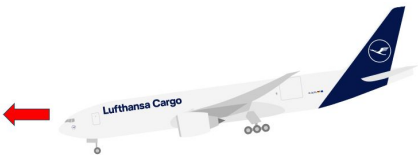
8.3 Standard Lashing under a Pallet Net or in a Container 5
8.3.1 Principles of the Standard Lashing 5
8.3.2 Standard Lashing under the Pallet Net 7
8.3.3 Standard Lashing in a Container 7

8.4 Lashing of Pipes and Bars 10

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8 Lashing

During the different flight phases, the aircraft and the freight loaded is exposed to various forces:

During take-off and the climb phase, the aircraft will experience a backward force.	
In flight, the aircraft may experience turbulences. These are the Up and Down and Lateral forces.	
During decent and landing, a forward force appears.	

Cargo must be secured against these forces.

8.1 Primary Lashing versus Standard Lashing

Primary Lashing

Primary Lashing protects caro against the above mentioned forces.

For Primary Lashing on a pallet, a **pallet net** must be used.

If the shape of the cargo does not allow the usage of a net, please contact Lufthansa Cargo for further information.

If loaded in a container, cargo is protected against the above mentioned forces by the container itself.

Standard Lashing

Standard Lashing with straps or ropes protects cargo from shifting, e.g. if the pallet base is not fully used or if the container is not fully loaded.

Only use Standard Lashing with straps or ropes

- on a pallet under the net,
- in a container.

8.2 Primary Lashing on a Pallet

Primary Lashing

A **pallet net** must be used for Primary Lashing on a pallet.

All pallets with the appropriate net will be provided by Lufthansa Cargo.

Lashing material must be sufficiently tightened without

- ✖ bending the pallet,
- ✖ damaging loaded cargo.



LH vs. OAL Nets

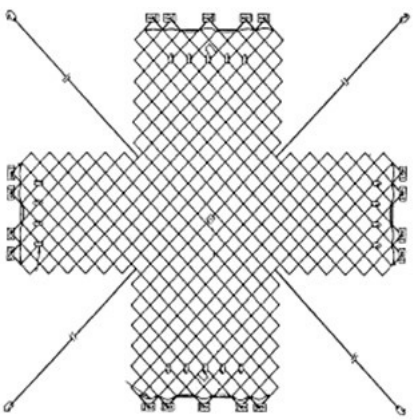
Preferably Lufthansa Cargo nets are to be used on Lufthansa Cargo pallets.

If you use a pallet net from other airlines, please refer to the regulations in chapter → 5.1.2, epsecially the weight limitation up to 3000 kg.

Corner Lashing Lines

- ✔ All 4 corner lashing lines have to be available (not or damaged, not too short).
- ✔ If a corner lashing line is missing or too short, only replace it with a serviceable Lufthansa Cargo lashing line.

  You may also send back the net to Lufthansa Cargo and use another serviceable net.
- ✖ It is not allowed to repair a net or increase the length of a corner lashing line with ropes or straps.

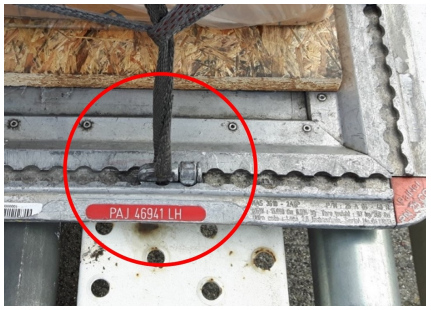


Net Attachment Points and Tie-Down

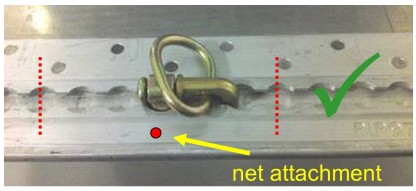
On the pallet edge net attachment points are located.

These markings tell where the net has to be fixed to the pallet, 5 fittings on the long side and 4 fittings on the shorter side of the LCAG 88/96" pallets.

✔ All net fittings must be utilised.



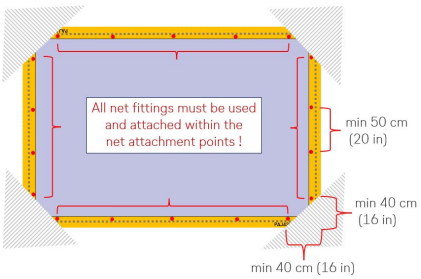
✔ A net tie-down fitting may be attached up to two holes left or right to the net attachment point marking.





This assures

- the minimum distance of 40 cm (16 in) between strap attachments and the pallet corners;
- the minimum distance of 50 cm (20 in) between net fittings.



8.3 Standard Lashing under a Pallet Net or in a Container

8.3.1 Principles of the Standard Lashing

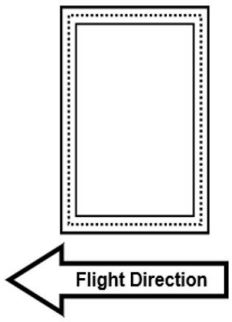
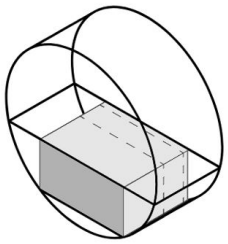
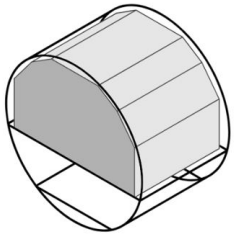
Standard Lashing with straps or ropes is used **on a pallet under the net or within a container** to avoid cargo from shifting, e.g.

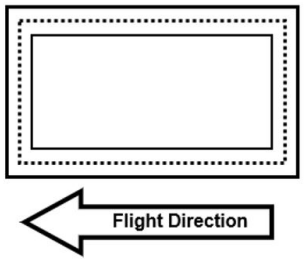
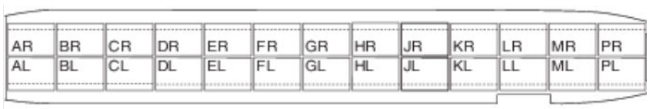
- if the pallet base is not fully used or
- if the container is not fully loaded (less than 3/4 of its internal height, see chapter → 8.3.3).

Part numbers (PN) apply for LH material. The usage of material from other Airlines (OAL) is allowed.

Flight Direction

For Standard Lashing it is essential that you consider the flight direction!

Lower Deck (all aircraft) and Main Deck A321F:		
ULDs are loaded laterally to the flight direction.		
		

Main Deck B777F:	
ULDs are loaded longitudinally in flight direction.	
	

Required Lashing Material

For Standard Lashing use:

- 4 tie-down straps (PN035) **OR**
- 4 single tie-down fittings (PN001) with

  4 tie-down ropes (PN040)

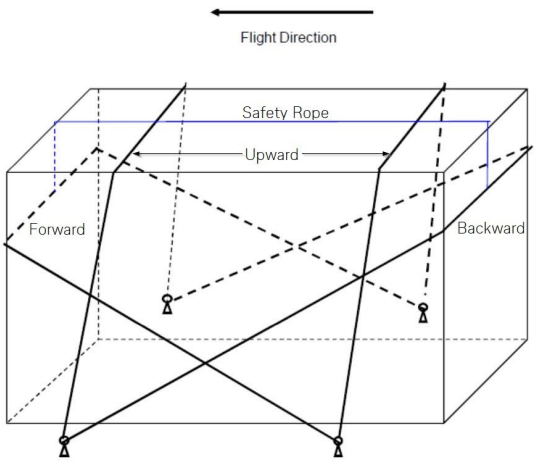
AND

- 1 safety rope (PN040)

In either case use:

- 2 against upward forces
- 1 against forward forces
- 1 against backward forces

Use an additional rope (safety rope) to prevent the ropes / straps, that secure against forward and backward forces, from slipping down.



Additional straps or ropes for lateral forces are not required here, these forces are secured by the net resp. the container walls.

Lashing Principles

✔ Always lash the longest way around.



Lashing material must be sufficiently tightened without

✖ bending the ULD base,

✖ damaging loaded cargo.

8.3.2 Standard Lashing under the Pallet Net

Attaching the Straps

✔ If additional straps are used under the net, the tie-down fittings must be attached to the pallet equidistant between two net attachment points.

✖ Do not attach straps in the area between the most outer net attachment point and the corner of the pallet.

8.3.3 Standard Lashing in a Container

Lashing required

Lashing within a container is required if

- a single piece can be damaged when tilting or moving, **OR**
- heavy pieces (especially HEAs) might damage other cargo or the container, **OR**
- the container is filled to less than 3/4 of its internal height.



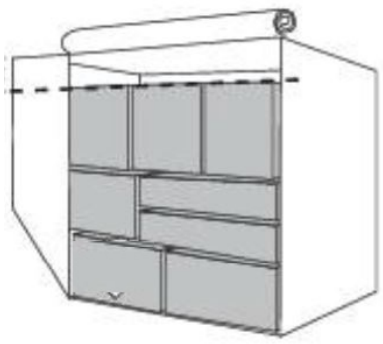
Lashing not required

Lashing within a container is not required if

- the container is completely filled with cargo, **OR**
- the entire floor area is used and the container is filled up to at least 3/4 of its internal height.

This is also valid if heavy pieces (including HEAs) or allowed DGR cargo are loaded.





Standard Lashing with Straps

New container types have 8 or more attachment points. Here lashing with straps (PN035) is preferred.

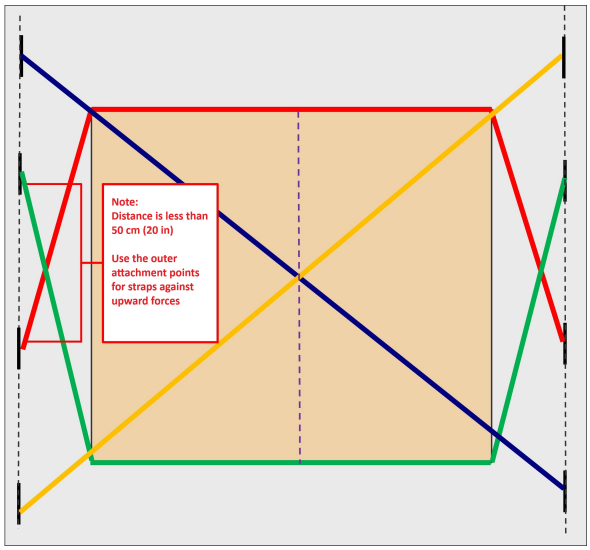
The distance between the attachment points is less than 50 cm (20 in).

Use the outer attachment points for the 2 straps against upward forces.

This assures keeping the minimum distance for straps pulling in the same direction.



top view:



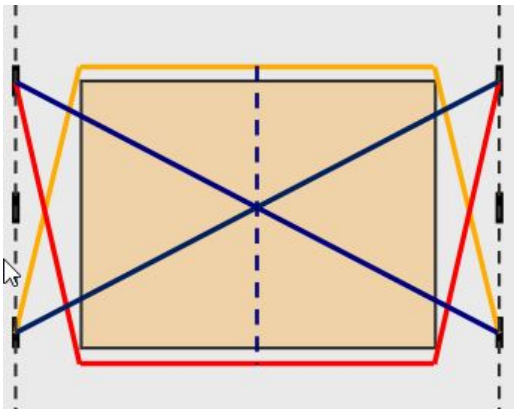
Standard Lashing with Ropes

Older container types have less than 8 attachment points for tie-down fittings / straps.

Here standard lashing is only possible with the use of ropes (PN040) in conjunction with tie-down rings (PN001).



top view:



- ✖ Any other method to secure cargo in a container is not allowed.
- ✔ If Standard Lashing in a contqainer is required, but not possible,
  - load cargo onto a pallet
  - and secure it with a pallet net.

8.4 Lashing of Pipes and Bars

Metal Pipes and Bars

✖ Metal pipes and metal bars may not be loaded in Shipper Built ULDs.

Pipes and Bars of other Material

✔ Pipes and bars made out of other materials and beams or similar pieces (e.g. small and long wooden boxes) must always be loaded laterally to the flight direction.

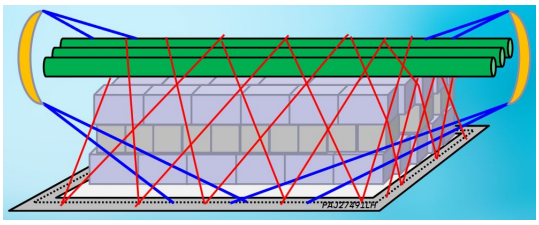
✖ Loading them in flight direction is not allowed due to safety reasons.



For the flight direction please consider chapter → 8.3.1.

Lashing

- Both ends must be secured with a tie-down spider (PN 039 - available from Lufthansa Cargo).
- At least 2 Tie-down Straps (PN035) per PN039 are fixed through the rings of the tie-down Spider and then to the pallet base.
- All rings of the PN039 must be used.
- Example:
  If 2 PN035 are used, each PN035 goes through 4 rings of the PN039.



- Finally the entire loadmust be secured with a pallet net.

The Tie-down Spider (PN039) must not be older than 3 years.

It has the follwoing lashing capacities:

- Upward: 750 kg
- Forward: 1500 kg
- Backwards: 1500 kg



9 Special Loads

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9 Special Loads

9.1 Dangerous Goods

9.1.1 DGR allowed in Shipper-Built ULDs

IATA-DGR 9.1.4.1

Cargo as per Dangerous Goods Regulations IATA-DGR 9.1.4.1 is allowed in Shipper-Built ULDs. This includes:

- a freight container for radioactive material (see Appendix A – IATA DG Regulations)
- ID 8000, Consumer commodities when prepared according to Packing Instruction Y963
- UN 1845, Carbon dioxide, solid (dry ice)

  provided that the unit load device does not contain dangerous goods other than UN3373, Biological substance, Category B or ID 8000, Consumer commodity or goods not subject to the Regulations
- UN 2807, Magnetized material
- UN 3373, Biological substance, Category B prepared according to Packing Instruction 650
- UN 3245, Genetically modified organisms, Genetically modified microorganisms prepared according to Packing Instruction 959
- Lithium ion, sodium ion or lithium metal cells and batteries meeting the provisions of Section II of Packing Instructions 966, 967, 969, 970, 977, 978
- UN 3164, Articles, pressurized, hydraulic or Articles, pressurized, pneumatic prepared according to Packing Instruction 208 (a)
- Dangerous goods in excepted quantity prepared according to Subsection 2.6.8
- Radioactive material, excepted packages, prepared according to Subsection 10.5.8

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9.1.2 Excepted Lithium / Sodium Batteries according to Section II

ELI/ELM Allowed in Shipper Built ULDs

UN number	Proper Shipping Name		Packing Instruction
UN3481	Lithium ion batteries **packed with** equipment	ELI	966
UN3481	Lithium ion batteries **contained in** equipment	ELI	967
UN3552	Sodium ion batteries **packed with** equipment	ELI	977
UN3552	Sodium ion batteries **contained in** equipment	ELI	978
UN3091	Lithium metal batteries **packed with** equipment	ELM	969
UN3091	Lithium metal batteries **contained in** equipment	ELM	970

ULD-tag

- The standard ULD-tag (Lufthansa or IATA) must be used.
- "ELI" resp. "ELM" must be entered on the ULD-tag unter the Remarks (see chapter → 10.1).

Loading Deck

- All packages containing ELI/ELM must be loaded on Lower Deck ULDs.
- The transport on the Main Deck is allowed
  - in Fire Resistant Containers (FRC); OR
  - on a pallet with a properly applied Fire Containment Cover (FCC).

    This constitutes an exemption to the general rule of only applying transparent cover foil.

Button Cell Batteries in Equipment

Packages containing only button cell batteries installed **in equipment** (including circuit boards) are excempt from the declaration on the AWB, ULD-tag and restrictions for Main Deck transport.

However, if declared as ELI / ELM, all rules and restrictions also apply for button cells.

9.1.2.1 Build Up Procedure for FCCs

General

- ✔ Verify that the FCC is only installed on PAJ or PMC pallets.
- ✔ Confirm the applicable height option by checking the Deployment Kit color: blue (maximum height J3) or grey (maximum height J4).
- ✔ Ensure no sharp objects are protruding from the cargo that could damage the FCC.
- ✔ A minimum of two people are recommended for the installation. The combined weight of the Deployment Kit with FCC is up to 64 kg, depending on the manufacturer.

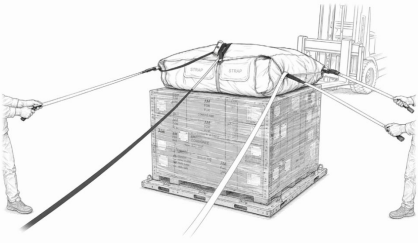
Preparation of the FCC Kit

- ✔ Align the long side of the Deployment Kit with the long side of the cargo.
- ✔ Remove the red strap and undo the closure fittings on both sides of the Deployment Kit.
- ✔ Remove the Deployment Ropes (black) and Deployment Straps (white and blue) from their respective pockets and lay them out completely on the ground.
- ✔ Using a forklift, lift the Deployment Kit off the ground.



Positioning on Cargo

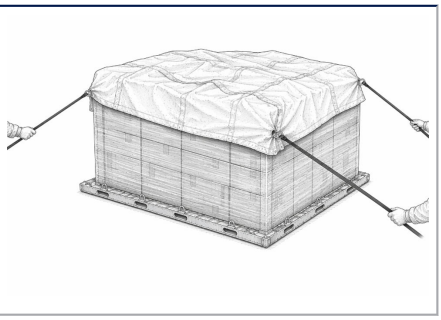
- ✔ While holding all Deployment Ropes and Straps clear of the forklift path, use the forklift to place the Deployment Kit on top of the cargo.
- ✔ If the load surface is uneven, position the Deployment Kit at the highest point of the load.
- ✔ The Deployment Straps may be used to stabilize the Deployment Kit while removing the forklift.
- ✔ Use the same Deployment Straps to make any necessary positional adjustments.



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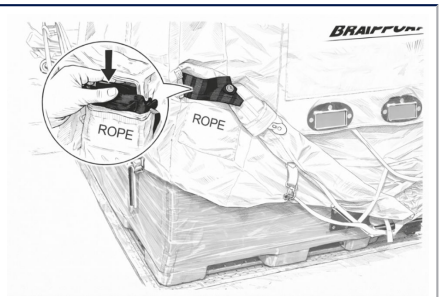
Deployment

- ✔ Pull the Deployment Ropes (black) on one side to deploy that side of the FCC down over the load.
- ✔ Repeat on the opposite side.
- ✔ Continue pulling the FCC down on all four sides until the cargo is fully covered.
- ✔ Ensure the cover is fully deployed and that there are no folds at any corner.



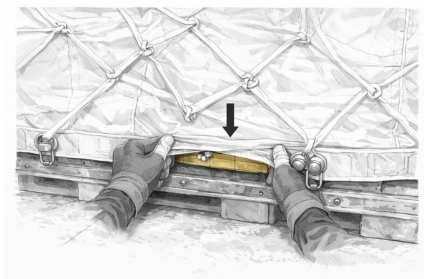
Securing the Deployment Ropes

- ✔ Tuck the Deployment Ropes (black) into their respective pockets located at all four corners on the inside of the FCC.



Fastening the Net

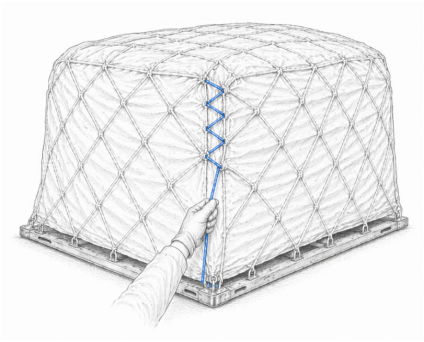
- ✔ Close the FCC net by fastening all double studs. Before engaging each double stud, pull the cover upward so that it lies flush with the surface of the pallet.
- ✔ Tighten the net using the tensioner hooks. Make sure that neither straps nor fabric are hanging loosely.
- ✔ Attach each tensioner hook to a higher mesh position directly above the existing hook location to prevent the net from twisting.
- ✔ If required, apply tension around the net a second time to achieve a tight, even fit.

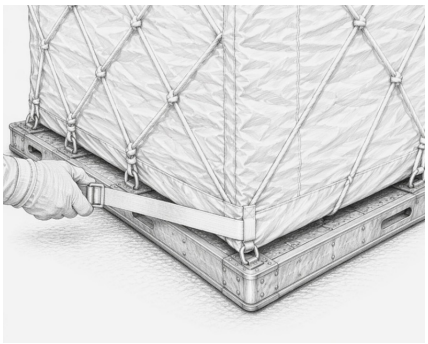


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Corner Lashing and Final Closure

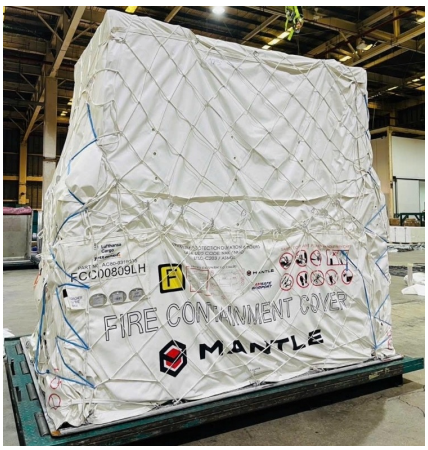
- ✔ Lash the net at all four corners using the lashing line.
- ✔ Pull each corner belt and attach its fitting to the pallet on the adjacent side. Repeat on all sides.
- ✔ Pull the cover downward to close any gap between the bottom seam and the pallet base.
- ✔ Verify that all double studs are fully engaged and that no gaps are present between the bottom seam and the pallet base.





Final Check

- ✔ No ropes or straps are hanging out from beneath the FCC.
- ✔ All double studs are fully engaged.
- ✔ All tensioner hooks are engaged and the cover is tightly wrapped around the cargo.
- ✔ All corner belts are attached and lashing lines are tightened.
- ✔ No gaps are present between the bottom seam of the FCC and the pallet base.

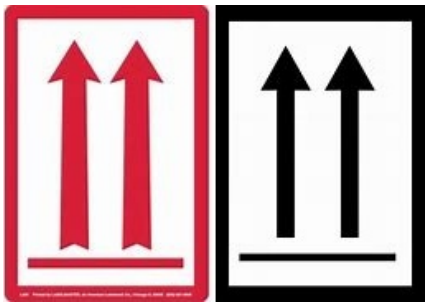


9.1.3 Build-Up of DGR

Before Loading

- Inspect the packing of dangerous goods to ensure that it has no holes, leakage or other indication that the package has been damaged.
- Each Dangerous Goods shipment must be packed, marked and labelled according to the IATA-Dangerous Goods Regulations.

Loading

✔ Handle dangerous goods with utmost care to prevent any damage to persons or goods.	
✔ Strictly observe all special handling instructions (labels or imprints), for example 'This Way Up!' or arrows showing the proper orientation of the package.	
✖ Do not load dangerous goods in such a way that they can be damaged by the weight or edges of other pieces loaded on top or next to them.	 

✖ Never load DG directly to the floor of a ULD. ✔ Use supporting planks/platforms to raise the DG up off the base of the ULD.	
✔ For the cooling of cargo, only packed dry ice may be used, e.g. packed in a fibreboard box. This is also applicable inside insulating containers.	

Lashing

- Lashing on a pallet as per general requirements, see → 8.2.
- Lashing in a container as per general requirements, see → 8.3.3.

Make sure that the lashing material does not damage a piece if tightened too much.

ULD-Tag

- The ULD-tag for Dangerous Goods must be used.
- For ELI / ELM, the standard ULD-tag (LH or IATA) must be used.
- For details see chapter → 10.

9.2 Baby Chicks (AVX)

Loading on Pallets Only

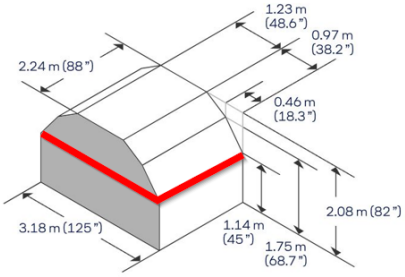
- Boxes must never have direct contact with the pallet surface:

  Put at least one layer of insulating material between the boxes and the pallet surface.
- Load chicken boxes with their longer sides parallel to the longer pallet side.
- Keep a minimum space of 10 cm (4 in) around every stack for sufficient air circulation.

  Use spacers.
- Do not cover the boxes with plastic foil or similar material.



Maximum Stacking

Lower Deck of all wide body aircraft (P-contour) ▪ 150 cm (59 in)	
Main Deck B777F (J4 contour) ▪ 10 layers of carton boxes, OR ▪ 12 layers of plastic boxes	
Main Deck A321F ▪ 114 cm (45 in) ▪ This correspponds to the hight up to which the Y-contour is built-up straight.	

ULD-tag

✔ The Special Load Code "AVX" must be entered on the ULD-tag under Remarks.

9.3 Vulnerable Cargo (VUN)

Special Permission

Vulnerable Cargo (VUN) is only allowed in Shipper Built ULDs with a special permission by the local Handling Manager of Lufthansa Cargo.

The permission must be documented in the Annex of the Declaration.

Weapons

✖ Weapons, weapons parts and ammunition are not allowed in Shipper Built ULDs.

The VUN permission mentioned above never applies to weapons, weapons parts and ammunition.

Loading

✔ Load vulnerable goods preferably into containers.

✔ If it is loaded on pallets, protect the vulnerable goods with two layers of plastic foil.

✖ Additional lose packages of VUN (BUP & loose) are not permitted.

ULD-tag

✔ The Special Load Code "VUN" must be entered on the ULD-tag under Remarks.

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9.4 Perishable Cargo (PER)

Special Permission

Perishable Cargo (PER) is only allowed in Shipper Built ULDs with a special permission by the local Handling Manager of Lufthansa Cargo.

The permission must be documented in the Annex of the Declaration.

9.4.1 Refrigerating Containers

Code	RAP (LH) Envirotainer (t2, e2, Releye), Icecooler, Unicooler, Opticooler, CSafe	
Type	Cool Container	
Base dimensions	224 x 318 cm	88 x 125 in
Height	163 cm	64 in
Max Gross Weight	4000 kg	
Contour	P	
Max dry ice bunker (only Icecooler, Unicooler)	320 kg	

Code	RKN (LH) Envirotainer, Icecooler, Unicooler, Opticooler, CSafe	
Type	LD3 Cool Container	
Base dimensions	153 x 156 cm	60.4 x 61.5 in
Height	163 cm	64 in
Max Gross Weight	1500 kg	
Contour	E	
Max dry ice bunker (only Envirotainer-t2, Icecooler, Unicooler)	120 kg	

Code	Unicooler – RLP (PC)		
Type	LD6 Cool Container		
Base dimensions	153 x 318 cm	60.4 x 125 in	
Height	163 cm	64 in	
Max Gross Weight	3000 kg		
Contour	P		
Max dry ice bunker	n/a		

Handling of Refrigerating Containers

The following must be obverved when a refrigerating ULD (RAP/RKN/RLP) is used:

- ✔ check the temperature setting;
- ✔ the bottle for condensation water inside the container must be empty;
- ✔ make sure that the fan is working and is not blocked with other cargo;
- ✔ the internal maximum loading height is observed (bottom edge of the fan);
- ✔ during interim storage, that is longer than 4 hours always, connect the container to electric power;
- ✔ secure load to avoid damages (see → 8.3.3);
- ✔ container may only be transported with a forklift, if the forklift blades are long enough to go all the way through the container's forklift pockets;
- ✖ do not place containers on the ground:

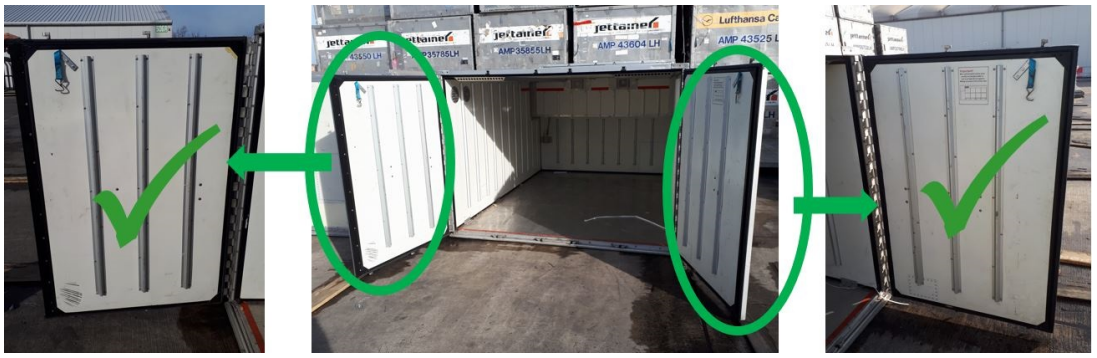
  use slave pallets, dollies or rollerbeds (for loading, unloading and transportation, e.g. truck);
- ✖ do not push containers with a forklift;
- ✖ do not lift a loaded RLP/ RAP from the short side;
- ✖ do not lift a loaded RLP/ RAP from the door side
- ✖ not stack or topload containers.

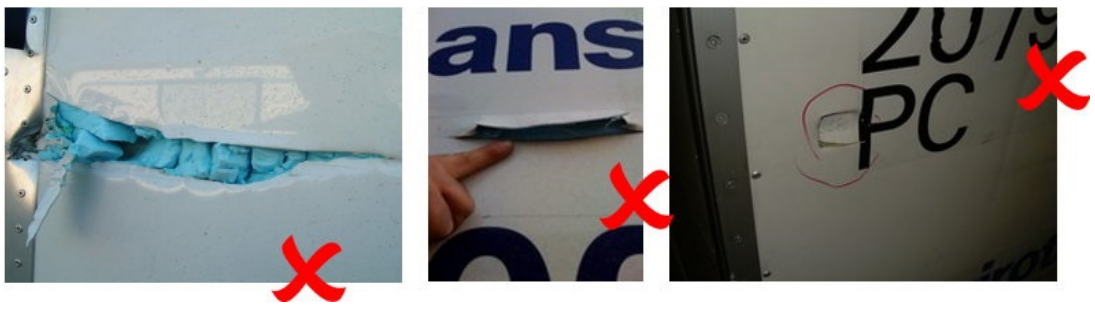
Serviceability

- ✔ No missing parts
- ✔ No more than **two** missing or loose rivets in the container base **next to each other**



- ✔ No hole or crack in the base (underneath or inside the container)
- ✔ No damaged door sealing
- ✔ No hole or crack in the side panels or roof panel





9.4.2 Build-Up of Perishable Cargo

9.4.2.1 Build-Up

All perishable goods

- need to be labelled with the IATA label
- must be properly packed
- must be loaded in a way that the weight of the upper layers does not damage the lower layers



PEF (flowers and plants) and PEP (fruit and vegetables)

- Do not load flowers next to fruit or vegetables.
- Make sure that there is space for sufficient air circulation between the packages.
- If pallets with flowers, plants, fruits and vegetables are covered with a plastic foil for weather protection, make sure that the foil does not cover more than 50cm (20”) from the upper rim of the contour to ensure a sufficient air circulationes not damage the lower layers.

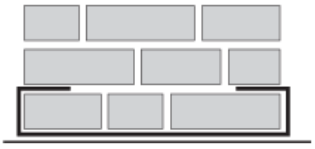


WET Cargo

- "Wet Cargo" is defined as goods, which contain liquids or which may leak liquids or give off moisture.
- Examples:
  - fresh and frozen meat,
  - fresh, salted or frozen fish/seafood packed with wet ice,
  - flowers, vegetables or fruits from which liquids can escape.
- Handling:

  cover the floor of the ULD with absorbent sheets (PN 106).
- ULD-tag:

  enter the Special Load Code "WET" under Remarks



Cover

For Passive Temp Support (PAS) or Perishables (PER) a non-transparent thermo cover may be used for reducing the exposure to external temperatures.

This constitutes an exemption to the general rule of only applying transparent cover foil.

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9.4.2.2 Handling Codes

ULD-Tag

From below mentioned Codes, applicable Codes must be entered on the ULD-tag under "Remarks for special loads" resp. on the IATA-tag under "Remarks".

For details regarding the ULD-tag see chapter → 10.

Codes for the Commodities

EAT	Food for human or animal consumption (which is not PEP, PEM & PES)
PEF	Fresh flowers and plants
PEM	Meat or Meat products
PEP	Fruit and vegetables
PES	Fresh fish and seafood
PER	Other sensitive cargo (i.e. medicines, serum, blood plasma)
WET	Wet Cargo not packed in watertight container

Codes for the Product

ACT	Active Temp Control: a refrigerating container is used
PAS	Passive Temp Support: Perishable cargo is built-up on regular ULDs

Temperature Codes

ERT	Extended Room Temperature (+2 to +25°C)
CRT	Controlled Room Temperature (+15 to +25°C)
COL	Cool Goods (+2 to +8°C)
FRO	Frozen Goods (-20 to -10°C)

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9.4.2.3 Dry Ice

Loading

✔ For the cooling of cargo, only packed dry ice may be used, e.g. packed in a fibreboard box.

This is also applicable inside cool containers.





AWB

The net quantity of dry ice per ULD loaded must be inserted in the AWB.

ULD-Tag

If Dry Ice is loaded

- always use the Dangerous Goods ULD-tag
- the net quantity of dry ice per ULD loaded must be inserted under "Remarks":
  - 9/ICE/<net quantity>, e.g. for 20 kg **9/ICE/20**
  - in a refrigerating container:
    ACT.9/ICE/<net quantity>, e.g. for 20 kg **ACT.9/ICE/20**

For details regarding the ULD-tag see chapter → 10.

9.5 Items on Wheels

Special Permission

Items on Wheels are only allowed in Shipper Built ULDs with a special permission by the local Handling Manager of Lufthansa Cargo.

The permission must be documented in the Annex of the Declaration.

This does not apply to vehicles. Those may only be tendered in Shipper Built ULDs under the BUP500+ license.





Build-Up

Load Cargo on wheels so that the wheels do not touch the ULD floor.

10 ULD-Tag

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10 ULD-Tag

Signature

The person signing the ULD-tag must hold a valid BUP training certificate.

By signing the ULD-tag the agent takes full responsibility for the correct build-up of the ULD as per the requirements of this manual.

10.1 ULD-Tag for General Cargo

Lufthansa- or IATA-Tag

For Cargo that is not subject to the Dangerous Goods Regulations (including for ELI / ELM), the Lufthansa- or IATA standard ULD-tag must be used.

The following fields must be filled in:

1) ID Code: ULD ID number

2) Destination: airport of destination

3) mark the BUP checkbox with "X"; (IATA-tag: not available)

4) B-number or signature

IATA-tag: put it down untder "Remarks" next to 10)

5) Loaded at: airport of origin

6) Flight No.: flight number and date

7) Transfer at: airport of transit (if applicable)

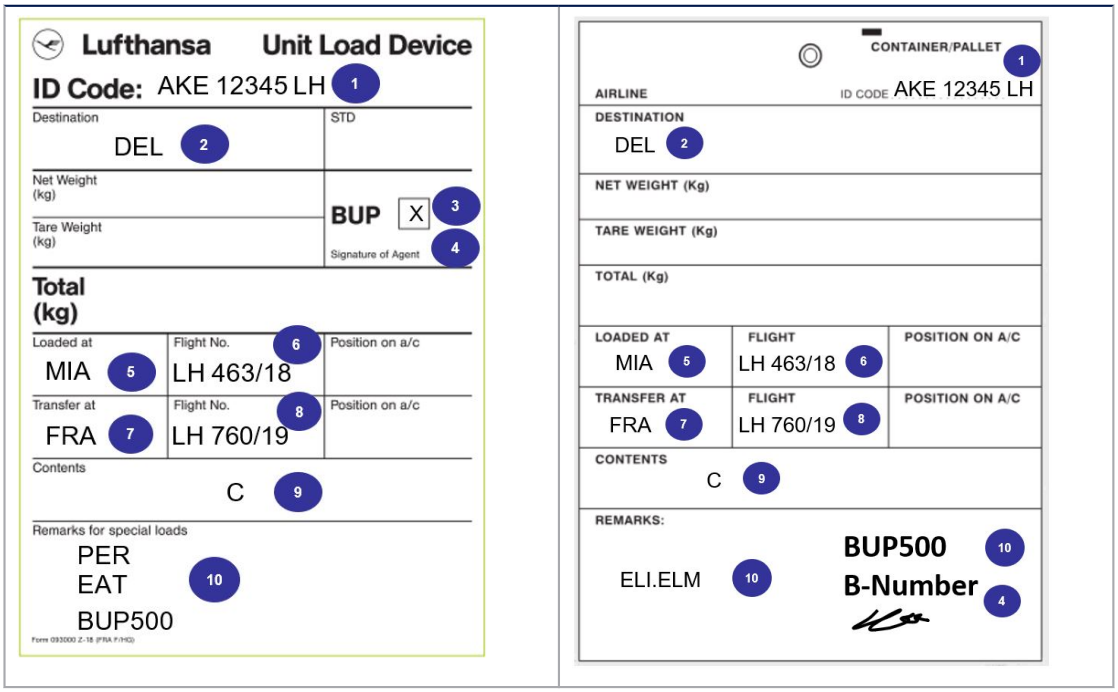
8) Flight No: connecting flight and date (if applicable)

9) Contents: always put "C" for cargo

10) Remarks for special loads:

- BUP license type (BUP500)
- Special Load Codes, if applicable (separated with a "." or one each line)
  - ✔ all relevant codes for perishable cargo (see chapter → 9.4.2.2)
  - ✔ AVX (baby chicken, see chapter → 9.2)
  - ✔ ELI (lithium or sodium ion batteries in excepted quantities, see chapter → 9.1.2)
  - ✔ ELM (lithium metal batteries in excepted quantities, see chapter → 9.1.2)
  - ✔ FIL (undevelopped film)
  - ✔ HEA (single pieces with 150 kg or more)
  - ✔ HEG (hatching eggs)
  - ✔ PRC (piercing or rigid cargo)
  - ✔ VUN (vulnerable cargo, see chapter → 9.3)
  - ✔ WET (wet material not packed in watertight container, see chapter → 9.4.2.2)

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Lufthansa
Unit Load Device
ID Code: AKE 12345 LH 1
Destination
DEL 2
STD
Net Weight (kg)
Tare Weight (kg)
BUP X 3
Signature of Agent 4
Total (kg)
Loaded at
MIA 5
Flight No.
LH 463/18 6
Position on a/c
Transfer at
FRA 7
Flight No.
LH 760/19 8
Position on a/c
Contents
C 9
Remarks for special loads
PER
EAT
BUP500 10
CONTAINER/PALLET 1
AIRLINE
ID CODE AKE 12345 LH
DESTINATION
DEL 2
NET WEIGHT (Kg)
TARE WEIGHT (Kg)
TOTAL (Kg)
LOADED AT
MIA 5
FLIGHT
LH 463/18 6
POSITION ON A/C
TRANSFER AT
FRA 7
FLIGHT
LH 760/19 8
POSITION ON A/C
CONTENTS
C 9
REMARKS:
ELI.ELM 10
BUP500 10
B-Number 4

10.2 ULD-Tag for Dangerous Goods

DGR ULD-Tag

For Dangerous Goods the Lufthansa DGR ULD-tag must be used.

The fields must be filled in as described for General Cargo in the prevoius chapter.

DG-specific Content

Special Load Codes to be entered under Remarks, if applicable:

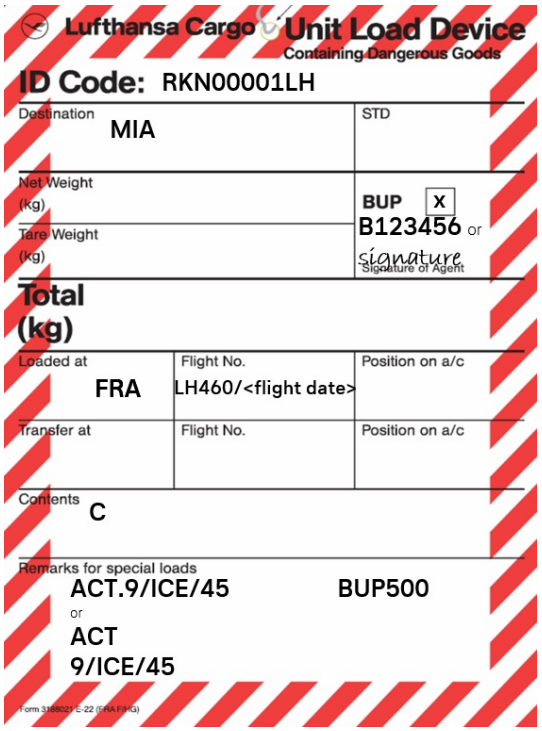
- ✔ ICE (dry ice)
- ✔ MAG (magnetized material)
- ✔ RMD (miscellaneous Dangerous Goods)

DG-specific content must be entered under "Remarks for special loads" in the format

<DG class>/<IMP code>/<net quantity per ULD>

Examples:

- 9/ICE/45
- if a refrigerating container is used:
  ACT.9/ICE/45
  or
  ACT
  9/ICE/45



10.3 Alternative Procedures

Alternatives to the ULD-tag

Instead of filling in the ULD-tag, the agent / shipper may choose one of the following alternatives:

1) The entire ULD-tag information can be provided upon Cargo Acceptance as a printed document or in electronic form (Excel, Word, PDF or accessible database). With this information the ULD Tag can be issued by our own staff/our handing agent.

2) The confirmation of the correct build-up (B-number, other unique ID, name) can also be given in the Handling Information of the AWB / FWB.

Special Permission

The usage of one of the alternatives to the ULD-tag requires a special permission by the Lufthansa Cargo Regional Handling Manager.

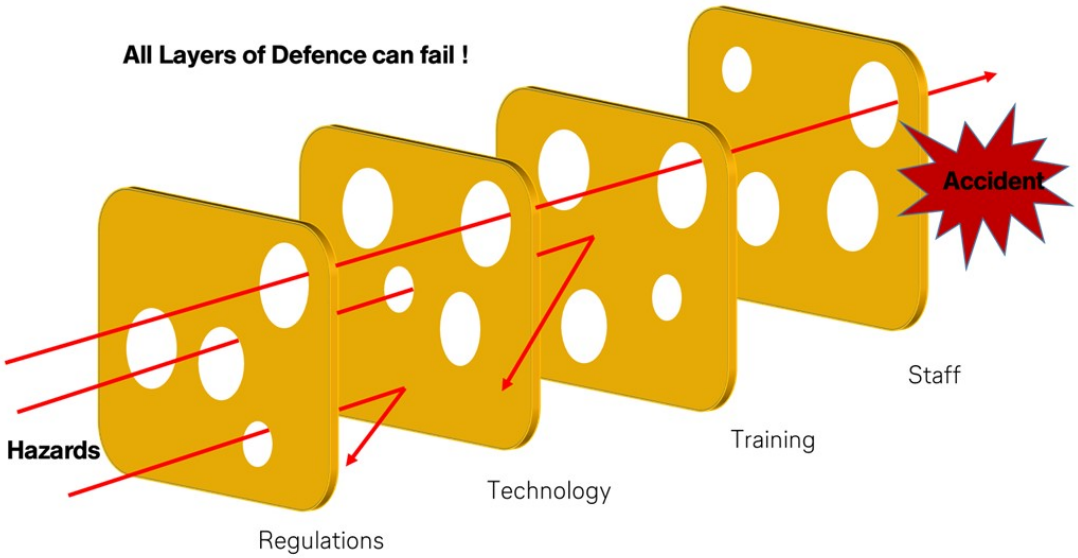
The permission must be documented in the Annex of the Declaration.

11 The Human Factor

Humans Make Mistakes

Human error is the unintentional act of performing a task incorrectly like:

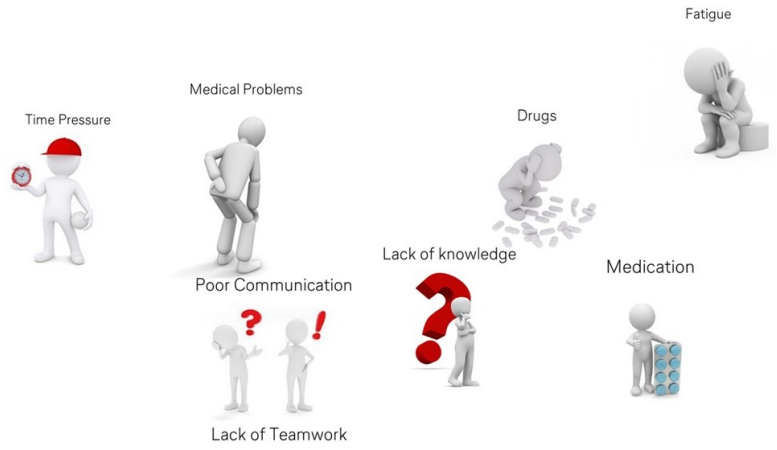
- Not performing a task or an act
- Accomplishing a task incorrectly
- Performing a task not authorized



You Can Reduce Risks

Human error, rather than mechanical failure, underlies most aviation accidents.

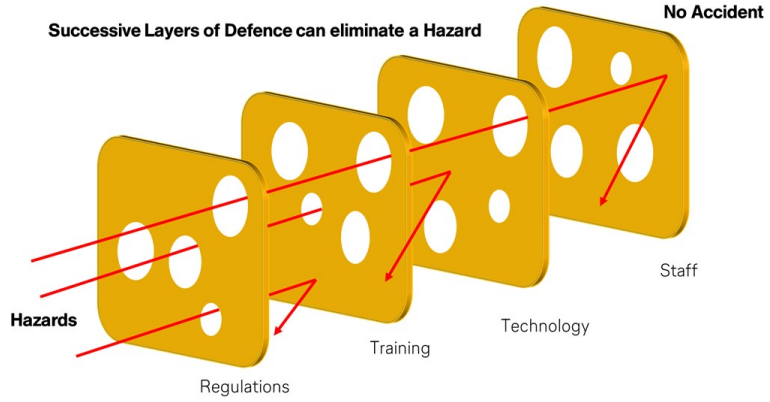
The list of human factors that can affect work performance is broad, like:



In Aviation, every Hazard or Risk can lead to an Accident. You can reduce those risks:

- Keep yourself fit.
- Get enough rest.
- Don't work if you don't feel okay.
- Keep yourself up-to-date.
- Always expect to find something wrong.
- Never sign-off something that you did not fully check.
- Always double-check your work.

Mission Accomplished



And if you have identified a risk or made a mistake ...

- **REPORT IT !!**

Even if it is against human nature to show weakness, **report what happened**, and support others by learning from errors.