

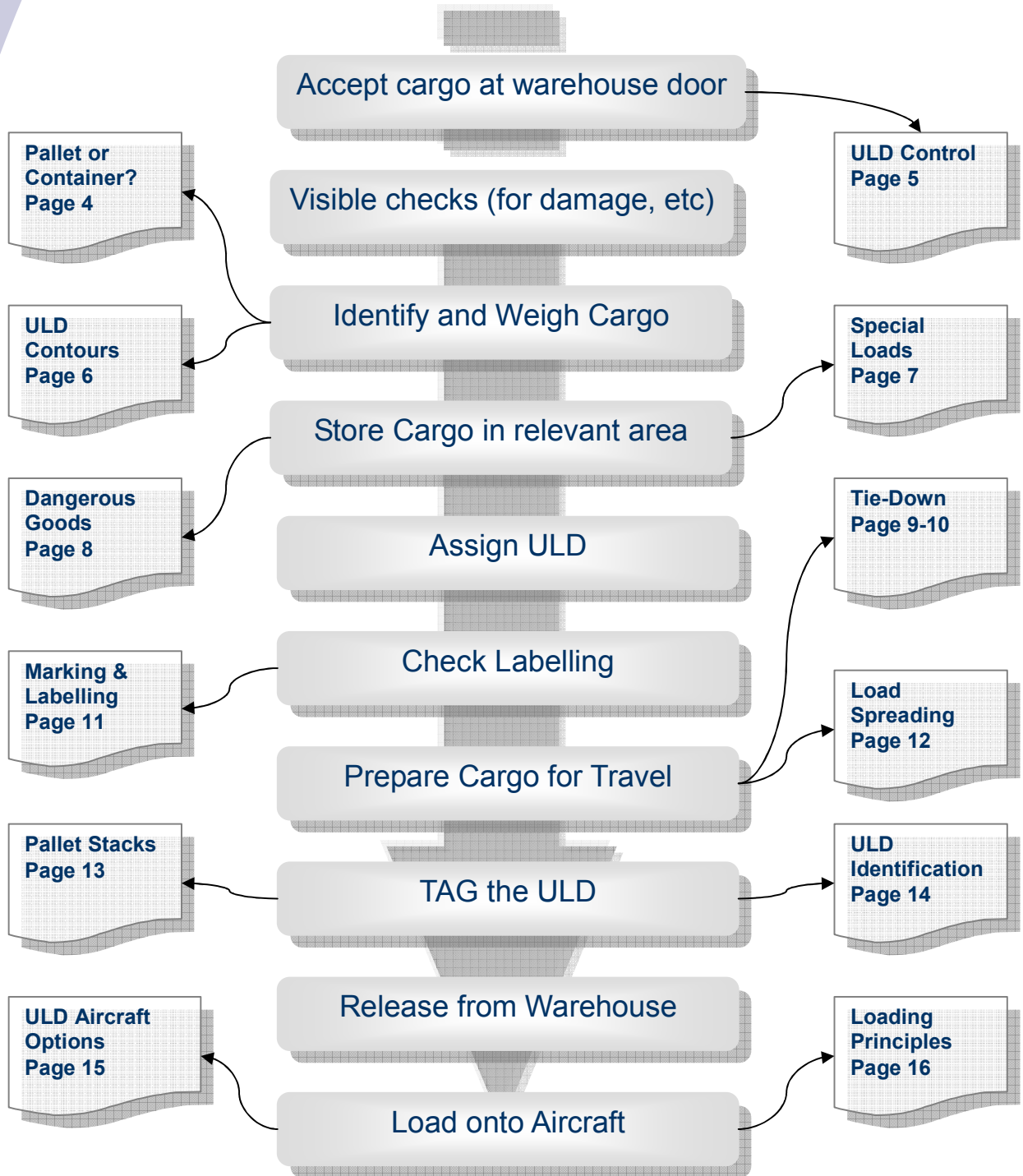


The Basic Principles of Safe Unit Load Device (ULD) Build-Up

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Build-Up Process



Introduction

This document includes:

- **ULD Loading Options**
- **Loading Principles**
- **Procedures for Tie-Down of Cargo**
- **Dangerous Goods processes**
- **ULD Identification**

Everyday hundreds of aircraft are in transit carrying thousands of passengers and tons of freight all over the world. As customers we put our trust in the airlines and expect they will deliver our freight and mail to the required destination without delay and, most importantly, in good condition. In order to achieve this there is a process that needs to occur and securing the safe transit of all cargo is hinged around a rigorous build-up process that needs to be adhered to.

This document provides important information on the build up of the Unit Load Device (ULD), their characteristics and the dangers caused by incorrect procedures, or oversights in the process of build-up.

The basics of what, why, where and when questions are addressed, from the arrival of a shipment at the door, to it's final point of leaving the shed fully built up and ready to fly securely and safely.



Industry Notes

Where appropriate the document also provides practical advice or industry based experience; to allocate them more easily they are highlighted with this icon.

Unit Load Device (ULD)

ULDs are used for the storage of cargo on the aircraft and are divided into two types; *Pallets* and *Containers*.

Pallets are secured by a net, attached to the rim of the pallet. The final shape (contour) chosen in the build-up of a ULD needs to fit the allocated aircraft type (see page 15 for aircraft options).

Containers provide the shape (contour) so the contents are secured either by the container doors being closed and bolted, or the door net being secured to the rims of the container walls and floor.



Industry Notes

Advantages of using a container ...

- Faster loading and unloading of the aircraft and container
- Better protection against weather conditions
- Better protection against damage to the cargo or to the aircraft
- Less experienced personnel required for build up as contour is complete

Why use a pallet?

- Some cargo is difficult to fit into containers
- There are more options for build-up when using an open pallet
- Some 'Special Load' cargo can only be loaded on open pallets

ULD Control

ULDs are owned by individual airlines; therefore ground handling agents are required by their airline customers to keep a regular stock check of these. Whenever releasing or accepting ULDs from an agent or airline, a UCR (ULD Control Receipt) report is completed.

ULD Control Receipts are vital to determine the responsibility and liability in respect of each unit released or accepted into a warehouse.

What do **ULD numbers** signify? How can we find a certain ULD easily and quickly? This table may help for ease of identification.

Code		Code	
A	Certified aircraft container	J	Thermal Non-Certified aircraft container
D	Non-Certified container	U	Non- Structural Igloo
P	Certified aircraft pallet	H	Horse stall
R	Thermal Certified aircraft container	V	Automobile Transport rack



ULD Control Receipts are vital and yet easily overlooked. The HERMES system ensures these are automatically completed at the end of the process and a report is printed.

Technology helps ground handlers to comply with UCR reporting requirements. By entering the Agent /Airline ULD codes the HERMES system will list the ULDs currently on station plus empties or those on flights. The operator selects the collecting driver's consignment and a UCR is created. These receipts can be triggered to go directly to the owner concerned.

HERMES ULD Inventory, displaying an "on-line" ULD stock

ULD Contours

Contours are created for the build-up of open ULDs

With any container you already have a contour to work with, as long as the outer shape is not disfigured in any way.

With an open pallet however, you create the **shape** or **outline** so it's very important you know the following:

- The ULD routing - (Thru pallet)
- The Aircraft you are loading the completed ULD for flight
- The loading position on the aircraft

It is advisable to consult the Airline's own Operations Manuals and regulations to confirm any query

Standard ULDs will fit on most aircraft and in most positions, however some aircraft do have odd sizes for ULDs to fit in certain loading positions. The contour must be correct too if an open pallet is to be used.

As well as the points above the maximum loading capacity of the ULD and more importantly the aircraft should be clarified before build up begins.



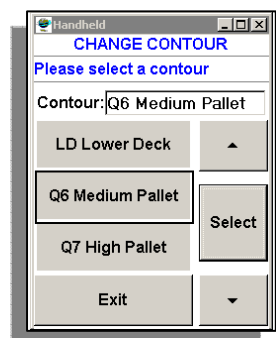
Industry Notes

You will hear the term '**TRIM**' raised regularly during the build up / completion of a flight. Quite simply, if the weight – contour – of a ULD is not correct that ULD will be offloaded regardless of the cargo loaded on it.



Once a ULD is completed, the data can be entered into the **HERMES** system to transmit information to Flight operations so they can then plan the ULD position in the aircraft.

Contours can also be defined using the **HERMES** handheld processes, to create an overhang or change from Lower to Main Deck.



HERMES Handheld "ULD Contour" selection screen

Special Handling

Any shipment carrying the requirement for 'Special Handling' is classified by the Consignee and the Handling Airline as a shipment which requires special precautions to protect:

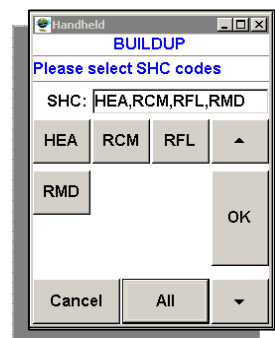
- The aircraft
- Handling personnel
- Other consignments loaded with the shipment
- The shipment itself

Or which, due to the urgency of the cargo, require priority handling. It is normally mandatory for a shipment that has a 'Special Handling' requirement to have a booking. Shipments that require special handling are identified by industry standard Special Handling Codes (SHCs) Airlines may create their own SHCs or Product Codes.

Where a 'Special Load' is present on a flight build-up plan, an airline representative will provide the requirements for that shipment to fly.

Life and Death shipments (LHO) carry the highest priority and must be treated accordingly. These shipments will usually fly with the crew in the cabin and a vehicle will collect the shipment directly from the aircraft.

HERMES Handheld "Special Handling Code" screen during ULD build-up



The HERMES system has the Special Handling three letter codes built into the system, including Dangerous Goods.

HERMES also has a compatibility warning system to alert warehouse staff when loading two incompatible shipments in the same ULD or hold.

HERMES will also give warnings when locating Special loads in potentially unsuitable locations your warehouse.

Dangerous Goods

Dangerous goods (DGR) are commodities possessing potentially hazardous characteristics. Transportation of these goods by air is not dangerous provided suitable precautions are taken. Within the definition of dangerous goods, items are not only the obvious substances such as acids, corrosives, and radioactive materials but also items as common as a standard battery for your radio, magnets, wheelchairs and aerosol sprays, breathing apparatus containing compressed gas, pesticides and bleach.

The ICAO Technical Instructions for the safe Transportation of Dangerous Goods by Air contains internationally agreed rules to ensure dangerous goods can be carried safely - these rules are reflected in the IATA Dangerous Goods Regulations. These provisions cover the procedures to be followed by all those involved in preparing a consignment of dangerous goods and placing it on an aircraft. Flight crew, handling staff and loading personnel need to understand these provisions so that they can monitor the system.

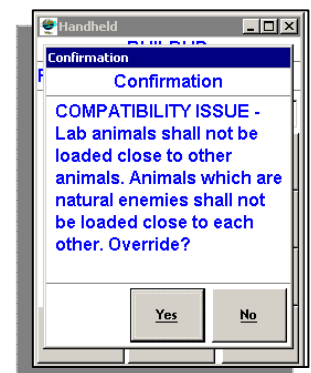
Dangerous Goods may be divided into four categories;

1. Acceptable for transport by air provided all the relevant regulations are complied with
2. Substances that are forbidden for transport by air transport under any circumstances
3. Substances forbidden for transport by air unless exempted by the states involved in the flight plan
4. Substances that are excepted from the provisions of the regulations



To help in this process, the HERMES system has a complete step by step DGR check built into the system. HERMES will highlight any potential risks and gives the user prompts of the relevant safety procedures. Compatibility loading charts are also contained within the system.

HERMES Compatibility checker warning



Tie-Down of Cargo

Securing of cargo loaded on a pallet

- The base of the pallet is covered with plastic sheeting and the load shaped to the correct contour for the position on the aircraft. For 'thru' pallets the most restrictive contour is used if a forwarding flight is advised
- The load is covered with another plastic sheet to ensure complete protection from the elements
- The net is checked for serviceability and placed evenly over the load ensuring all packages are covered
- Fittings are attached before attempting to tension the net, fittings should be spread out evenly
- The final tightening is done by means of the corner lashings and, depending on the ULD's contents, these should not be over tightened
- Net straps and ropes should be tensioned without damaging the cargo, or bending the pallet. When using rope, the use of 'Quick release loops' are far better for transit by air than using knots as loops work against the 'Forces in the Air'

Dangerous Goods shipments classified as 'Cargo Aircraft Only' should not be covered with more than one plastic sheet. If they cannot be seen clearly they may be regarded as inaccessible during flight.

When cargo is packed within a container it must be loaded so it does not fall out when the door is opened. Additionally, all cargo loaded in containers which have a flexible door should be loaded to avoid cargo pressing against the plastic door or deforming the contour of the container.

Rope, Tie - down Rings and various Securing straps also apply when calculating lashing. Whatever you are lashing down, either on / in a ULD or to the aircraft fuselage in the bulk load compartment, you will need to know the capacity of the equipment you are using.



Industry Notes

Always refer to specific **airline manuals** as capacities can change and differ and it is imperative these are correct

Tie-Down of Special Loads

Special Loads or 'unusual shipments' may require additional ties downs, lashing or strapping, the equipment used is dependent on:

- What is being transported?
- Weight of the piece/s being loaded
- Capacity of the equipment being used

A serviceable net should withstand 6804kgs of pressure in flight on the Main Deck, but certain cargo may need additional rope or straps to make it secure, for instance cars, aircraft engines and some machinery; cars could be damaged by using a net placed over the top, in some cases the pallet net is not big enough.

Lashing is determined against what is known as
The Forces in the Air – G-Force

The straps used have a capacity (Breaking strain) of 2250kgs at 3.0G.

So, if the weight of the cargo = 3000kgs ÷ capacity of strap = 2250kgs = 1.333 = 2 straps to secure against the upward movement.

Therefore at 1.5G – 3000kgs ÷ 4500kgs = 0.6666 = 1strap for forward / backward movement.

- Tie down straps may only be used in conjunction with double stud ring bolts
- Tie down attachment points must be spaced evenly to allow maximum effectiveness
- When securing to pallets, tie-down points should be a minimum of 25cm from the corner of the pallet
- All pallet and container restraints must be serviceable and engaged when cargo is individually restrained

Equipment should be supplied by all Airlines whenever a 'Special Load' is booked to fly. Tie-Down Straps range depending on the total weight of the piece/s.

Marking and Labelling

Movement of fragile goods would have a 'Shock watch' or 'Tip n Tell' label attached, these are liquid or beads in a tube that would break or leak if the shipment was incorrectly handled. This could result in a claim made against the handling company if it was originally accepted at the reception door in good condition.

Below are the various additional 'Handling Labels' commonly found on 'Special Loads'. These handling labels will predominantly be displayed on Dangerous Goods packages.



Industry Notes

The two labels depicting arrows above are known as **Package Orientation labels** and must be used when shipments contain liquid dangerous goods. Each package must show two labels affixed on opposite sides of the piece. The words '**THIS END UP**' or '**THIS SIDE UP**' may also be displayed on the top of the package, these labels may be red or black.

Load Spreading

The term 'Load spreading' quite simply means spreading the weight of the load over as much of the surface area available on or in the pallet or container. Not only is this more secure, it helps to ...

- Make the Aircraft loading easier – an evenly weighted ULD is far more manageable
- Evenly weight and balance the aircraft
- Ensure safety for all concerned, i.e. the majority of any load is not concentrated on one single pallet
- Avoid damage to the aircraft structure

Floor Bearing Capacity

To know if the piece we are loading is going to exceed the maximum value, the supporting surface of the piece has to be calculated.

Surface Calculation = Length x Width.

For example;

A piece of freight has four separate feet with the dims of 10cm x 10cm (0.1 x 0.1m)

The supporting surface of one foot will be $0.1 \times 0.1\text{m} (l \times w) = 0.01\text{m}^2$.

Four feet means $0.01 \times 4 = 0.04\text{m}^2$ this is the total supporting surface of that piece.

The maximum weight per sqm = 2,000Kg so to calculate the maximum weight a piece can weigh before spreader boards are required:

$0.04 \times 2000 = 80\text{kg}$.



Industry Notes

Know the capacity – this can always be obtained by referring to airline operational manuals

Pallet Stacks

Usually, stacks are built and must be supplied with the pallet nets. These are laid out on each base as another is loaded on top, or removed, placed into sacks and lashed down on the top pallet.

It is important to remember that the larger the stack the more lashing straps will be required to ensure safe transit.

If space is tight on a specific flight you are building for, additional cargo can be loaded on top of a pallet stack.

However, the maximum gross weight must always be monitored depending on the loading position on the aircraft.

HERMES export ULD screen showing the loaded contents of the pallet stack

The screenshot displays the 'ULD Details' interface. At the top, it shows 'ULD Details PWC 37432 LH STK - 1 - 1 LH 1000 17/02/2005'. Below this, there are two main sections: 'Details' and 'Additional Details'. The 'Details' section includes fields for 'Contour' (set to 'P Contour'), 'Dest' (set to 'FRA'), 'Height' (163), 'Weight' (1500.0), and 'Tare' (110.0). The 'Additional Details' section has a table with 'Type' and 'Value' columns, containing 'Main or Lower' and 'Loading Position'. There are also 'Messages' and 'Equipment' buttons. Below these sections, there are 'AwB' and 'ULD' tabs, and a table titled 'ULD's' with columns for 'ULD Type', 'ULD Number', and 'ULD Owner'. The table lists three entries: PMC 42587 LH, PMC 55874 LH, and PMC 87412 LH.

ULD Type	ULD Number	ULD Owner
PMC	42587	LH
PMC	55874	LH
PMC	87412	LH



Industry Notes

Pallet stacks should not exceed 24 pallets on passenger aircraft



The HERMES system has a process to automatically assist building pallet stacks using a handheld device.

ULD Identification

Once a ULD is completed at any transit shed, the ULD needs to be prepared for the flight. To make a ULD available and acceptable for loading at the aircraft side, every unit loaded onto an aircraft must have all the information the Ramp Agent should need to know, in the form of a ULD Tag.

These tags are very tough and can withstand adverse weather conditions. This information is then cross-referenced with the flight documentation at the aircraft, both must read the same. In general, all airlines should have their own ULD tags with their own logo and requirements stated, however some ground handling facilities use their own Tags so must be acceptable to their airline customers.

The following information is required to enable the Ramp loading staff to successfully load the aircraft correctly ...

- Correct tag for the consignments loaded on/in the ULD
- ULD / number
- Destination
- Gross weight
- Correct Airline
- Tag completed in full
- Signature stating the ULD is correctly built and the weight correctly established
- Staff should make sure the ULD is not overweight for the aircraft position and the ULD itself is within the maximum gross weight for that ULD
- Tags are usually positioned on the long sides of the pallets by means of wire fasteners or in pocket on container door



Industry Notes

Tags are always located on the side of ULDs so the Ramp Agent can start cross checking information on the tag with the documentation before it is unloaded from the truck. If any discrepancies are found in the information supplied, then that ULD will run the risk of being offloaded and returned to the handling company for rectification.



The HERMES system has ULD 'maximum weight' warnings built into the system.

The Print Tag can be automatically generated containing all the loading information gathered from the initial build up process.

ULD Loading Options

There are many different types of aircraft that carry cargo, they are either known as:

- Non-ULD (Narrow-Body)
- ULD carrying Aircraft (Wide-Body)
- Freighters –Cargo only (no passengers)

Narrow-Body aircraft

In most Narrow-Body aircraft only loose cargo can be loaded, sometimes referred to as Bulk Loads. However, some of these aircraft can take ULDs in the form of Pallets and /or Containers.

Narrow-bodied aircraft allow loose cargo and passenger baggage, therefore Cargo Allocations are created once the passenger figures are known, this process applies to all passenger aircraft. All loose cargo loads are stowed below in the Lower Deck.

The loading positions on Narrow Body aircraft are known as “Holds” and are divided into compartments which on narrow-bodied aircraft are divided into Net Sectors. Holds are stowage spaces accessible only through external doors. Between the Forward Hold and the Aft Hold is a solid partition, giving no access from one hold to another.

Wide Bodied aircraft

Wide Bodied aircraft have a similar layout in the Lower Deck to that of narrow-bodied aircraft with both Forward and Aft holds. These Holds are divided into Compartments to accommodate the ULDs. Every wide-bodied aircraft has a loose load Compartment called Compartment 5 or Bulk load.

Freighters

Freighters carry cargo only, no passengers. Cargo is stored in both Main Deck and Lower Deck giving a vast amount of cargo space. Normal passenger aircraft only have lower deck cargo loading options as the Main deck is the passenger compartment. With Freighters you have a far greater option to load; - larger cargo, larger quantities and fewer dangerous goods restrictions.

Loading Principles

Each aircraft has its own maximum weights for positions, compartments and holds. When accepting cargo through the landside door, the actual acceptance weight needs to be documented, not the weight taken from the AWB (Airway Bill).

The gross weight of each ULD can be determined by either;

Establishing the Actual Cargo Weight/Establishing the ULD Gross Weight

Loading Norms /Criteria

- ULDs are loaded on ball mat, not on the floor
- All shipments loaded on or in a ULD must be destined for the same offloading station
- Where possible all pieces belonging to one shipment (AWB) should be loaded on or into the same ULD
- Large or heavy pieces on pallets (small pieces are best loaded in containers)
- Heavy or sturdy pieces are loaded as a first or bottom layer
- Light pieces are then loaded on top to lessen the chance of damage
- The 'bricklayer' method of loading helps to stabilise the cargo
- The tie down rail on the pallet rim needs to be kept free of loads at all times to enable the attachment of tie down equipment
- Wooden pallets, supporting platforms or planks are used when loading pieces with a metal base. This helps to prevent the piece/s slipping whilst in transit. Additional lashing may be required by certain airlines.

HERMES Flight Load Plan screen

ULD Loading	AID	AOI	Weight Limit	Actual	Level	Container
1	AMS	KUL	SIN	1588.0		LD 3
2	PSA (3)	KUL	KUL	34020.0	3000.0	0.0 D6
4	PAC (2)	DWB	DWB	8252.0		D6
50	PAC (10)	KUL	KUL	48208.0	5500.0	0.0 D6
50	AME (6)	KUL	KUL	9528.0		LD 3
50	PAC (6)	KUL	KUL	27756.0		LOPC
50	BULK	KUL	KUL	2000.0		

AWB / Group	AID	AOI	Expected Wgt	Actual Wgt
232-2910004	KUL	KUL	5400.0	0.0
232-2910005	KUL	KUL	1500.0	1500.0
232-2910006	DWB	DWB	3000.0	0.0
232-2910007	DWB	DWB	500.0	0.0
232-2910008	KUL	KUL	3600.0	0.0
232-2910009	DWB	DWB	1500.0	1500.0
2007311000005			500.0	
2007311000006			500.0	
2007311000007			500.0	
232-2910010	KUL	KUL	675.0	0.0
232-2910011	KUL	KUL	560.0	0.0
232-2910012	KUL	KUL	5400.0	5400.0
232-2910014	KUL	SIN	4400.0	0.0
232-2910015	KUL	KUL	1500.0	0.0

Additional Details: AWB 232-2910009

SHC:	Pieces (EAW)	Volume (EAW)	Wgt (E)
	40 / 40 / 0	1500.0 / 0.0 / 0.0	0.0



Industry Notes

All pallets should be covered with polythene unless live animals are loaded. Heavy crates should be loaded at the bottom of the pallet and small parcels interlocked.



Contact Hermes

The HERMES system has been created by industry experts that have first hand experience of all ground handling processes allowing us to identify with your business and the challenges you face. At HERMES Logistics Technologies we are able to offer a comprehensive and practical solution to increasing your operational throughput without increasing your costs.

Speak to someone who understands YOUR business ...

Contact HERMES to request a consultation with one of our cargo experts to discuss your specific requirements.

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