TEST REPORT N° DGP-23.006R

revised version of report DGP-23.006 of 27/01/2023

REPORT DATE: 16/03/2023

YOUR REF.: P908 Case 6000

SUBJECT: Tests on plastic boxes (4H2), to obtain the authorization for the transport of batteries.

BY ORDER OF: **CAREPACK HOLLAND BV**
DOUGLASSINGEL 25
NL – 1119 MC SCHIPHOL-RIJK

Recognition:

BELAC 282-TEST ISO/IEC 17025

Stefaan De Ryck
Analyst – consultant
(F)IBC & Dangerous goods packaging

Ing. D. De Valck
Head of Department
(F)IBC & Dangerous goods packaging

1. Received samples:

Contact person	:	Lambert Dekkers
E-mail contact person	:	l.dekkers@carepack.nl
Receiving date of the samples	:	09/01/2023
Description of the received samples	:	Plastic boxes with content. The samples were taken and sent by Carepack Holland B.V. to IBE-BVI.
Testing date	:	11/01/2023
Analyst	:	Stefaan De Ryck

2. Objective of the project:

Additional prototype tests on plastic boxes (4H2), to obtain the authorization for the transport of dangerous goods.

Boxes which were the subject of reports G-18.349, G-19.302, G-21.312 & G-22.266 and have already successfully received the following mark:

un 4H2/Y24/S/* * : year of manufacture
B/1655.2109-180319

Reason of additional tests:

- Additional type of content.

The packaging will be used to transport Lithium batteries.

All tests with (Q) are executed under the Belac accreditation.

This report is a test report and exclusively refers to the tested objects.

3. Description of the samples:

Type of box:	Plastic box (4H2) conform the description as mentioned in the different regulations.
Manufacturer:	B&W INTERNATIONAL GMBH JUNKENDIEK 5 D - 49479 IBBENBÜREN
Composition:	Body with lid which is attached with plastic hinges at the backside. At the front there is a plastic handle. Special steel construction in the box: Steel top part which is attached to the lid with 4 steel screws. Steel bottom part which is attached to the bottom with 4 steel screws. Steel ventilation plates at front and backside of the box attached with 2 steel screws each.
Closure of the package:	2 plastic clip locks at the front side. No metal safety pin was used for the tests.
Material outer box:	Polypropylene (DPP) Type P728-H
Material steel construction:	1.0330 Steel plate cold rolled Thickness: 1mm
Dimensions:	Outside: 510 x 420 x 215 mm Inside: 388 x 264 x 128 mm (steel frame)
Volume:	33 l
Empty weight:	4.0 kg (plastic box only)
Weight with steel construction:	9.02 kg

Content:

Batteries (or batteries in equipment) of UN Numbers. 3090, 3091, 3480 and 3481 in fire-resistant cloth bags.
Each battery is placed in a separate fire-resistant cloth bag.
The filled fire-resistant cloth bags are placed in the steel construction.
The empty space in the steel construction is filled up with foam walls, top and bottom piece (see pictures).

2 dummy batteries in fire-resistant cloth bags were used for the tests.

Fire-resistant cloth bags:

- Material: 50 g silicone coated fiberglass fabric, waterproof
- Closure: Velcro band at inside top
- Empty weight: 267 g
- L x W: 600 x 400 mm

Foam filling & cushioning:

- Material: See data sheet in annex
- Weight: 159 g (total)

Dummy battery:

- Material outer casing: Plastic
- Weight: 4.01 kg (each)
- L x W x H: 370 x 90 x 140 mm

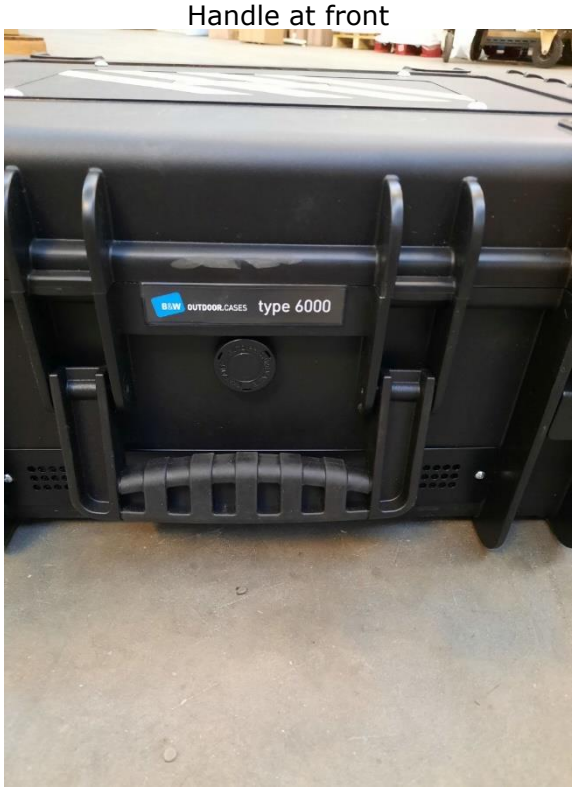
Gross mass of the tested sample	:	17.74 kg
Gross mass of the final package	:	**17.8 kg**

Pictures of the tested samples:

Outer box

Closure

Handle at front



Steel ventilation plate front side

Hinges at backside

Steel ventilation plate at backside

Inside view – steel frame and foam top

Inside view steel frame in lid

Inside view steel frame – bottom part

Content – filled fire-resistant cloth bags

Foam filling & cushioning walls & bottom

Foam

Fire-resistant cloth bag

Dummy battery

4. Test program:

Performance tests for plastic boxes (4H2) prescribed by:
- UN-Recommendations – part 6
- IMDG-Code – part 6
- ICAO-TI – part 6
- ADR–RID - part 6

A. Drop tests (Q):

Filling material	:	See point 3 'content'. The samples were filled and closed at BVI.
Number of tested packages	:	5
Preconditioning	:	48 hours at -18°C
Weight of the samples	:	17.74 kg
Drop height	:	1.20 m
Drop orientation	:	First drop: flat on the bottom Second drop: flat on the top Third drop: flat on the long side Fourth drop: flat on the short side Fifth drop on a top corner

Criteria for passing the tests:

No damage liable to affect safety during transport.
No important breakage or leakage, nor of the box, nor of the inner receptacles

Results of the tests:

Flat on the bottom	:	No loss of contents
Flat on the top	:	No loss of contents
Flat on the long side	:	No loss of contents
Flat on the short side	:	No loss of contents
On a bottom corner	:	No loss of contents

B. Stacking tests (Q):

Stacking tests were not performed due to reason that the original box was already tested in report G-18.349 for a higher gross mass of 24 kg. Therefore, the stacking tests can be waived.

C. Fire test – Temperature test:

Test set-up:

The packaging was filled with only 1 battery simulating the future use. Next to the cells a glow plug was foreseen to initiate the thermal runaway of the internal cells causing the complete battery to catch fire. This mimics the worst-case scenario that could occur during transport.

Used battery inside the packaging:

- Net weight: 3,82 kg
- Nominal voltage: 36,5V
- Nominal capacity: 21Ah
- Nominal energy: 756Wh
- Rechargeable: Yes
- The battery was at 100% state of charge before the test.

During the complete duration of the test, 2 cameras were positioned so that in the event of a flame or projectile exiting the packaging this could be registered.

Result the tests:

a. No flame nor projectiles protruded the package.
b. The structural integrity of the package remained maintained.

Picture of the end of the fire test:

5. Conclusion:

The presented package has successfully met the performance tests prescribed for the transport of dangerous goods and may be used in accordance with the following conditions:

For the content Lithium Batteries:

- Maximum stacking height : 3 m
- Maximum permissible gross mass : 17.8 kg

The packaging is in conformity with P908.

All other conditions of use are not covered by this report.

The use of other packaging methods or components other than stated in this report will render the use of this package invalid.

In addition, lithium batteries (except for damaged or defective batteries) with a different cell chemistry but having a similar design, format and weight may also be transported in this packaging under condition all packing requirements and conditions as described in this report and in the applicable packing instructions are met.

In the case of damaged or defective batteries, supplementary testing, assessment and reporting that proves compliance with any additional requirement of the applicable packing instructions of the regulations for the transport of damaged lithium batteries may be required.

The packaging also meets the requirements as defined in P910 & P908 and may therefore be used in accordance with SP376.

Stefaan De Ryck
Analyst - consultant
(F)IBC & Dangerous goods packaging

Delivered UN mark

The hereafter mentioned: **Plastic boxes (4H2)**

that form the subject of report: **DGP-23.006R of 16/03/2023**

may obtain the hereafter mentioned UN-mark:

un	4H2/Y24/S/*	*	:	year of manufacture
	B/1655.2109-180319		:	

as far as the use of the above-mentioned packaging in the IMDG-Code, ICAO-TI and ADR-RID prescriptions is provided for.

The stacking test was effectuated for a stacking height of 3 m.

Gross mass	:	**24 kg**
Firm	:	**CAREPACK HOLLAND BV** **DOUGLASSINGEL 25** **NL - 1119 MC SCHIPHOL-RIJK**

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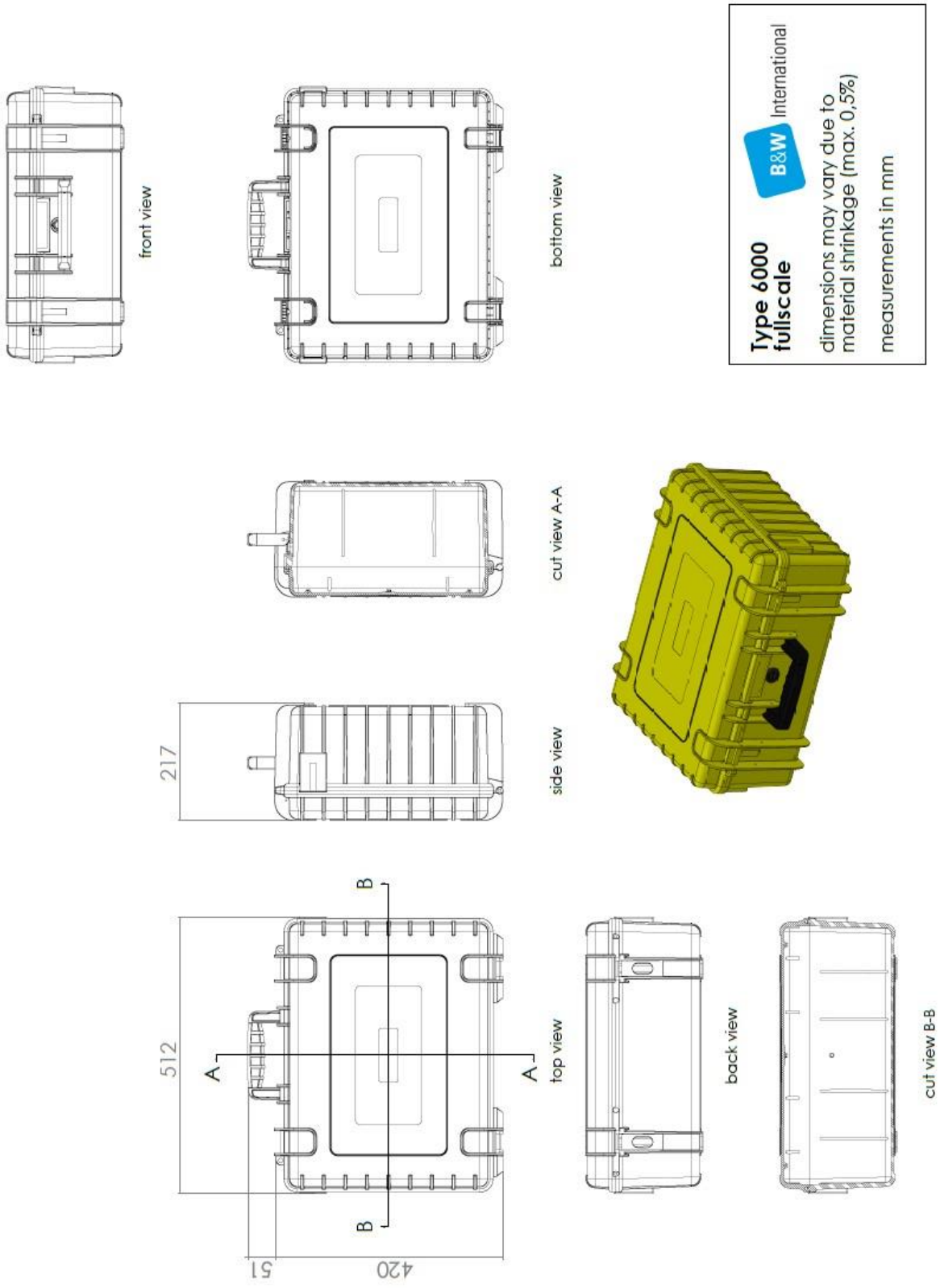
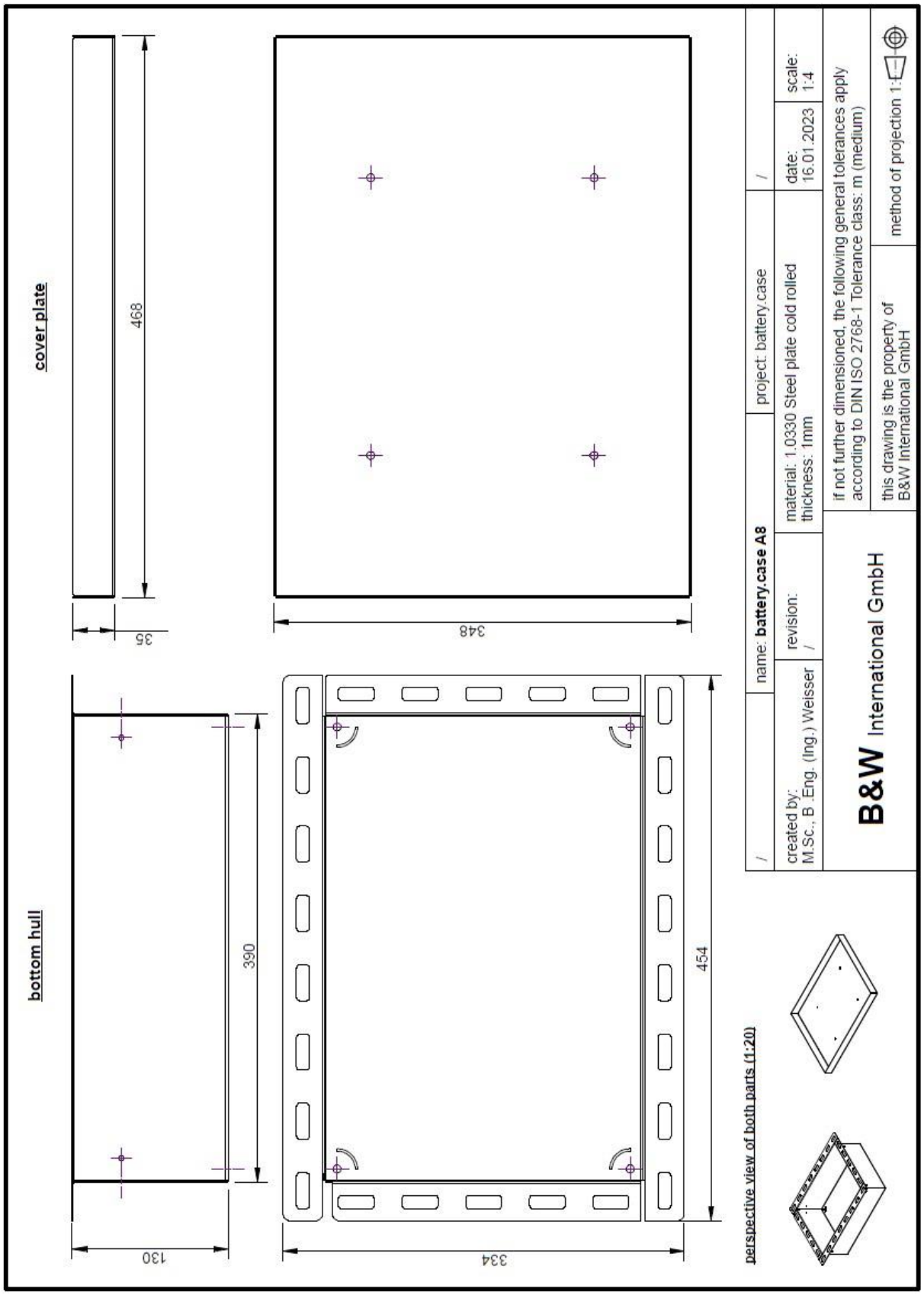
Annex 1: Technical drawing outer box:



Annex 2: Technical drawing of the steel construction:



Annex 3: Data sheet of the fire-resistant bags:

B&W
Cases of Success

Fireproof Bags

Material:	50g silicone coated fiberglass fabric, waterproof
Color:	white
Thickness:	0.45 mm
Weight:	480g/m2
Working temperature:	550°C (permanent)
Max working temperature:	1100°C (short time)
Dimensions:	400 x 600 mm
Certified according to:	EN1869 and EN13501
Pictures:	

B&W International GmbH
research and special projects
Junkendiek 5
49479 Ibbenbüren
Germany

Annex 4: Data sheet of the Foam:

倍威实业(嘉兴）有限公司
B&W (Jiaxing) Co., Ltd.

BW/D

Material Data Sheet

Product Name: SI

Color: black

serial no.	Test Item	Test Standard	Unit	product technical requirements	Actual Test Data	OK/NG
1	density	GB/T 6343-2009 (ISO 845)	kg/m³	22±2	21.7	OK
2	surface hardness	JIS K6301A	/	55±10	55-60	OK
3	elongation at break	GB/T 6344-2008 (ISO 1798-A)	%	> 100	163.75	OK
4	breaking load	GB/T 6344-2008 (ISO 1798-A)	N	> 6	11.3	OK
5	tensile strength	GB/T 6344-2008 (ISO 1798-A)	KPA	> 80	102.76	OK
6	tearing strength	GB/T 10808-2006 (ASTM D 624-B)	N/cm	> 2	2.96	OK
7	flame retardance	GB/ 8410-2006 (FMVSS571.302)	mm/min	< 100	A-0	OK
8	indentation hardness index (compressed 25%)	GB/T 10807-2006 (ISO 2439)	N	⩾60	81.43	OK

倍威实业(嘉兴）有限公司
B&W (Jiaxing) Co., Ltd.

BW/D

9	indentation hardness index (compressed 40%)	GB/T 10807-2006 (ISO 2439)	N	⩾80	102.74	OK
10	indentation hardness index (compressed 65%)	GB/T 10807-2006 (ISO 2439)	N	⩾120	205.25	OK
11	compressive stress（40%）	GB/T 18942.1-2003 (ISO 3386-1)	KPA	2.5±1	2.61	OK
12	drop ball coefficient of restitution	GB/T 6670-2008 (ISO 8307)	%	> 25	29	OK

Report Date: Apr. 1th, 2021

Annex: changes

Report N° DGP-23.006R replaces report N° DGP-23.006.

Initiator of the revision:

Carepack Holland B.V.

Reason for the revision:

Incorrect customer's reference on page 1 of the original report.

Adding the fire test (point C.) to the test program in the revised report.

Changes:

Change customer's reference on page 1 of this report from P909 into the correct reference P908.

Added the fire test to the test program on pages 10-11-12 of the revised report.

Adding an extra sentence to the conclusion of this report regarding P910 & P908.