



Workshop on Dangerous goods

05 - Packaging, marking and labelling



European Union Aviation Safety Agency

EU-ASEAN Sustainable Connectivity Package Aviation Partnership Project
(EU-ASEAN SCOPE APP)

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the European Union Aviation Safety Agency (EASA)

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European Union Aviation Safety Agency

05 - Packaging, marking and labelling

1. **Markings & labels**
2. **General requirements for packaging**
3. **Packing instructions**
4. **Specification of packaging**



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05 - Packaging, marking and labelling

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05 - Packaging, marking and labelling

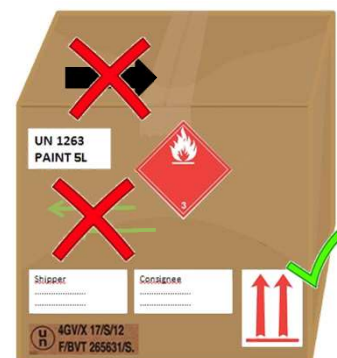
01 – Markings & labels

Unless otherwise provided in the Technical Instructions, packages of dangerous goods and overpacks containing dangerous goods offered for transport by air must be marked.
 Related provisions are detailed in TIs Part 5 §2.

All required package marks must be:

- durable and printed or otherwise marked on, or affixed to, the external surface of the package;
- readily visible and legible;
- able to withstand open weather exposure without a substantial reduction in effectiveness;
- displayed on a background of contrasting colour;
- and not be located with other package marks that could substantially reduce their effectiveness.

Arrows for purposes other than indicating proper package orientation must not be displayed on a package containing liquid dangerous goods.



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05 - Packaging, marking and labelling

01 – Markings & labels

Unless otherwise provided in the Technical Instructions, must be displayed on each package:

- the proper shipping name of the dangerous goods;
- and, when assigned, the corresponding UN number preceded by the letters “UN” or “ID”, as appropriate;
- the name and address of the person who offers the dangerous goods for transport by air;
- the name and address of the consignee.

(Some additional marking requirements are detailed in the regulation for explosives, radioactive materials, refrigerated liquefied gas, dry ice, biological substances Category B, environmentally hazardous substances, chemical oxygen generators, lithium batteries.)



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05 - Packaging, marking and labelling

01 – Markings & labels



>> See presentation 02 – Limitations

Marks required by other international or national transport regulations are permitted in addition to marks required by these Instructions...



... provided that they cannot be confused or conflict with any marks prescribed by the Technical Instructions, because of their colour, design or shape



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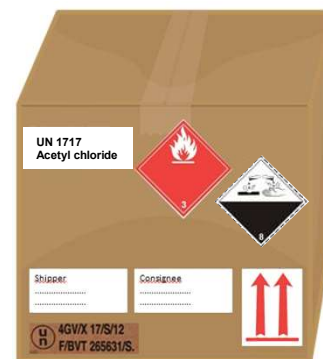
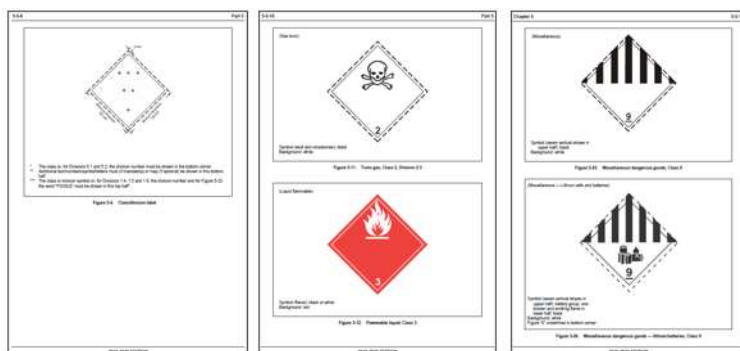
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05 - Packaging, marking and labelling

01 – Markings & labels

Where articles or substances are specifically listed in the Dangerous Goods List, one hazard class label must be affixed for each identified hazard (see TIs Part 5 §3)

Labels must satisfy the provisions of chapter 3.5 in terms of colour, symbols and general format. Illustrations of the approved class hazard labels, are also given at the end of the chapter 3.



05 - Packaging, marking and labelling

01 – Markings & labels

Handling labels also have approved design, colour and minimum dimensions (see TIs Part 5 §3).



* Place for UN number(s)

** Place for telephone number for additional information

05 - Packaging, marking and labelling

01 – Markings & labels

The “Cargo Aircraft Only” must be affixed:

- when the package containing the dangerous goods may only be transported on a cargo aircraft;
- when the packing instruction for cargo is used;
- when both passengers and cargo packing instructions are the same but the shipped quantity is above the one allowed on passenger aircraft.

However, where the packing instruction number and the permitted quantity per package are identical for passenger and cargo aircraft, the “Cargo aircraft only” label should not be used;

Passenger and cargo aircraft		Cargo aircraft only	
Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
10	11	12	13
FORBIDDEN		361	30 L
355	60 L	366	220 L
219	75 kg	219	150 kg
956	200 kg	956	200 kg

→ If IAW PI 366

→ If > 75 kg



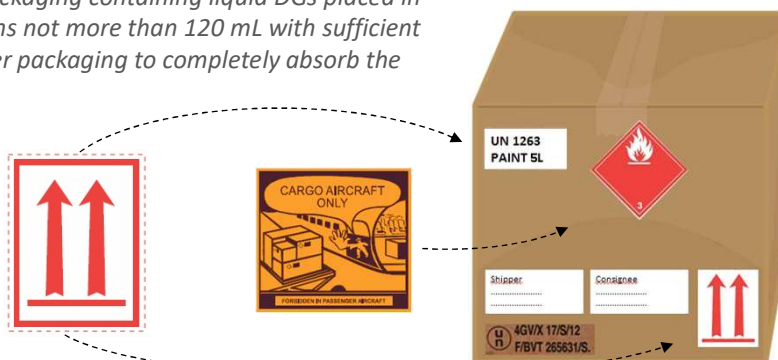
05 - Packaging, marking and labelling

01 – Markings & labels

The “Cargo aircraft only” must be affixed on the same surface of the package near the hazard labels

When required, either the “Package orientation” or pre-printed package labels must be affixed to or printed on at least two opposite vertical sides of the package with the arrows pointing in the correct direction.

(orientation labels are not required on outer packaging containing liquid DGs placed in inner packaging if each inner packaging contains not more than 120 mL with sufficient absorbent material between the inner and outer packaging to completely absorb the liquid contents).



05 - Packaging, marking and labelling

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05 - Packaging, marking and labelling

02 – General requirements for packaging

Empty packaging

Packaging that has previously contained dangerous goods must be identified, marked, labelled and placarded as required for those dangerous goods

UNLESS

steps such as cleaning, purging of vapours or refilling with a non-dangerous substance are taken to nullify any hazard.

>> **If the hazard is not fully nullified, empty packages are to be considered as filled ones.**

Excepted and limited quantities

Single packaging are not permitted (there must be an inner packaging).



Lithium batteries >> See presentation 06 - The transport of lithium batteries

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05 - Packaging, marking and labelling

02 – General requirements for packaging

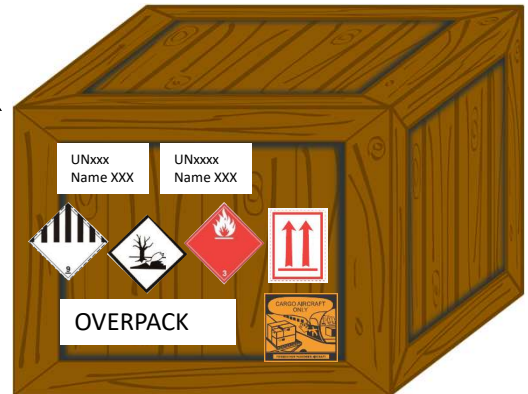
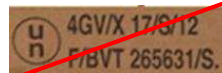
Overpacks

Definition: enclosure used by a single shipper to contain one or more packages and to form one handling unit for convenience of handling and stowage (\neq ULD).

An overpack must be labelled for each item of dangerous goods contained in the overpack
UNLESS
labels representative of all dangerous goods in the overpack are visible.

- “overpack” mention (letters’ height $\geq 12\text{mm}$);
- for each DG:
 - UN number;
 - proper shipping name;
 - required marks and labels.

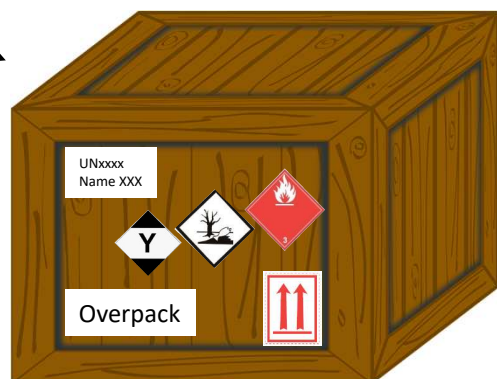
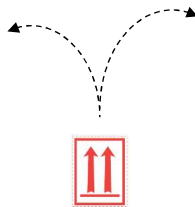
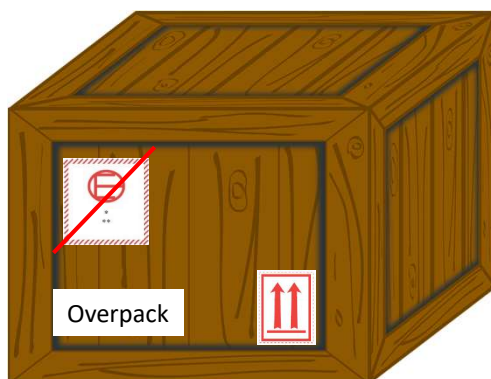
Shipper	Consignee
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05 - Packaging, marking and labelling

02 – General requirements for packaging

Overpacks



05 - Packaging, marking and labelling

02 – General requirements for packaging

Segregation

TIs part 7 §7.2

>> presentation 09

These tables also applies to packaging in the same overpack.

Hazard label	Class or division										
	1	2.1	2.2, 2.3	3	4.1	4.2	4.3	5.1	5.2	8	9 see 2.2.1.2
1	Note 1	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2
2.1	Note 2	—	—	—	—	—	—	—	—	—	X
2.2, 2.3	Note 2	—	—	—	—	—	—	—	—	—	—
3	Note 2	—	—	—	—	—	—	X	—	—	X
4.1	Note 2	—	—	—	—	—	—	—	—	—	X
4.2	Note 2	—	—	—	—	—	—	—	—	—	—
4.3	Note 2	—	—	—	—	—	—	—	—	—	—
5.1	Note 2	—	—	—	—	—	—	—	—	—	—
5.2	Note 2	—	—	—	—	—	—	—	—	—	—
8	Note 2	—	—	—	—	—	—	—	—	—	—
9 see 2.2.1.2	Note 2	X	—	—	—	—	—	—	—	—	—

Division and compatibility group	1.3C	1.3G	1.4B	1.4C	1.4D	1.4E	1.4G	1.4S
1.3C			X					
1.3G			X					
1.4B	X	X		X	X	X	X	
1.4C			X					
1.4D			X					
1.4E			X					
1.4G			X					
1.4S								

An "X" at the intersection of a row and column indicates that explosives of these divisions and compatibility groups must be loaded into separate unit load devices and, when stowed aboard the aircraft, the unit load devices must be separated by other cargo with a minimum separation distance of 2 m. When not loaded in a unit load device, these explosives must be loaded into different, non-adjacent loading positions and separated by other cargo with a minimum separation distance of 2 m.

05 - Packaging, marking and labelling

02 – General requirements for packaging

Unit Load Devices

Definition: Any type of freight container, aircraft container, aircraft pallet with a net or aircraft pallet with a net over an igloo (≠ overpack).

Each unit load device containing dangerous goods which require a class hazard label must display an identification tag on its exterior indicating that dangerous goods are contained within the unit load device, UNLESS those hazard class labels are themselves visible



- Border of prominent red hatchings on both sides and be visible at all times;
- Primary and subsidiary hazard class(es) or division(s) numbers of every DG;
- "CAO" mention when relevant.

05 - Packaging, marking and labelling

02 – General requirements for packaging

Identification tag

Primary and subsidiary hazard class(es) or division(s) are mandatory

➤ IMP codes are optional...

... especially when they are wrong:

RPB = Div. 6.1

CL.8 = RCM

RFL .. CL 3 .. RPB .. CL 8 .. RLI .. CL 9



05 - Packaging, marking and labelling

02 – General requirements for packaging

Different dangerous goods packed in one outer packaging

The inner packaging used for each item and the quantity of DG it contains correspond to the part of the packing instruction (requirements) applicable to that item.

Inner packaging must be placed, secured or cushioned with cushioning material.

Outer packaging used are permitted IAW all packing instructions applicable to each item.

The package ready for shipment meets the specifications and tests of the most restrictive packing group for the substances or articles in the package.

Different DGs should not be packed in the same outer packaging if they react dangerously with each other, causing:

- combustion and/or the release of intense heat;
- the release of flammable, toxic or asphyxiating gases; or
- the formation of corrosive substances; or
- the formation of unstable substances.

Be careful with the segregation

05 - Packaging, marking and labelling

02 – General requirements for packaging

Different dangerous goods packed in one outer packaging – the Q value

When \neq dangerous goods are all contained in 1 outer packaging,
 >> the total net quantity in the package does not exceed the value of 1:

(UN 1845 (dry ice) and the “no limits” do not need to be taken into account)

$$Q = \frac{n_1}{M_1} + \frac{n_2}{M_2} + \frac{n_3}{M_3} + \dots \leq 1$$

Real net quantities

Arrows point from the variables in the formula to their corresponding values in the table below:

- n_1 (yellow arrow) points to 353
- M_1 (yellow arrow) points to 5 L
- n_2 (green arrow) points to 355
- M_2 (green arrow) points to 60 L
- n_3 (purple arrow) points to Y840
- M_3 (purple arrow) points to 0.5 L

353	5 L
355	60 L
Y840	0.5 L

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05 - Packaging, marking and labelling

03 – Packing instructions

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4	5	6	7	8	9	10	11	12	13
Gasoline	1203	3		Liquid flammable		A100	II	E2	353 Y341	5 L 1 L	364	60 L

>> TIs Part 4

Packing Instructions 403 – 406
Passenger aircraft

General requirements
Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**
— Substances must be compatible with their packaging as required by 6.1.1.3.
— Metal packagings must be corrosion resistant to the product (liquid immersion for substances with a Class 8 subsidiary hazard).

2) **Closure requirements**
— Closures must meet the requirements of 6.1.1.4.

Packing instruction	Packing group	Inner packaging (see 6.3.2)	Inner packaging (see 6.3.2)	Inner packaging (see 6.3.2)	Inner packaging (see 6.3.2)
403	I	Glass	1.5 kg	10 kg	No
		Plastics	1.5 kg	10 kg	No
		Metal	1.5 kg	10 kg	No
404	I	Glass	2.5 kg	10 kg	No
		Plastics	2.5 kg	10 kg	No
		Metal	2.5 kg	10 kg	No
405	II	Glass	2.5 kg	20 kg	No
		Plastics	2.5 kg	20 kg	No
		Metal	2.5 kg	20 kg	No
406	III	Glass	10 kg	20 kg	No
		Plastics	10 kg	20 kg	No
		Metal	10 kg	20 kg	No

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS
Packing Group II

— Packagings must meet the Packing Group II performance requirements.
— If a substance is packed in a combination packaging, it must be placed in a subsidiary inner or equally effective means of containment and must not be damaged.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6.3.1)

Boxes	Drums	Jerricans
Aluminium (4B)	Aluminium (1B1, 1B2)	Aluminium (3B1, 3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H1, 3H2)
Natural wood (4C1, 4C2)	Other metal (1N1, 1N2)	Steel (3A1, 3A2)
Other metal (4N)	Plastics (1H1, 1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A1, 1A2)	
Reconstituted wood (4F)		
Steel (4A)		

If applicable :

- general requirements ;
- authorised quantities;
- packing requirements (types, conditions...)
 - inner packaging;
 - combined outer packaging;
 - single packaging;
 - overpack;
- etc.

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05 - Packaging, marking and labelling

03 – Packing instructions

Example

Gasoline
PI 353

Packing Instructions 350 – 355
Passenger aircraft

General requirements
Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**
— Substances must be compatible with their packaging.
— Metal packagings must be corrosion resistant to the subsidiary hazard.

2) **Closure requirements**
— Closures must meet the requirements of 4.1.1.4.

Packing instruction	Packing group	Inner packaging (see 6.3.2)	In
350	I	Glass	
		Plastics	
		Metal	
351	I	Glass	
		Plastics	
		Metal	
352	II	Glass	
		Plastics	
		Metal	
353	II	Glass	
		Plastics	
		Metal	
354	III	Glass	
		Plastics	
		Metal	
355	III	Glass	
		Plastics	
		Metal	

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

Packing Group I
— Inner packagings must be packed with sufficient absorbent material to absorb the entire contents of the inner packagings and placed in a rigid leakproof receptacle before packing in outer packagings.

Packing Group III
— Packagings must meet the Packing Group II performance requirements if the substance has a Class 8 subsidiary hazard.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6.3.1)

Boxes	Drums	Jerricans
Aluminium (4B)	Aluminium (1B1, 1B2)	Aluminium (3B1, 3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H1, 3H2)
Natural wood (4C1, 4C2)	Other metal (1N1, 1N2)	Steel (3A1, 3A2)
Other metal (4N)	Plastics (1H1, 1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A1, 1A2)	
Reconstituted wood (4F)		
Steel (4A)		

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III
— Packagings must meet the Packing Group II performance requirements if the substance has a Class 8 subsidiary hazard.

SINGLE PACKAGINGS FOR PACKING GROUP III (PI 354 OR PI 355)

Composites	Cylinders	Drums	Jerricans
All (see 6.3.1.18)	See 4.2.7	Aluminium (1B1, 1B2)	Aluminium (3B1, 3B2)
		Other metal (1N1, 1N2)	Plastics (3H1, 3H2)
		Plastics (1H1, 1H2)	Steel (3A1, 3A2)
		Steel (1A1, 1A2)	

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04 – Specification of packaging

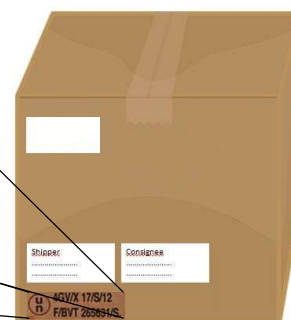
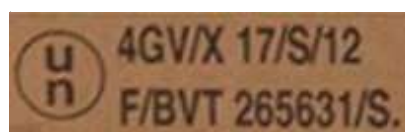
TIs part 6 §2

Each outer or single packaging used for dangerous goods, for which specification packaging is required in Part 4, must bear the marks appropriate to the contents as specified.

Marks must be stamped, printed or otherwise marked on the package to provide adequate permanency.

These marks indicate that it corresponds to successfully passed tests and that it conforms.

They are a means of identifying the type and indicating the test requirements it meets.



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05 - Packaging, marking and labelling

04 – Specification of packaging

Packaging performance tests

TIs part 6 §4

They are designed to prevent leakage of the contents under normal conditions of transport.
The severity of the tests to which a packaging is subjected depends on its intended contents.
Each design type of packaging must have passed the prescribed tests before being used.
The tests must be repeated on production samples at regular intervals.

Drop test

Waterproofing test

Internal pressure test (hydraulic)

Stacking test

>> Test report



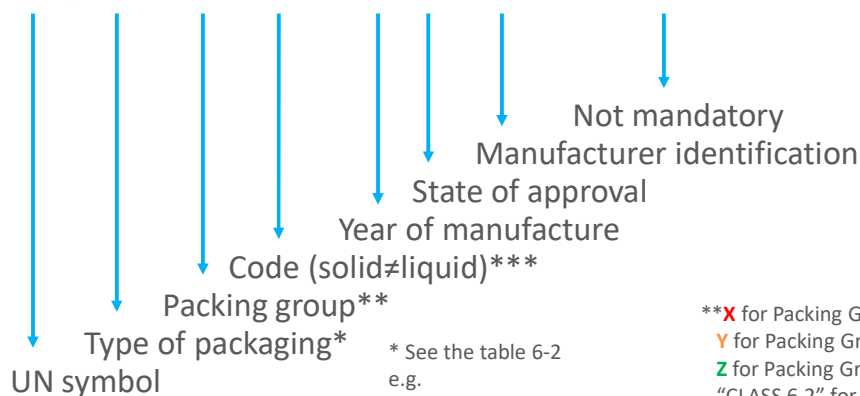
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05 - Packaging, marking and labelling

04 – Specification of packaging



4GV/X 17/S/12 F/BVT 265631/S



* See the table 6-2

e.g.

4G = Fibreboard boxes

5M1 = Paper bag, multiwall

5M2 = Paper bag, multiwall, water-resistant

**X for Packing Groups I, II and III

Y for Packing Groups II, III

Z for Packing Group III

"CLASS 6.2" for Div. 6.2

*** For liquids:

> hyd. test pressure

> volume





e.g. « 1.4/150 »

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05 - Packaging, marking and labelling

04 – Specification of packaging

Examples

	4G/Y145/S/02 NL/VL823	Fibreboard box
	1A2/Y150/S/01 NL/VL825	Steel drum
	1A1/Y1.4/150/98 NL/VL824	Steel drum (to contain liquids)
	4G/CLASS 6.2/01 S/SP-9989-ERIKSSON	Fibreboard box (for infectious substances)



05 - Packaging, marking and labelling



Thank you for your attention

