

Interactive Guide to Shipping Lithium Batteries

About this document:

This document provides awareness of the International Civil Aviation Organization's (ICAO) 2021-2022 Edition of the Technical Instructions (Doc 9284) requirements for lithium batteries.

This document does not replace any regulation and is not considered training.

The carrier can be more restrictive than the regulation.

Always check the full regulations and carrier requirements before shipping.

Updated: September 2022

Produced by AOC and ASH.2022-ASH-017

ASK US
ABOUT
BATTERY
SAFETY
#SafeCargo

faa.gov/go/safecargo



Battery Types

STEP 1 – What Type Of Battery/Cell Are You Shipping?



Lithium Ion/Polymer
Batteries or Cells
(rechargeable)



Lithium Metal
Batteries or Cells
(non-rechargeable)

STEP 2 – How Are You Shipping Them? Lithium Ion:

Batteries / Cells
Packed With
Equipment
(separately in the
same package)

Batteries / Cells
Only



Batteries / Cells
Contained in Equipment



STEP 2 – How Are You Shipping Them? Lithium Metal:

Batteries /Cells
Packed With
Equipment
(separately in the
same package)

Batteries / Cells
Only



Batteries / Cells
Contained in Equipment





STEP 3 – What Is The Capacity (Watt Hour* (Wh) Rating) Of Your Lithium Ion Battery/Cell?

30% Rule

All Lithium Ion batteries must be shipped at a state of charge (SoC) not exceeding 30% of their rated design capacity



**For information on how to calculate the Wh rating, click on the information button in the top right corner of the page.*

Cells and Batteries < 2.7Wh

Cells > 2.7Wh and \leq 20Wh

Batteries > 2.7Wh and \leq 100Wh

Cells > 20Wh Batteries > 100Wh



STEP 3 –How Much Lithium Does Your Lithium Metal Battery/Cell Contain?

Cells and
Batteries
< 0.3 g

Cells
> 0.3 g /
< 1 g

Batteries >
0.3 g /
< 2 g

Cells
> 1 g /
Batteries
> 2 g





STEP 3 – What Is The Capacity (Watt Hour* Rating) Of Your Lithium Ion Battery/Cell?

Cells \leq 20 Wh or
Batteries \leq 100 Wh

Cells $>$ 20 Wh or
Batteries $>$ 100 Wh





STEP 3 – What Is The Capacity (Watt Hour* Rating) Of Your Lithium Ion Battery/Cell?

Cells \leq 20 Wh or
Batteries \leq 100 Wh

Cells $>$ 20 Wh or
Batteries $>$ 100 Wh





STEP 3 – How Much Lithium Does Your Lithium Metal Battery/Cell Contain?

Cells \leq 1 g or
Batteries \leq 2 g

Cells $>$ 1 g or
Batteries $>$ 2 g





STEP 3 – How Much Lithium Does Your Lithium Metal Battery/Cell Contain?

Cells \leq 1 g or
Batteries \leq 2 g

Cells $>$ 1 g or
Batteries $>$ 2 g





STEP 4 – Lithium Metal: How Many Cells Does Your Package Contain In Total?

\leq 8 Cells

$>$ 8 Cells





STEP 4 – Lithium Ion: How Many Cells Does Your Package Contain In Total?

\leq 8 Cells

$>$ 8 Cells





STEP 4 – How Many Lithium Ion Batteries Does Your Package Contain In Total?

≤ 2 Batteries

> 2 Batteries





STEP 4 – How Many Lithium Metal Batteries Does Your Package Contain In Total?

≤ 2 Batteries

> 2 Batteries





STEP 4 – How Many Lithium Metal Batteries Does Your Package Contain In Total?

≤ 4 Cells
or
 ≤ 2 Batteries

> 4 Cells
or
 > 2 Batteries





STEP 4 – How Many Lithium Ion Batteries Does Your Package Contain In Total?

≤ 4 Cells
or
 ≤ 2 Batteries

> 4 Cells
or
 > 2 Batteries





Step 5 – Lithium Ion: How Many Packages Are In The Consignment?

≤ 2 Packages

> 2 Packages





STEP 5 – Lithium Metal: How Many Packages Are In The Consignment?

≤ 2 Packages

> 2 Packages





Packing Instruction (PI) 965, Section 1A

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3480, Lithium ion batteries	>20 Wh	NA	>100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) <u>Forbidden</u> 35kg (CAO)	YES	Class 9 + CAO Label	Y (PGII)	SOC ≤30%

[Click Here to See additional 2019 requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.](#)



See completed Package

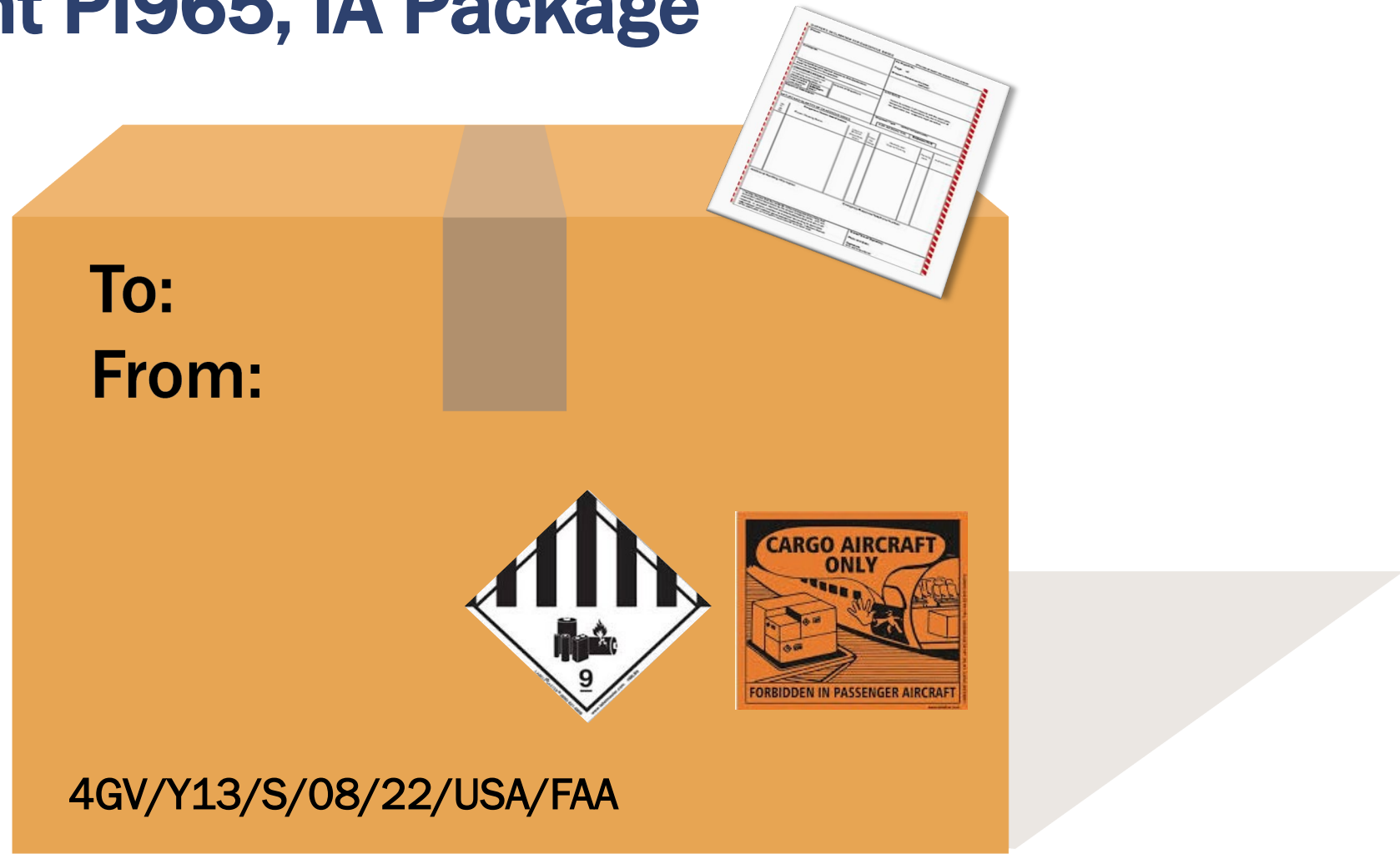


Federal Aviation
Administration





Compliant PI965, IA Package





Packing Instruction (PI) 965, Section 1B

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3480, Lithium ion batteries	>2.7 Wh and ≤20 Wh	NA	>2.7 Wh and ≤100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) <u>Forbidden</u> 10kg (CAO)	Y	Class 9 + CAO Label + Lithium Battery Mark	1.2 m drop test	PI # needs "IB" on Dec. SOC ≤30%

[Click Here to See additional 2019 requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.](#)



See completed Package



Federal Aviation Administration



Compliant PI965, IB Package

***IB on Declaration**





PI 965, Section II *≤1 package per consignment

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3480, Lithium ion batteries	NA	NA	>2.7 Wh and <u>≤</u> 100 Wh	<u>Forbidden</u> (PAX) <u>≤</u> 2 Batteries (CAO)

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium ion batteries, in compliance with Section II of PI965 – CAO on AWB (if used).	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	SOC <u>≤</u> 30% <u>≤</u> One Package Per Overpack

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





PI 965, Section II *≤1 package per consignment

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3480, Lithium ion batteries	>2.7 Wh and <u>≤</u> 20 Wh	<u>Forbidden</u> (PAX) <u>≤</u> 8 cells (CAO)	NA	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium ion batteries in compliance with Section II of PI965- CAO” on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	SOC <u>≤</u> 30% <u>≤</u> One Package Per Overpack

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





PI 965, Section II *≤1 package per consignment

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3480, Lithium ion batteries	<u>≤</u> 2.7 Wh	NA	<u>≤</u> 2.7 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
Forbidden (PAX) 2.5kg (CAO)	Lithium ion batteries in compliance with Section II of PI965- CAO” on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	SOC <u>≤</u> 30% <u>≤</u> One Package Per Overpack

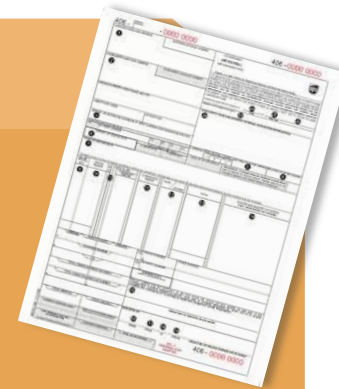
NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.



Compliant PI965, Section II Package

"Lithium ion batteries, in compliance with Section II of PI965-CA0" on AWB.

To:
From:



NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.



*Section II cells and batteries must not be packed in the same outer packaging with other dangerous goods. *Click here to [See additional overpack restrictions.](#)



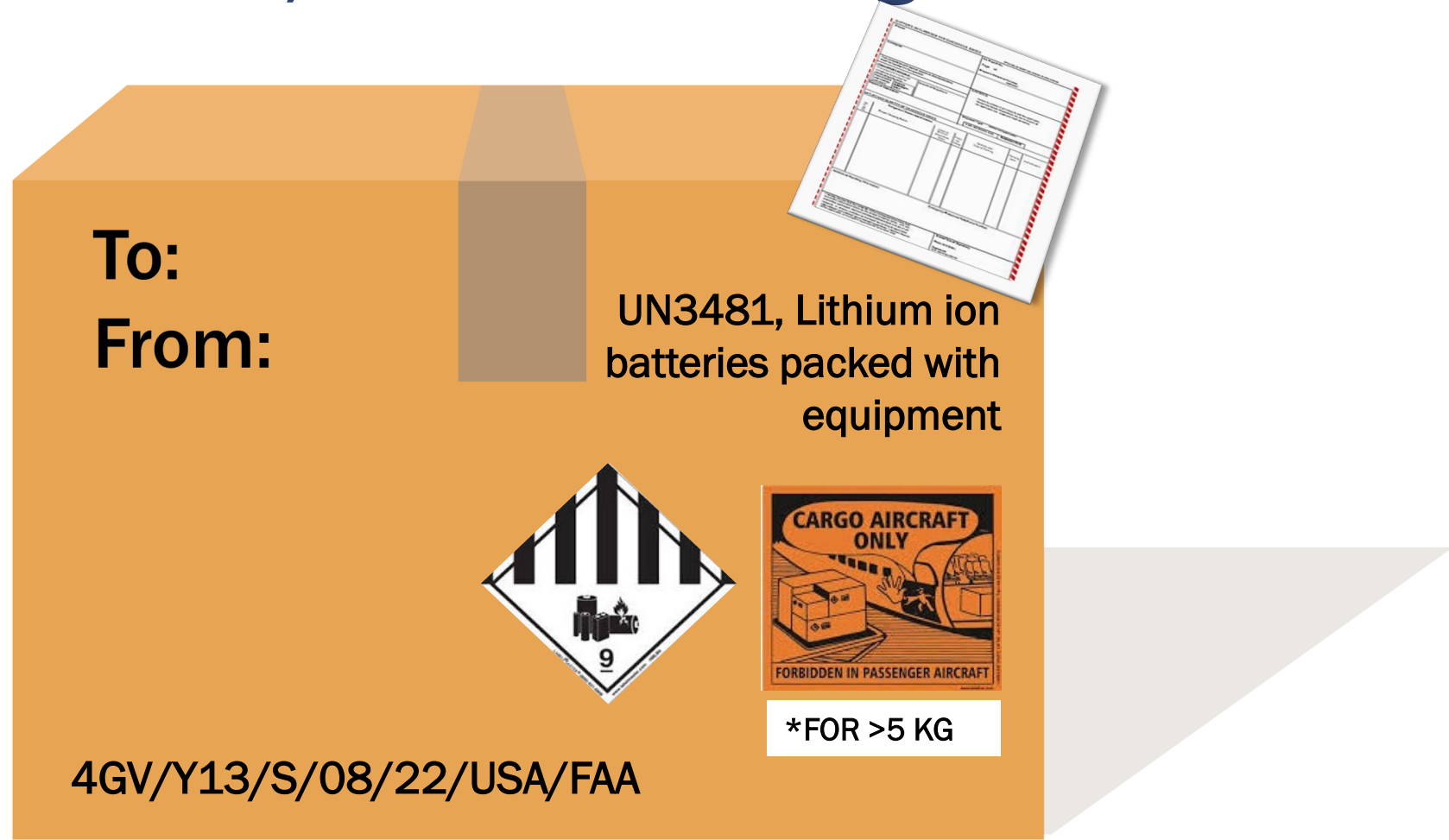
Packing Instruction (PI) 966, Section I

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries packed with equipment	>20 Wh	Minimum to power equip + 2 spare sets	>100 Wh	Minimum to power equip + 2 spare sets

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	Y	Class 9 + CAO *(if >5kg)	Y (PGII)	



Compliant PI966, Section I Package





Packing Instruction (PI) 966, Section II

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries packed with equipment	≤20 Wh	Minimum to power equip + 2 spare sets	≤100 Wh	Minimum to power equip + 2 spare sets

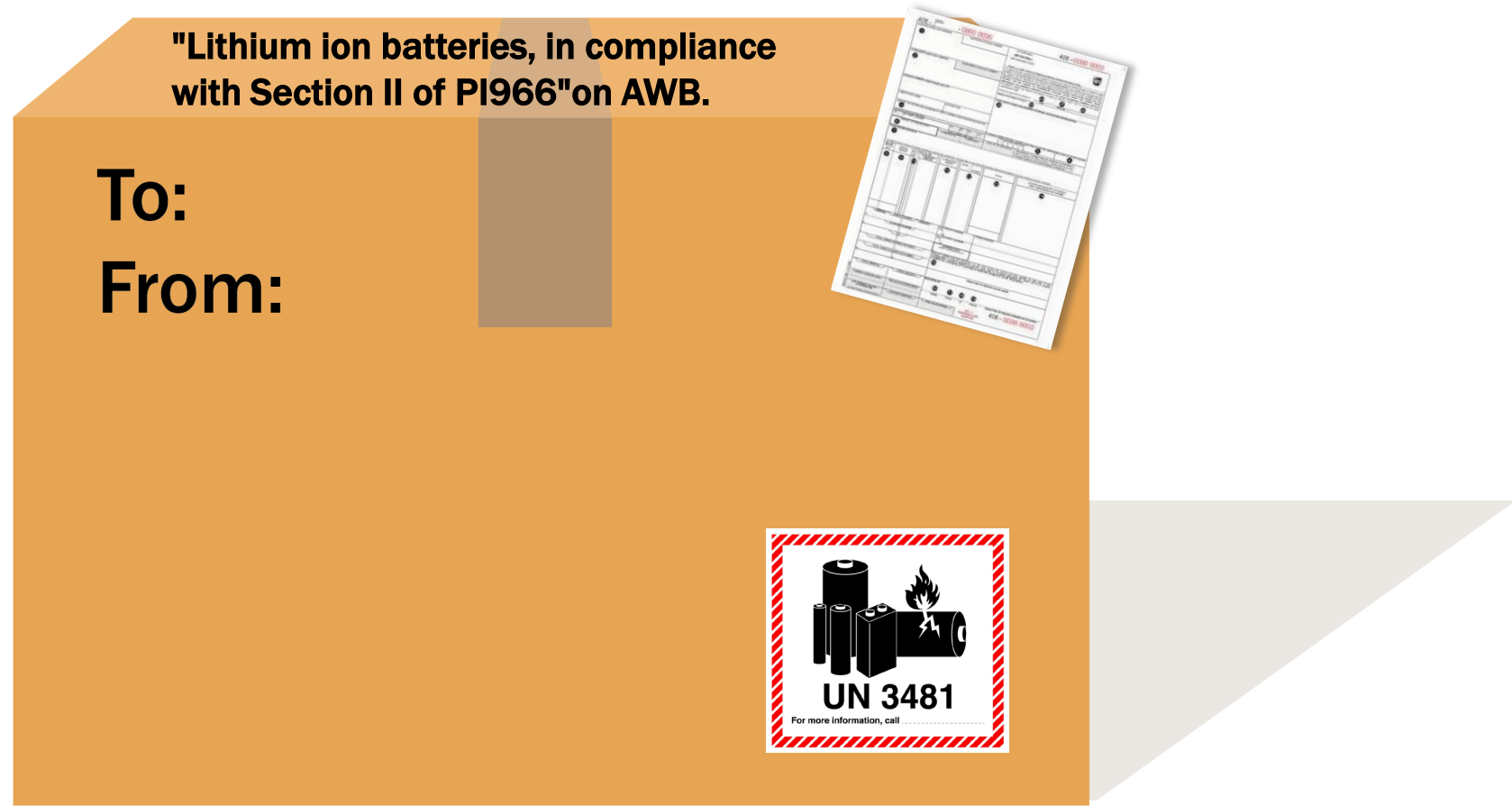
Allowable Net Mass Per Package	Shippers Dec?	Labels/Markings	UN Spec Required?	Additional?
5 kg (PAX) & (CAO)	Lithium ion batteries in compliance with Section II of PI966 on AWB.	Lithium Battery Mark	1.2 m drop test	N/A

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Compliant PI966, Section II Package



NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





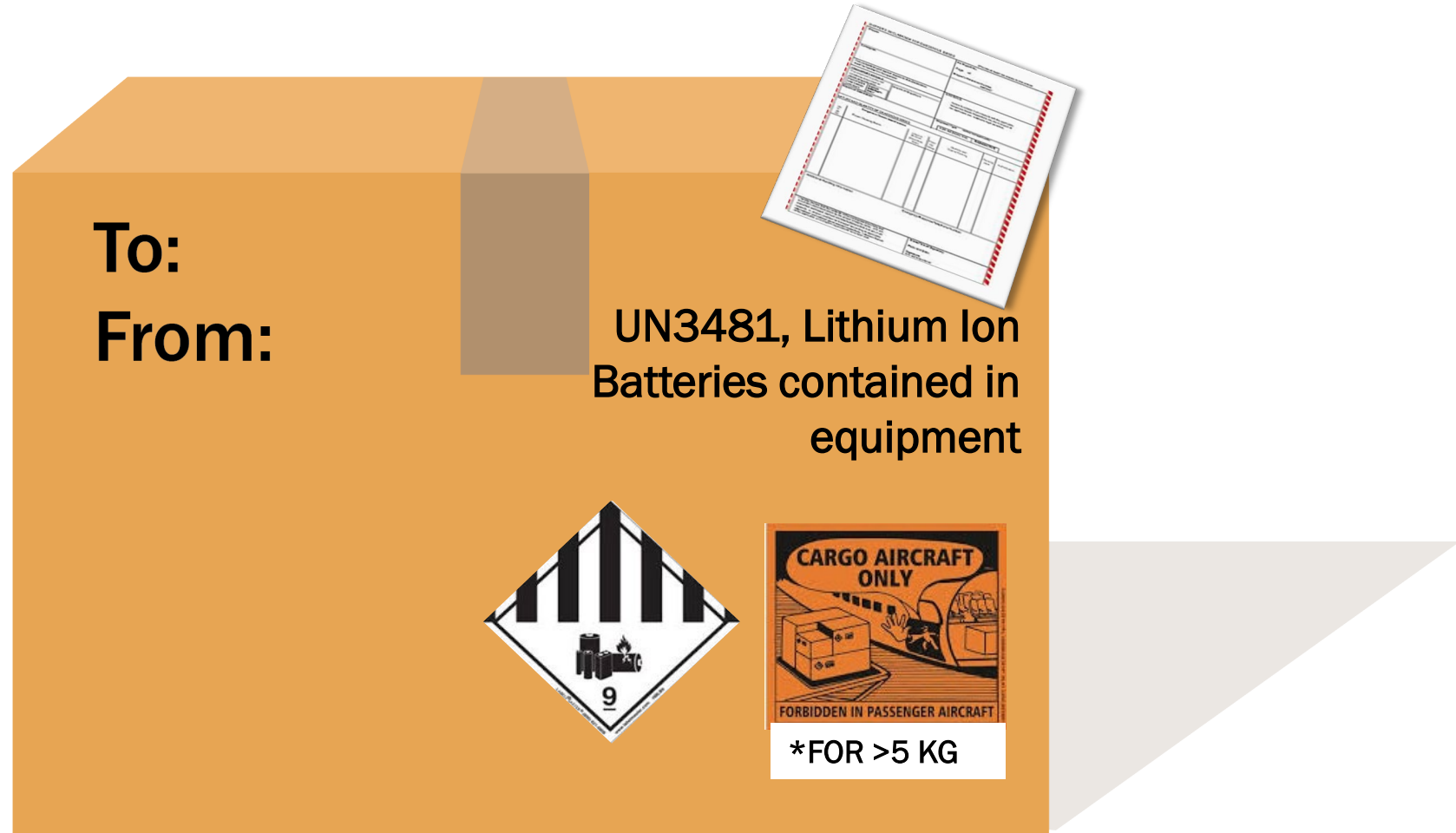
Packing Instruction (PI) 967, Section I

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries contained in equipment	>20 Wh	NA	>100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	Y	Class 9 + CAO Label *(if>5kg)	Suitable material of adequate strength and design.	Packed to prevent accidental activation.



Compliant PI967, Section I Package





Packing Instruction (PI) 967, Section II

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries contained in equipment	≤20 Wh	NA	≤100 Wh	NA

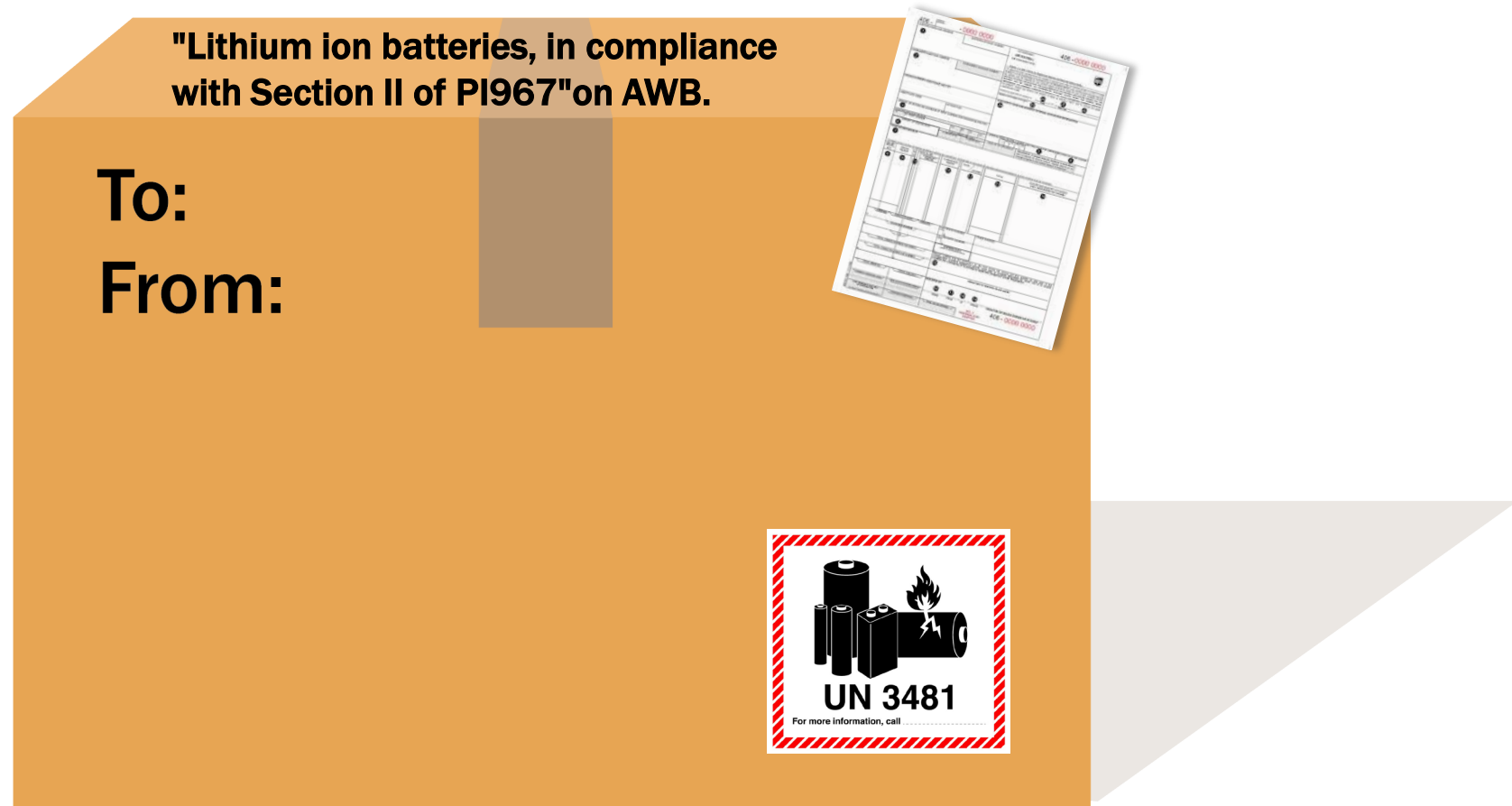
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5 kg (PAX) & (CAO)	Lithium ion batteries in compliance with Section II of PI967 on AWB.	Lithium Battery Mark	Suitable material of adequate strength and design.	See PI 967 for RFID tags. Packed to prevent accidental activation.

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Compliant PI967, Section II Package



NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Packing Instruction (PI) 968, Section IA

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3090, Lithium metal batteries	>1g lithium content	NA	>2g lithium content	NA

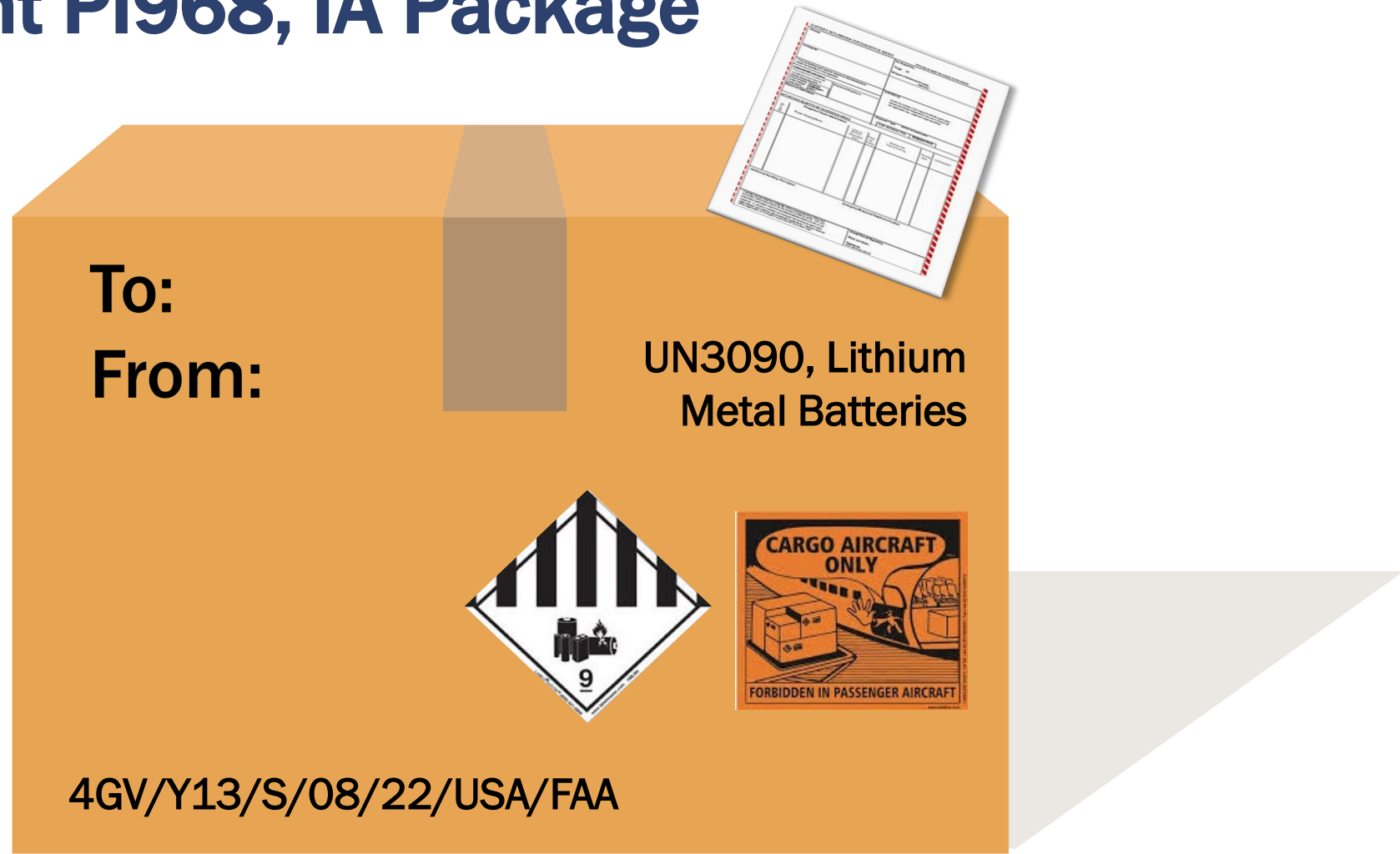
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) Forbidden 35kg (CAO)	Y	Class 9 + CAO Label	Y (PGII)	

[Click Here to See additional 2019 requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.2019 Packing Restrictions](#)





Compliant PI968, IA Package





Packing Instruction (PI) 968, Section IB

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3090, Lithium metal batteries	>0.3g and ≤1g lithium content	NA	>0.3g and ≤2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) Forbidden 2.5kg (CAO)	Y	Lithium Battery Mark + Class 9 + CAO Label	1.2 m drop test	"IB" required on DGD

[Click Here to See additional 2019 requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.](#)



Compliant PI968, IB Package

***IB on Declaration**





Packing Instruction (PI) 968, Section II

***≤1 Package Per Consignment**

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3090, Lithium Metal Batteries	NA	NA	>0.3g and ≤2g lithium content	<u>Forbidden (PAX)</u> ≤2 batteries (CAO)
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium metal batteries, in compliance with Section II of PI968-CAO on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	No consolidations allowed. <u>≤</u> One Package Per Overpack

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Packing Instruction (PI) 968, Section II

* <1 Package Per Consignment

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3090, Lithium Metal Batteries	>0.3g and ≤1g lithium content	<u>Forbidden</u> (PAX) ≤8 cells (CAO)	NA	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium metal batteries, in compliance with Section II of PI968-CAO on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	No consolidations allowed. ≤One Package Per Overpack

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Packing Instruction (PI) 968, Section II

* <1 Package Per Consignment

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3090, Lithium Metal Batteries	≤0.3g lithium content	NA	≤0.3g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) <u>Forbidden</u> 2.5kg (CAO)	Lithium metal batteries, in compliance with Section II of PI968- CAO on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	No consolidations allowed. ≤One Package Per Overpack

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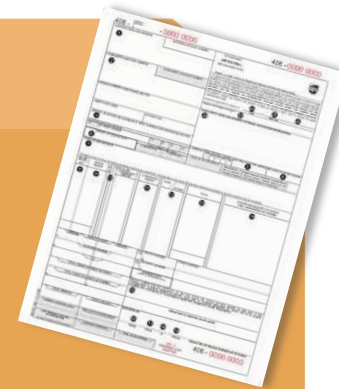




Compliant PI968, Section II Package

"Lithium metal batteries, in compliance with Section II of PI968-CA0" on AWB.

To:
From:



***Section II cells and batteries must not be packed in the same outer packaging with other dangerous goods. *Click here to [See additional overpack restrictions.](#)**

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.



Packing Instruction (PI) 969, Section I

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Packed With Equipment	>1g lithium content	Minimum to power equip + 2 spare sets	>2g lithium content	Minimum to power equip + 2 spare sets
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	Y	Class 9 + CAO Label *(if>5kg)	Y (PGII) Packed to prevent accidental activation.	PAX - packed in intermediate /outer rigid metal packaging surrounded by non-conductive /combustible cushioning then inside an outer packaging.



Compliant PI969, Section I Package

To:
From:

UN3091, Lithium Metal Batteries Packed With Equipment

4GV/Y13/S/08/22/USA/FAA

CARGO AIRCRAFT ONLY
FORBIDDEN IN PASSENGER AIRCRAFT
*FOR >5 KG

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(Note: A shipping label form is shown overlapping the top right corner of the box.)



Packing Instruction (PI) 969, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Packed With Equipment	>0.3g and ≤1g lithium content	Minimum to power equip + 2 spare sets	>0.3g and ≤2g lithium content	Minimum to power equip + 2 spare sets

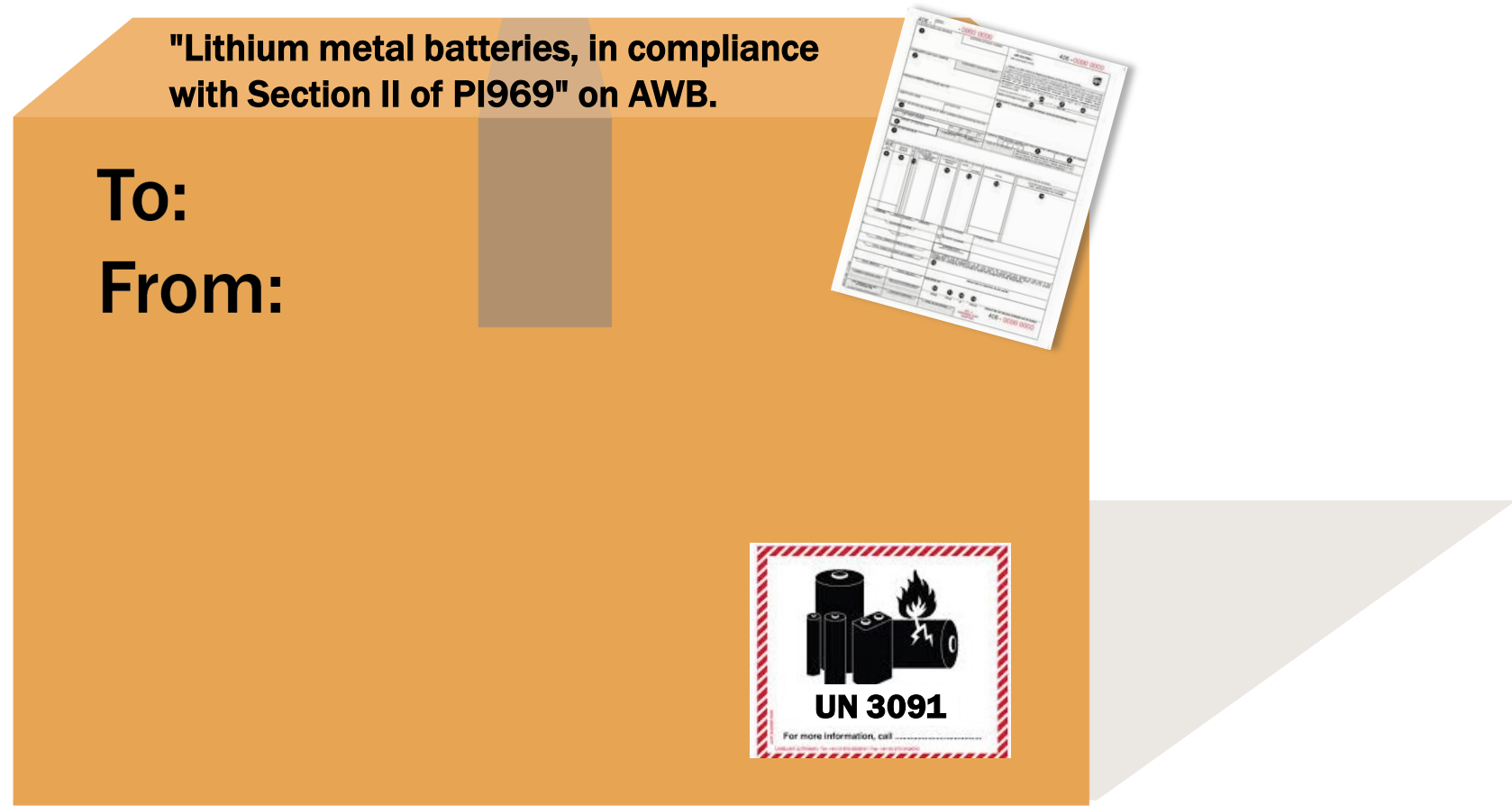
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	Lithium metal batteries, in compliance with Section II of PI969 on AWB.	Lithium Battery Mark	Packed to prevent accidental activation & 1.2 m drop test.	NA

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Compliant PI969, Section II Package



NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.



Packing Instruction (PI) 970, Section I

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Contained In Equipment	>1g lithium content	NA	>2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	Y	Class 9 + CAO Label *(if >5kg)	Suitable material of adequate strength And design.	Packed to prevent accidental activation.



Compliant PI970, Section I Package





Packing Instruction (PI) 970, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Contained In Equipment	>0.3g and ≤1g lithium content	NA	>0.3g and ≤2g lithium content	NA

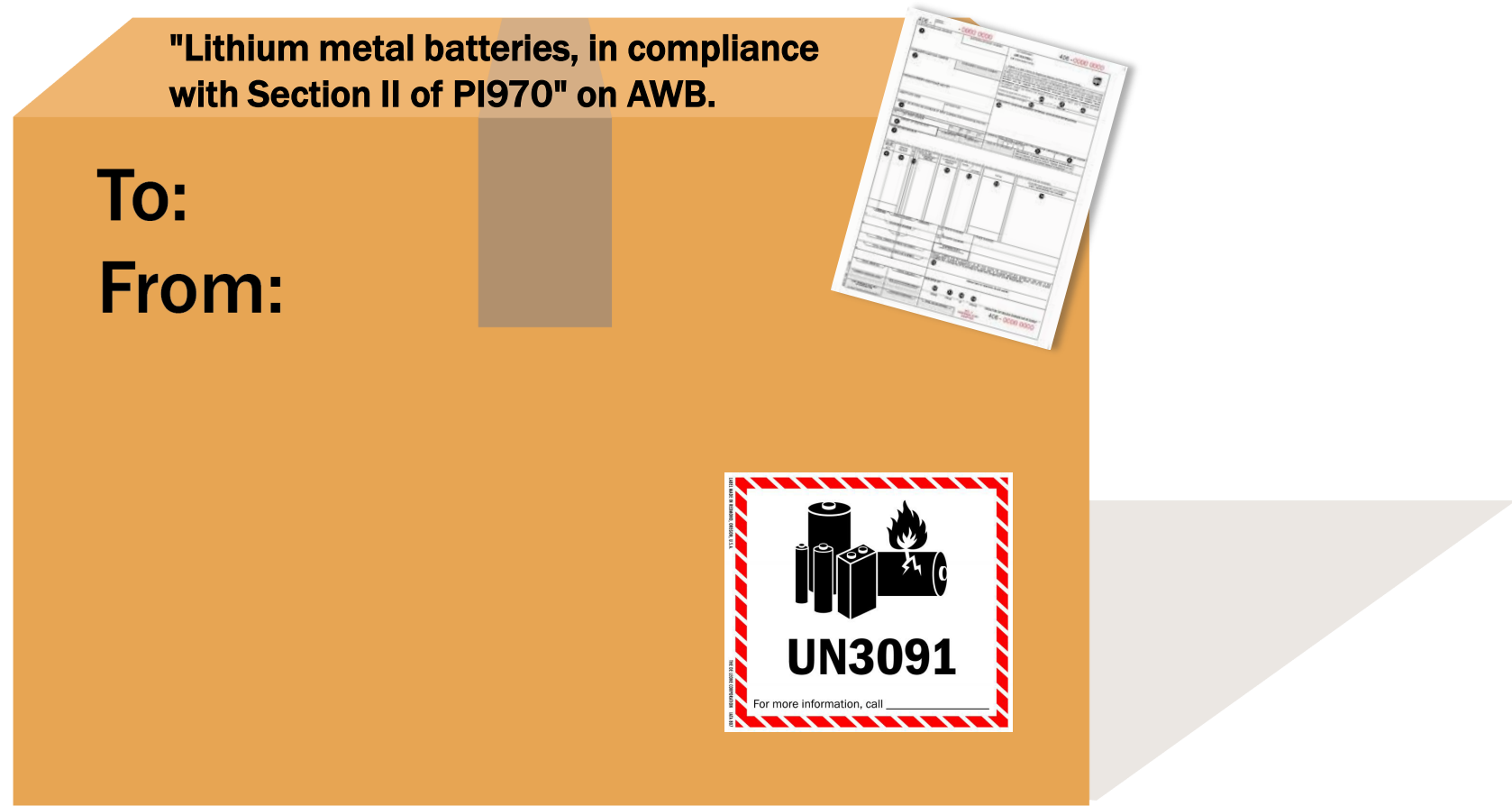
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	Lithium metal batteries, in compliance with Section II of PI970 on AWB.	Lithium Battery Marking	Suitable material of adequate strength and design.	See PI 970 for RFID tags. Packed to prevent accidental activation.

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Compliant PI970, Section II Package



NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.



How to Determine the Watt-hour (Wh) Rating

If the Watt-hour rating isn't clearly marked on your battery case, and the information isn't included on a battery specification or Safety Data Sheet, you can simply determine the battery's Wh-rating by multiplying the battery's voltage (V) and capacity in ampere-hours (Ah).

$$\underline{\text{Ah} \times \text{V} = \text{Wh}}$$

Some battery cases list mAh.

To convert mAh to Ah, divide by 1000

E.G., $1020 \text{ (mAh)} / 1000 = 1.020 \text{ Ah}$

$1.020 \text{ Ah} \times 7.2 \text{ V} = \sim 7.4 \text{ Wh}$





2019 Packing Restrictions

PI965 & PI968 Section IA & IB (Outer Packages)

UN 3090, lithium metal batteries prepared in accordance with Section IA or Section IB of PI 968 and UN 3480, lithium ion batteries prepared in accordance with Section IA or Section IB of PI 965 must not be packed in the same outer packaging with dangerous goods classified in Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

PI965 & PI968 Section IA, IB, and II (Overpacks)

Packages containing cells or batteries must not be placed in an overpack with packages containing dangerous goods classified in Class 1 other than Division 1.4S, Division 2.1, Class 3, Division 4.1 or Division 5.1.



Packing Instruction (PI) 967, Section II

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries contained in equipment	≤20 Wh	NA	≤100 Wh	NA

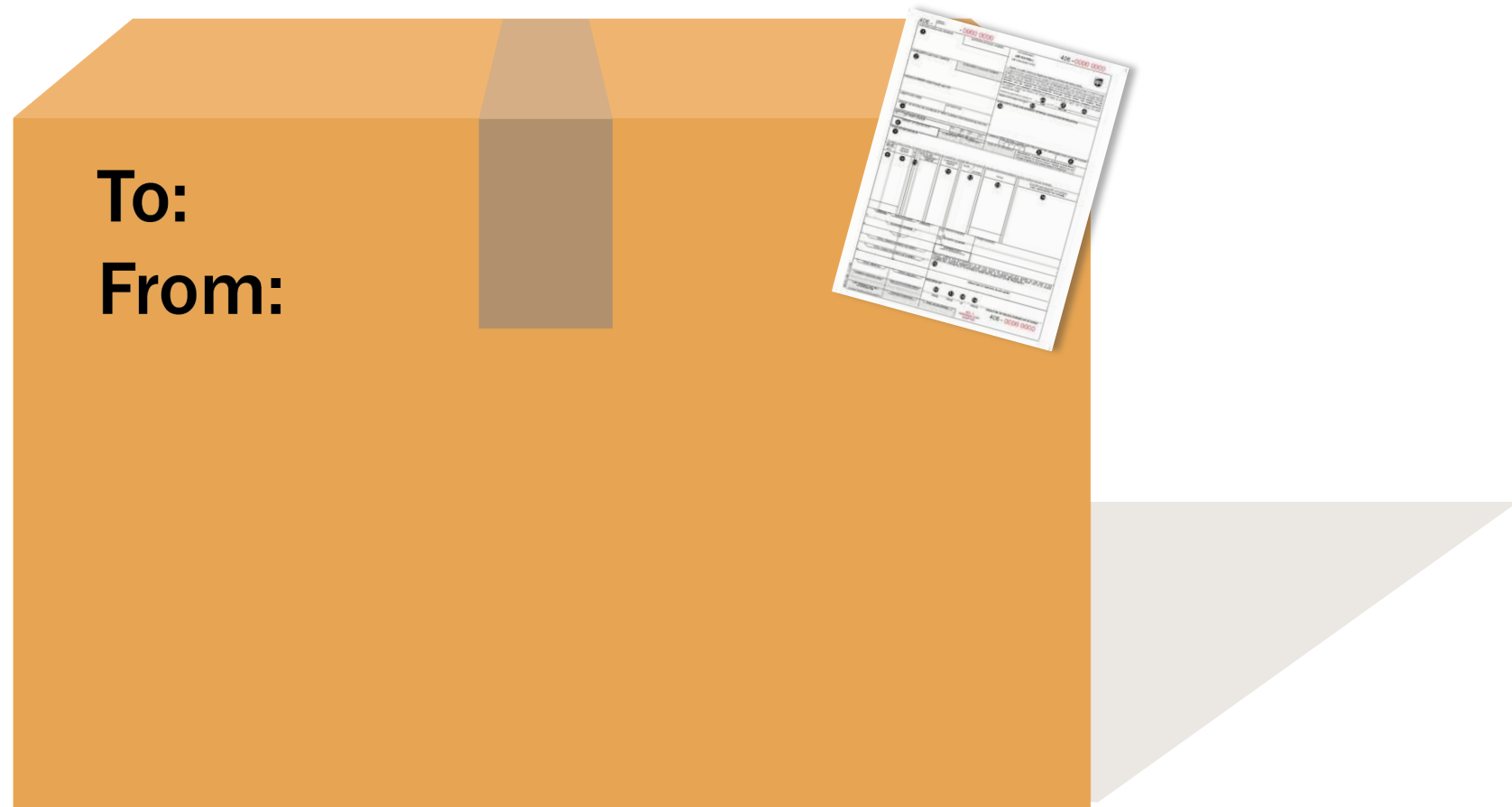
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5 kg (PAX) & (CAO)	NA	NA	Suitable material of adequate strength and design.	See PI 967 for RFID tags. Packed to prevent accidental activation.

NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.





Compliant PI967, Section II Package



NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.



Packing Instruction (PI) 970, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Contained In Equipment	>0.3g and ≤1g lithium content	NA	>0.3g and ≤2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	NA	NA	Suitable material of adequate strength and design.	See PI 970 for RFID tags. Packed to prevent accidental activation.

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Compliant PI970, Section II Package



NOTE: On the first of the year (2023) ICAO will not permit 965 section II lithium ion batteries. DHL, FedEx and UPS are not accepting these now.