Director: Professor H R Milner
Secretary: Ms S Lim

AUSTRALIA

TEST REPORT

DROP TESTS ON PANPAC 4 LITRE PLASTIC CONTAINERS

CLIENT:

PANPAC PTY LTD
SUITE G1 63 STEAD ST
SOUTH MELBOURNE
VIC 3205

TESTING AUTHORITY:

MONASH TIMBER ENGINEERING CENTRE
900 DANDENONG ROAD,
CAULFIELD EAST 3145
AUSTRALIA

JOB NO: CT1
REPORT NO: 96/1

Approved signatory:

Certified Correct: .....
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2 December 1996

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DROP TESTS ON PANPAC 4 LITRE PLASTIC CONTAINERS

1. Objective

The objective of the test program was to evaluate the toughness and re-usability of plastic containers supplied by Panpac Pty Ltd.

2. Description of Plastic Containers

Three types of plastic containers were tested, the E-type, the CHEP-blue (E-type), and the G-type.

The E-type containers are made of a rubber-modified polypropylene material compounde from polypropylene co-polymer and diene rubber. Technically it is referred to as an ethylen propylene diene monomer ("epdm"). This particular material (trade name "Epalex") wa compounded by Polypacific Pty Ltd.

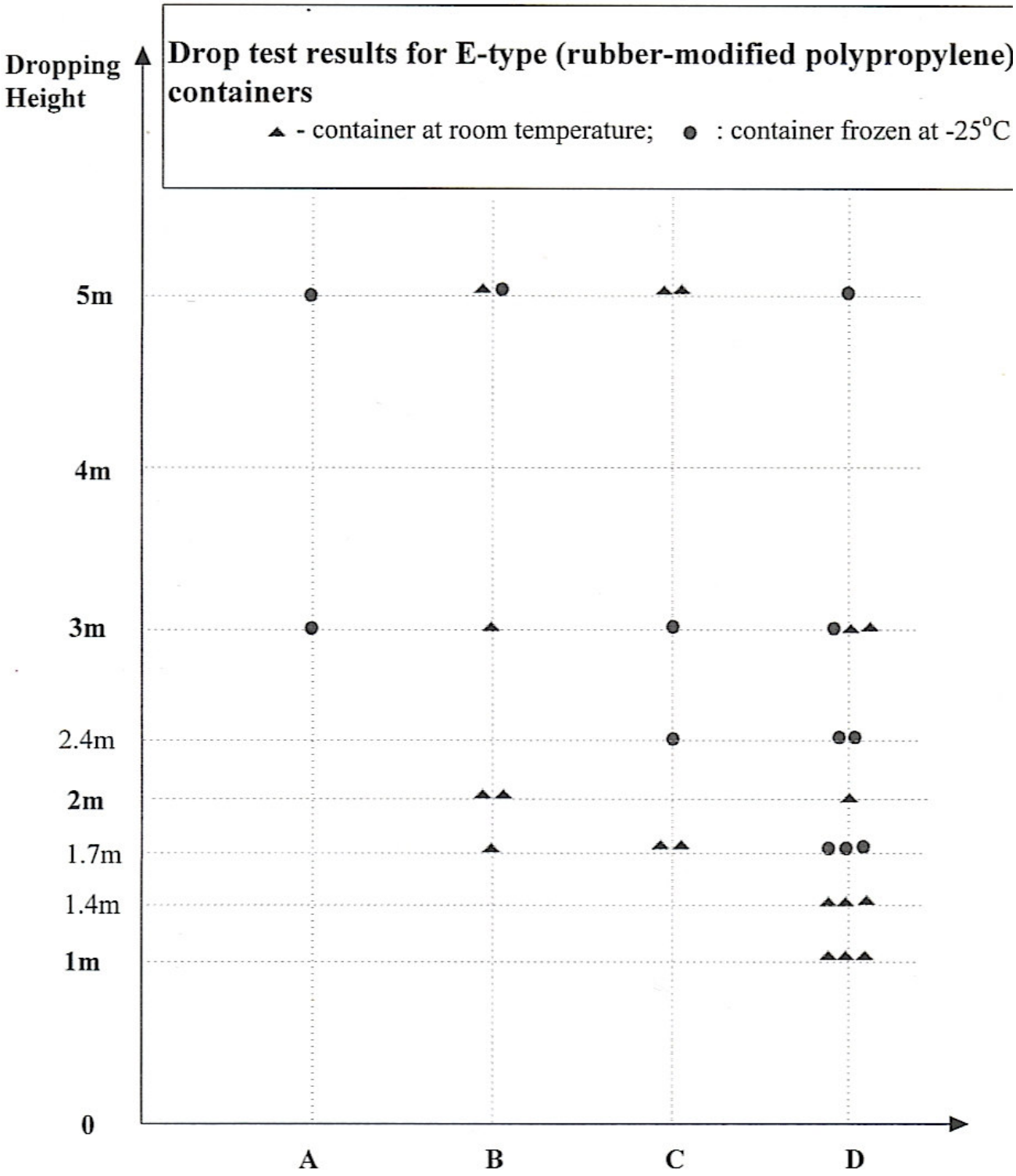
The CHEP-blue (E-type) containers are similar to the E-type ones but moulded from epdn compounded with blue pigment.

The G-type containers are made of polypropylene co-polymer, specifically ICI grad GYM263-66.

3. Test Procedure

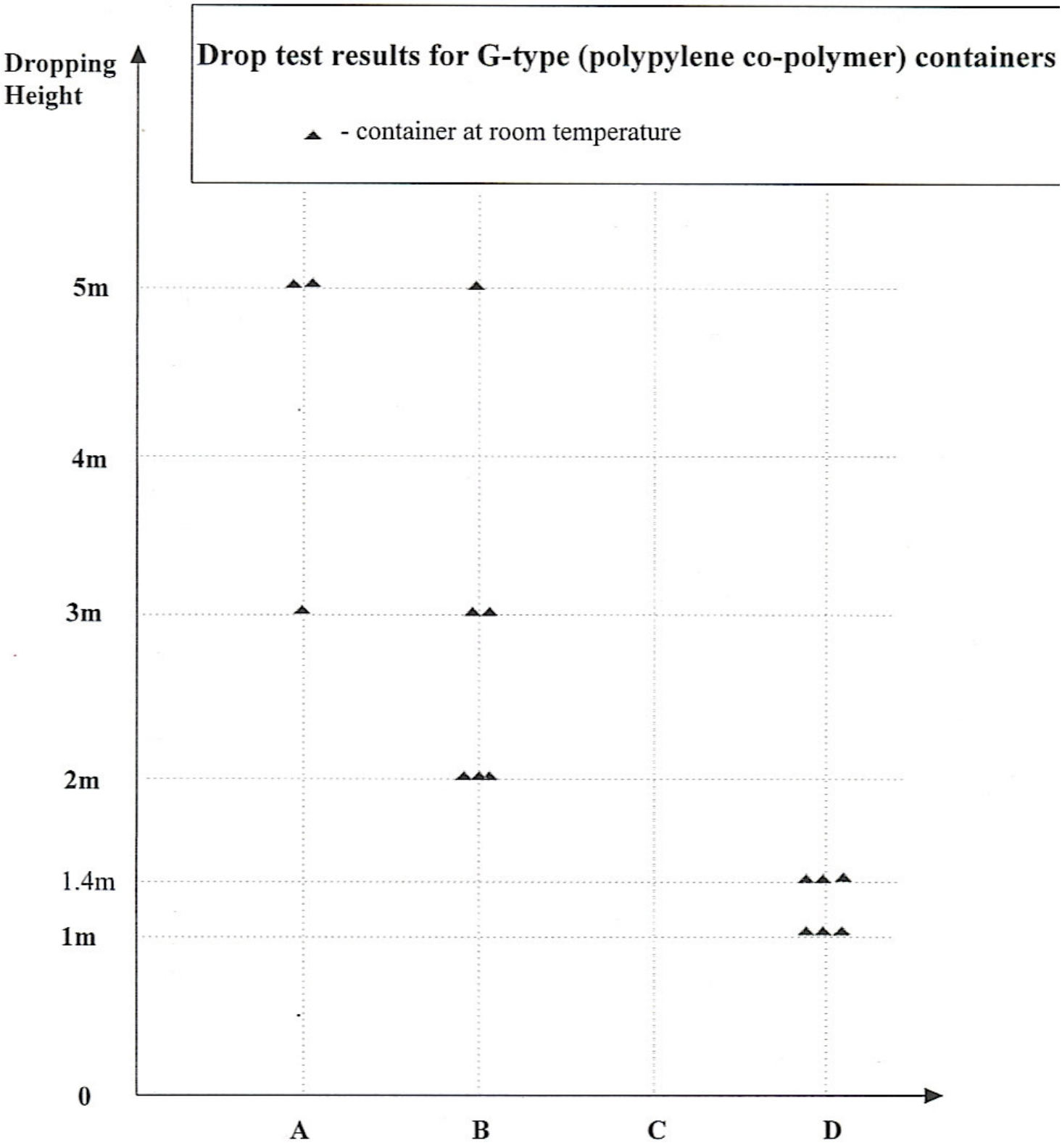
The test procedure simulated realistic but extreme situations in which the containers wer dropped at different heights. An approximate maximum height at which the container can b dropped with no visible damage was established. The appropriate maximum test weight of 1 kg was applied to the containers. Three dropping positions, base-impact, side-impact and end impact, were used in the tests. To test the effect of low temperature on the containers, a tes program was also conducted for the E-type containers frozen at -25°C. The dropping height were measured against a marked survey staff. The containers were dropped on to a steel plat resting on the strong-floor of the Civil Engineering Laboratory at Monash University.

4. Results



A - Major damage, mostly flap sheared off - container not re-usable
B - Major cracks (60mm - 150mm) developed along hinge
C - Minor cracks (≤ 30mm) developed along hinge and minor dents
D - No visible damage

* Test sequence was conducted with CHEP-blue pigmented containers chilled to -25°C



A - Major damage, mostly flap sheared off - container not re-usable
B - Major cracks (60mm - 150mm) developed along hinge - box re-usable
C - Minor cracks (≤ 30mm) developed along hinge and minor dents - box re-usable
D - No visible damage - box re-usable

Conclusions from Drop Tests on Crosstrack Plastic Containers

The containers were tested at dropping heights ranging from 1m to 5m at both ambien temperature and -25°C from three different dropping positions (base impact, sid impact, end impact). The containers were loaded to capacity with an extraordinar heavy weight of 14 kg. Steel chain was used as the test load to simulate the wors scenario of a packed container subject to a large dynamic force transferred to the wall of the container on impact. These test parameters cover the extreme realistic situation which the containers may be subject to.

All but 2 containers, including both E-(rubber-modified polypropylene) and G (polypropylene co-polymer) types, burst open on impact.

E-type (rubber-modified polypropylene) containers:

Of all 30 samples tested, all but 2 samples remained intact after dropping. The samples (-E5.3, -E3.3), both frozen at -25°C, failed with one flap of the cover sheare off. The most common damage to the containers is hinge cracks which are caused b the dynamically induced shear force created when the container was being distorted o impact.

All 28 surviving samples are considered to be re-usable.

The safe dropping height without any visible damage of a typical E-type container is a least 1.4m.

G-type (polypropylene co-polymer) containers:

Of all 14 samples tested, all but 4 samples remained intact after dropping. The 4 failin samples (G5.1, G5.3, G3.2, G2.3) suffered severe damage, rendering the containers no re-usable. The most common damage to the containers is hinge cracks which are cause by the dynamically induced shear force created when the container was being distorte on impact.

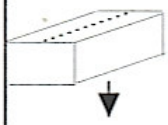
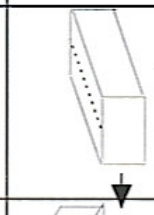
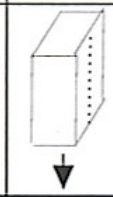
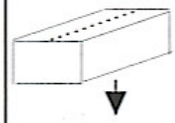
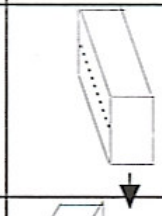
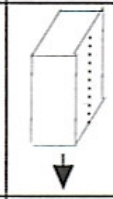
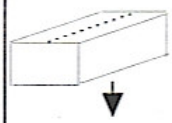
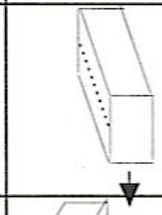
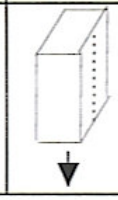
All 10 surviving samples are considered to be re-usable.

The safe dropping height without any visible damage of a typical G-type container is a least 1.4m.

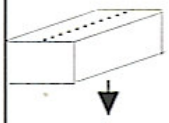
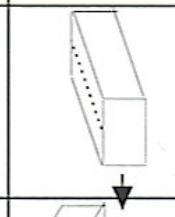
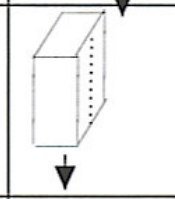
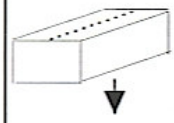
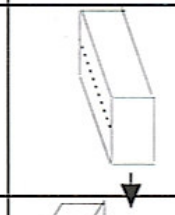
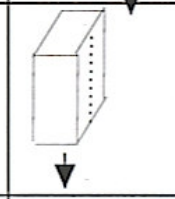
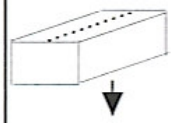
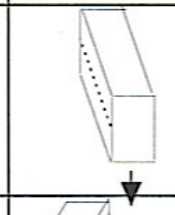
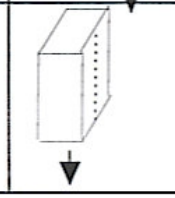
Only 2 CHEP-blue E-type containers frozen at -25°C and dropped at 5m and 3n suffered major damage. However, some containers under the same conditions droppe at the same heights suffered no damage at all. Therefore, the evidence is inconclusive t determine whether containers would be more susceptible to damage when workin under low temperatures. However, as the glass transition point for epdm compounds i well below -25°C, it is reasonable to assume that the performance degradation is no significant.

Appendix : Detailed test results for containers

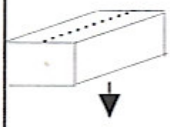
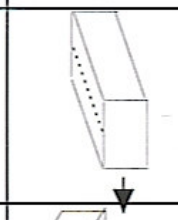
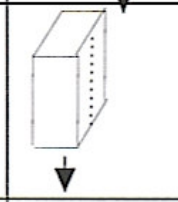
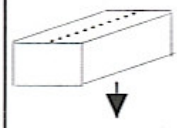
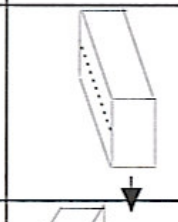
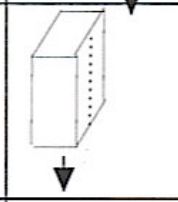
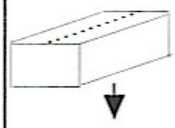
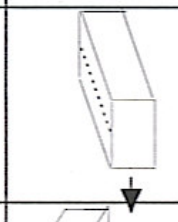
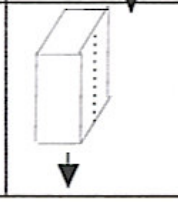
Type : E = rubber-modified polypropylene; G = propylene co-polymer

Test No.	Drop Position	Dropping Height (m)	Type	Container Temp.	Condition of flaps during test	Condition of container after test
E5.1		5m	E	ambient	burst open	110mm crack along one hinge
E5.2		5m	E	ambient	burst open	30mm crack along one hinge
E5.3		5m	E	ambient	burst open	minor dent at bottom corner
E3.1		3m	E	ambient	burst open	no visible damage
E3.2		3m	E	ambient	burst open	no visible damage
E3.3		3m	E	ambient	burst open	60mm crack along one hinge
E2.1		2m	E	ambient	burst open	110mm crack along one hinge
E2.2		2m	E	ambient	burst open	Minor dent at base
E2.3		2m	E	ambient	burst open	70mm crack along one hinge

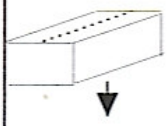
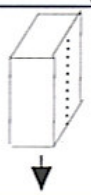
Type : E = rubber-modified polypropylene; G = propylene co-polymer

Test No. / Drop Position		Dropping Height (m)	Type	Container Temp.	Condition of flaps during test	Condition of container after test
E1.71		1.7m	E	ambient	burst open	20mm crack along one hinge
E1.72		1.7m	E	ambient	burst open	30mm crack along one hinge
E1.73		1.7m	E	ambient	burst open	90mm crack along one hinge
E1.41		1.4m	E	ambient	burst open	no visible damage
E1.42		1.4m	E	ambient	burst open	no visible damage
E1.43		1.4m	E	ambient	burst open	no visible damage
E1.1		1m	E	ambient	open partially, load still contained	no visible damage
E1.2		1m	E	ambient	open partially, load still contained	no visible damage
E1.3		1m	E	ambient	burst open	no visible damage

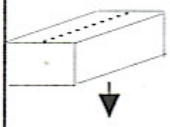
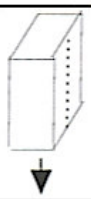
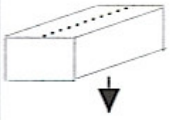
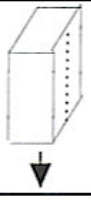
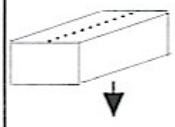
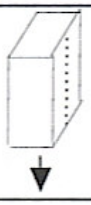
Type : E = rubber-modified polypropylene; G = propylene co-polymer

Test No.	Drop Position	Dropping Height (m)	Type	Container Temp.	Condition of flaps during test	Condition of container after test
-E5.1		5m	E	-25°C	burst open	80mm crack along one hinge
-E5.2		5m	E	-25°C	burst open	no visible damage
-E5.3		5m	E	-25°C	flap detached	one flap of the cover sheared off
-E3.1		3m	E	-25°C	burst open	20mm crack along one hinge
-E3.2		3m	E	-25°C	burst open	no visible damage
-E3.3		3m	E	-25°C	flap detached	one flap of the cover sheared off
-E2.41		2.4m	E	-25°C	burst open	20mm crack along one hinge
-E2.42		2.4m	E	-25°C	burst open	no visible damage
-E2.43		2.4m	E	-25°C	burst open	no visible damage

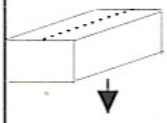
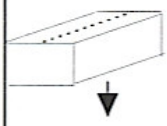
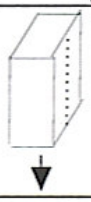
Type : E = rubber-modified polypropylene; G = propylene co-polymer

Test No. / Drop Position		Dropping Height (m)	Type	Container Temp.	Condition of flaps during test	Condition of container after test
-E1.71		1.7m	E	-25°C	intact	no visible damage
-E1.72		1.7m	E	-25°C	burst open	no visible damage
-E1.73		1.7m	E	-25°C	burst open	no visible damage

Type : E = rubber-modified polypropylene; G = propylene co-polymer

Test No. / Drop Position		Dropping Height (m)	Type	Container Temp.	Condition of flaps during test	Condition of container after test
G5.1		5m	G	ambient	flap detached	one flap of the cover sheared off; a 140mmx30mm hole on side and large crack at base
G5.2		5m	G	ambient	burst open	150mm crack along one hinge
G5.3		5m	G	ambient	burst open	sides and base severely damaged, a hole at base (1/3 of base area)
G3.1		3m	G	ambient	burst open	90mm crack along one hinge
G3.2		3m	G	ambient	flap detached	one flap of the cover sheared off
G3.3		3m	G	ambient	burst open	80mm crack along one hinge
G2.1		2m	G	ambient	burst open	70mm crack along one hinge
G2.2		2m	G	ambient	burst open	150mm crack along one hinge
G2.3		2m	G	ambient	burst open	80mm crack across the contact face, minor damage around the latch

Type : E = rubber-modified polypropylene; G = propylene co-polymer

Test No. / Drop Position		Dropping Height (m)	Type	Container Temp.	Condition of flaps during test	Condition of container after test
G1.41		1.4m	G	ambient	intact	no visible damage
G1.42		1.4m	G	ambient	burst open	no visible damage
G1.1		1m	G	ambient	burst open	no visible damage
G1.2		1m	G	ambient	burst open	no visible damage
G1.3		1m	G	ambient	burst open	no visible damage