International Civil Aviation Organization

WORKING PAPER

DGP/26-WP/48
29/9/17
Revised
04/10/17
English only

DANGEROUS GOODS PANEL (DGP)

TWENTY-SIXTH MEETING

Montréal, 16 to 27 October 2017

Agenda Item 6: Resolution, where possible, of the non-recurrent work items identified by the Air Navigation Commission or the panel:
6.3: Mitigating risks posed by the carriage of lithium batteries by air *(Job card DGP.003.01)*

NEW DANGEROUS GOODS LIST ENTRY FOR "LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT" (UN 3536)

(Presented by D. Brennan)

REVISED

SUMMARY

As discussed at DGP-WG/17 in relation to the subject of amendments to the Technical Instructions to align with the UN Model Regulations, this document proposes to add the new UN entry UN 3536, "**Lithium batteries installed in cargo transport unit**" to Table 3-1 in Part 3 of the Technical Instructions with a special provision to allow transport of these units on cargo aircraft subject to the approval of the State of Origin and State of the Operator. Guidance for issuing such approvals is also proposed for inclusion in the Supplement to the Technical Instructions.

Action by the DGP: The DGP is invited to agree to the amendments to the Technical Instructions and to the Supplement to the Technical Instructions as proposed in the appendices to this working paper.

1. INTRODUCTION

1.1 At the seventeenth working group meeting of the Dangerous Goods Panel (DGP-WG/17, Montréal, 24 to 28 April 2017), a dedicated working group was tasked with reviewing the draft amendments to Part 3 of the Technical Instructions to align with the UN Model Recommendations. In connection with this task, the working group considered the new entry UN 3536 — **Lithium batteries installed in cargo transport unit**. As recorded in the report of DGP-WG/17 (see document DGP/26-WP/3, paragraph 3.2.3.2.1a)), while it was not believed that there would be any need to transport these by air on a regular basis, there might be a need to transport them on an exceptional basis. It was therefore recommended that these units be forbidden for transport by air under normal circumstances but that a special provision be developed so as to allow their transport on a cargo aircraft under certain conditions with the approval of the

authorities of State of Origin and State of the Operator. Panel members volunteered to work with appropriate experts to develop a proposal along the lines recommended.

1.2 For panel members who are not familiar with how these large lithium batteries are constructed and the contents of these containerized energy storage systems, attached as Appendix C are several mechanical drawings of one of these systems manufactured by a PRBA member.

1.3 The working group was correct in its assessment that on an exceptional basis air transport of these large lithium battery systems may be necessary. For example, such systems may be necessary to provide power to devastated areas in the event of natural disasters. In addition, it is known that these systems are used for power grid levelling and energy storage on remote islands, and mining sites in remote locations, and therefore air transport may be the most viable option for transporting the systems.

1.4 As recommended by the working group, this working paper offers proposals for a new entry and associated special provisions to allow the transport of these power systems with the approval of the appropriate authority of the State of Origin and the State of the Operator. A new entry in Table 3-1 for UN 3536 is proposed indicating the dangerous goods covered by the entry are forbidden for transport on both passenger and cargo aircraft. A new special provision "A2XX" is proposed to be assigned to this entry, consisting of the first paragraph of UN Special Provision 389, which explains the applicability of the entry. In addition, as recommended by the working group, Special Provision A2 is also proposed to be assigned to allow transport of these systems on cargo aircraft with the approval of the appropriate authority of the State of Origin and the State of the Operator.

1.5 To provide guidance to appropriate authorities considering issuing such approvals, this working paper also proposes amendments to the Supplement to the Technical Instructions. Thus, a corresponding new entry for UN 3536 is proposed to be added to the Supplementary Dangerous Goods List (Table S-3-1). A new supplementary Special Provision A3XX is proposed to be indicated in the entry and added in Table S-3-4 (supplementary special provisions). Because these power units are quite large, it is proposed that no quantity limit be indicated, and that any such limit be considered, if appropriate, as part of the approval process.

1.6 The proposed supplementary Special Provision "A3XX" largely reflects the text of UN Special Provision 389 not already appearing in proposed Special Provision "A2XX". This text provides general requirements for the power units in order to ensure their safe transport and appropriate hazard communication. In addition to the UN text, a provision has been proposed to limit the state of charge of lithium ion or polymer batteries to not more than 30 per cent, unless otherwise approved. This has been placed in square brackets since the DGP may consider it unnecessary and could be considered as part of the approval process since in some cases (e.g. natural disasters) it might be impossible to charge the units upon arrival. A recommendation has also been suggested, and also in square brackets, that installed fire extinguishing systems "should" remain activated during transport. Again, whether this is appropriate in any given case can be considered by the appropriate authorities during the approval process taking account, for example, of the ability of the cargo transport unit to retain the fire suppressant medium.

2. ACTION BY THE DGP

2.1 The DGP is invited to agree to the amendments to the Technical Instructions as proposed in Appendix A to this working paper, and those to the Supplement to the Technical Instructions as proposed in Appendix B to this working paper.

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APPENDIX A

PROPOSED AMENDMENTS TO PART 3 OF THE TECHNICAL INSTRUCTIONS

Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

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Chapter 2

ARRANGEMENT OF THE DANGEROUS GOODS LIST (TABLE 3-1)

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Table 3-1. Dangerous Goods List

Name	*UN No.*	*Class or division*	*Subsidiary risk*	*Labels*	*State variations*	*Special provisions*	*UN packing group*	*Excepted quantity*	*Passenger aircraft*		*Cargo aircraft*	
									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*
Lithium batteries installed in cargo transport unit lithium ion batteries or lithium metal batteries	3536	9			AU 1 CA 7 IR 3 NL 1 US 3	A2 A2XX		E0	FORBIDDEN		FORBIDDEN	
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Chapter 3

SPECIAL PROVISIONS

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Table 3-2. Special provisions

TIs	*UN*
. . .	
A2XX	This entry only applies to lithium ion batteries (including lithium polymer batteries) or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. The lithium batteries must meet the requirements of 2;9.3.1 a) to e).
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APPENDIX B

PROPOSED AMENDMENTS TO PART S-3 OF THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS

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Part S-3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND QUANTITY LIMITATIONS

(ADDITIONAL INFORMATION FOR PART 3 OF THE TECHNICAL INSTRUCTIONS)

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Chapter 4

SUPPLEMENTARY DANGEROUS GOODS LIST

Classes 3 to 9

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									Passenger aircraft		Cargo aircraft	
Name	*UN No.*	*Class or division*	*Subsidiary risk*	*Labels*	*State variations*	*Special provisions*	*UN packing group*	*Excepted quantity*	*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*
Lithium batteries installed in cargo transport unit lithium ion batteries or lithium metal batteries	3536	9				A2 A3XX		E0	FORBIDDEN		See Special Provision A3XX	(No Limit)
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Chapter 6

SPECIAL PROVISIONS

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Table S-3-4. Special Provisions

Supplementary special provisions

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A3XX (389)	This entry only applies to lithium ion batteries (including lithium polymer batteries) or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. The lithium batteries must meet the requirements of Part 2;9.3.1 a) to e) of the Technical Instructions and contain the necessary systems to prevent overcharge and over discharge between the batteries. The batteries must be securely attached to the interior structure of the cargo transport unit (e.g. by means of placement in racks or cabinets) in such a manner as to prevent short circuits, accidental operation, and significant movement relative to the cargo transport unit under the shocks, loadings and vibrations normally incident to transport. Dangerous goods necessary for the safe and proper operation of the cargo transport unit (e.g. fire extinguishing systems and air conditioning systems) must be properly secured to or installed in the cargo transport unit and are not otherwise subject to the Technical Instructions. Dangerous goods not necessary for the safe and proper operation of the cargo transport unit must not be transported within the cargo transport unit. The batteries inside the cargo transport unit are not subject to the marking or labelling requirements of the Technical Instructions. The cargo transport unit must display the UN number in accordance with 5.3.2.1.2 of the UN Model Regulations and must be placarded on two opposing sides in accordance with 5.3.1.1.2 of the UN Model Regulations. The placard to be applied is that corresponding to the label shown in Figure 5-25 of the Technical Instructions. [For lithium ion or lithium polymer batteries installed in a cargo transport unit, the state of charge of the installed batteries as offered for transport must not exceed 30 per cent of their rated capacity, unless otherwise approved by the appropriate authorities of the State of Origin and the State of the Operator.] [When a fire extinguishing system is installed in the cargo transport unit, it should remain activated during transport.]

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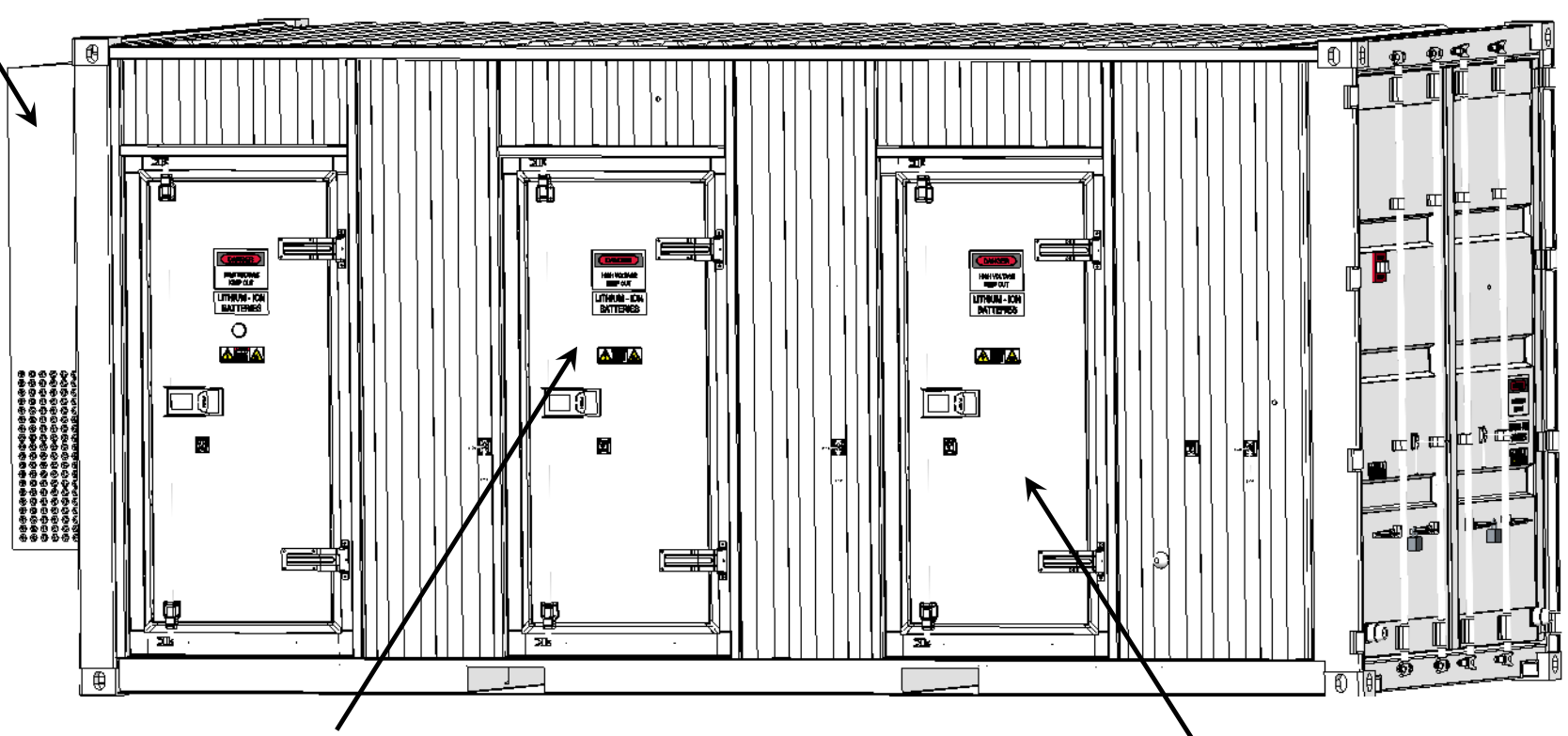
APPENDIX C

MECHANICAL DRAWINGS

20 foot (6 meter) ISO Container: Compliant to - International Convention for Safe Containers (CSC)

Drawings courtesy of Saft

HVAC with Humidity Control



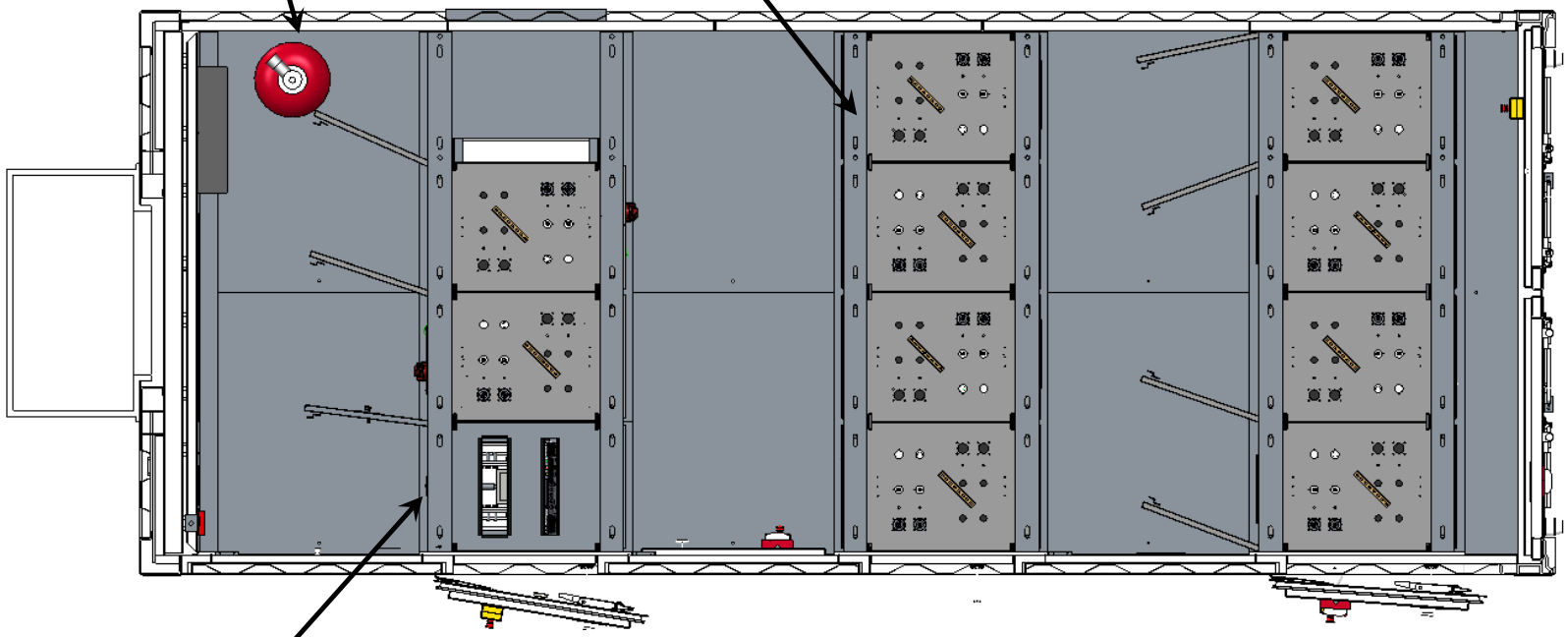
Lithium ion Battery &
High Voltage Warning

Certified ISO Container
(modified for personnel access)

Drawings courtesy of Saft

Fire Suppression System
(Fluoroketone)

Energy Storage System Unit (ESSU) Cabinets

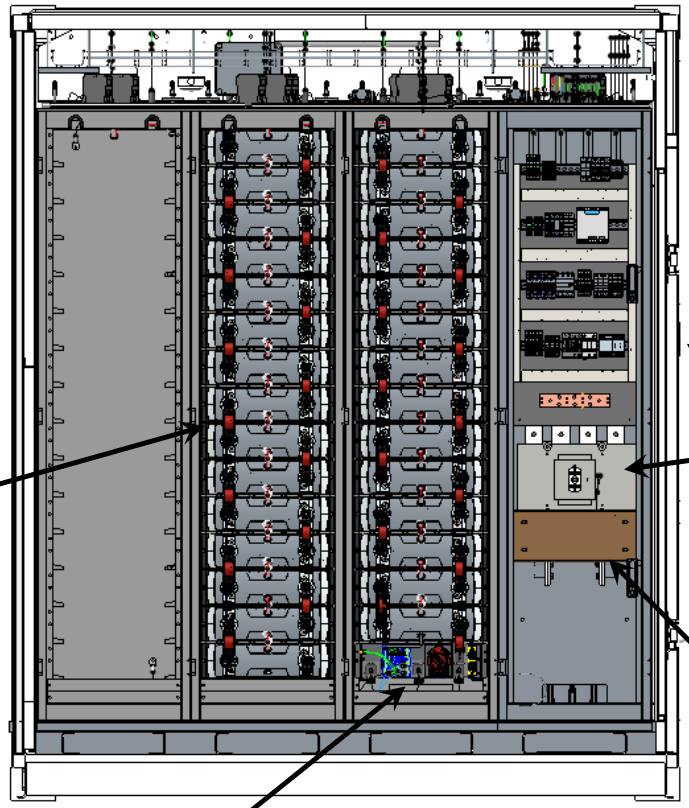


Distribution Cabinet

Emergency Battery Stops

Drawings courtesy of Saft

Typical ESSU Cabinet and Distribution Cabinet



Trays containing battery modules

Distribution and control

Buss Bar

Battery Management System

Trays containing battery modules

Drawings courtesy of Saft

- HVAC: Heating, Ventilation, Air Conditioning
- Buss Bar: An electrical junction in which all the incoming and outgoing electrical current meets.
- Battery Management System: Electronic system that manages assembly of batteries by protecting the assembly from operating outside its safe operating zone.
- Battery Module: A lithium ion “battery” comprised of lithium ion cells that serves as the building block for a large assembly of batteries. Also commonly used in electric vehicles.

Drawings courtesy of Saft

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