AD NUMBER
AD361297
CLASSIFICATION CHANGES
TO: unclassified
FROM: restricted
LIMITATION CHANGES
TO: Approved for public release, distribution unlimited
FROM: Controlling Organization: British Embassy, 3100 Massachusetts Avenue, NW, Washington, DC 20008.
AUTHORITY
DSTL, ADM 227/2621, 18 Nov 2008; DSTL, ADM 227/2621, 18 Nov 2008

Report No. 2433/3206/29
Date 24 MAR 1965

ELECTRICAL DEPARTMENT

ADMIRALTY ENGINEERING LABORATORY

WEST DRAYTON, MIDDLESEX

EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINER MADE BY PERMALI LTD. AND UNITED EBONITE & LORIVAL LTD. FOR SUBMARINE CELL TYPE 8000 - SHOCK.

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Investigator:-

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Head of Section

Authorised

Head of Electrical Department
A.E.L.

CT.

SUMMARY

Two experimental thin-pannoled homogeneous glass-fibre/resin containers for cell Type 8000 were subjected to shock tests. The shock resistance of the container made by United Ebonite & Lorival Ltd., was satisfactory but the centre vertical rib of one long side of the container made by Permali Ltd., fractured and was separated from the side. Both containers bulged considerably.

EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD. AND UNITED EBONITE & LORIVAL LTD. FOR SUBMARINE CELL TYPE 8000 - SHOCK.

1. INTRODUCTION

Report No. 2430/3206/25 described an investigation carried out to determine the shock resistance of two experimental thin-panelled homogeneous glass-fibre/resin containers made by Permali Ltd. for submarine cell Type 6560. The containers, which were considerably lighter than the Cat. No. X266 Mk2 container, were similar in all respects except that the glass-fibre fabric covering the inner and outer surfaces of one was Hook Leno and of the other the twill used for containers Cat. No. X266 Mk2. The shock resistance of both containers was satisfactory but the bulge was greater than could be accepted.

Two further containers of this type were made for cell Type 8000 and in these the horizontal strengthening ribs were resited and of a different shape, and in addition a rib was incorporated along the vertical centre line of each long side. This report describes the investigation carried out at the Laboratory in May and June 1961 to determine their shock resistance and bulge.

2. PARTICULARS OF CONTAINERS

The containers were marked Permali 8000 and U.E.L. 8000. Their measurements and weights were as follows:-

TABLE 1

Manufacturer		Permali	U.E.L.
Exterior	Height in.	39 5/8	39 9/16
	Length "	21 1/16	21 1/16
	Width "	13 13/32	13 3/8
Interior	Height "	38 11/16	38 11/16
	Length "	20 3/32	20 3/32
	Width "	12 1/4	12 1/4
Average thickness of upper panels at centre (in.)		0.103	0.107
Weight (without lining) (lb)		45	43 1/2

3. EXAMINATION BEFORE SHOCK TEST

(a) To enable the bulge of the container to be measured and the location of any damage to be given the parts of the container were marked and described as shown in Fig. 1.

(b) The exterior and interior of the containers were examined on receipt and the following damage and imperfections were observed.

Permali Container

(i) Damage:- Small piece of resin dislodged from bottom edge of one base pad.

(ii) Imperfections. Exterior:- Narrow areas of resin slightly or moderately opaque at following positions:- Below junction of base and side AB from corner rib A to near lifting channel; along boundaries BC1 cd CD3L da, CD2R cd, CD3R cd, and DA3 cd; small areas at corners BC 3c and d, CD1Rc, CD3Rb and DA1d.

.../Interior

Interior:- Narrow areas of resin slightly or moderately opaque at following positions. Along boundaries AB2Lcd, 1Rab, 1R bcd 2Rbc; BC1cd, 2cd, 2 ab, 3 cda; CD2L cda, 3Lcda, 2Rabcd, 3Rda, 1Rbc; DA2 cd and 3 cd. At corners AB1Lb, 2Lb, 3La, 1Rb, 1Rc, 2 Ra, 3Ra, 1Rc; CD3Ra and b.

U.E.L. Container

(i) No damage.

(ii) Imperfections. Exterior:- Many resin-rich areas on chamfers of vertical and horizontal ribs and at junction of base and sides.

Interior:- Resin rich along base fillet of side CD and over a few areas near the top of sides AB and CD.

4. MEASUREMENT OF BULGE

Measurements were taken with the container empty between opposite points on the exterior vertical centre lines of the long sides at distances of 1, 5, 8, 16, 24, 28, 32, and 35½ in. from the top edge, and were repeated after assembling the container as a cell before the shock test, after the 4 ft 6 in. blow with the cell assembled, and after removing the plate group, liquid and rubber lining for the final examination. The differences between the first and subsequent measurements are given in Table 2.

5. SHOCK TEST

The containers were assembled as cells with elements Type 8000 and covers Cat. No. X283 and filled to the correct level with water. They were then placed in turn on a solid teak baseboard 1½ in. thick and mounted on the upward blow shock machine. A series of blows was applied to each cell commencing at a height of 2 ft 6 in. and increasing by 6 in. steps to 4 ft 6 in. The exterior of the container was examined after each blow and the interior after the 2 ft 6 in., 3 ft 6 in. and 4 ft 6 in. blows. The results of the shock test are given in Tables 3 and 4.

6. DISCUSSION OF RESULTS

(a) Permali Container

(i) Damage due to shock:- The outer glass-fibre fabric covering of the bottom section of the centre vertical rib of both sides terminated at the lower chamfer of No. 2 horizontal rib. On side AB the resin at this boundary was cracked by the 2 ft 6 in. blow and on side CD a few hairline cracks appeared between corners 2Lc and 2Ra, i.e. about 1½ in. above the boundary of the cloth. There was also an increase in the capacity of the exterior and interior resin along many of the boundaries between panels and ribs (where the cross section of the material changed sharply) and a wale in the outer cloth along two of the boundaries. This damage was increased by subsequent blows and after the 4 ft 6 in. blow the bottom section of the centre vertical rib of side AB (see Fig. 3(a) and 4(b)) was fractured and separated from the body of the container over 1/3 rd of its length and the damaged outer and inner skins at the boundaries of several panels could be cut easily and removed from the container. The

resin beneath these damaged areas was white and powdery and could be scraped easily from the glass fibres. When the container was subsequently half filled with water and tested for leakage a seepage of 10 ml in 1 hour occurred, mostly through the damaged resin along the lower boundaries of the bottom panels. Figs. 3(b), 4(a) and 5(a).

(ii) Bulge between the long sides. The maximum bulge before the shock test was 0.274 in. between points 16 in. from the top of the container. The maximum bulge after the shock test was 0.304 in. between points 32 in. from the top of the container. The maximum permanent set 2 hours after the last blow was 0.154 in. between points 32 in. from the top of the container.

(b) U.E.L. Container

(i) Damage due to shock. The damage to this container up to the final blow was slight and comprised very faint crazing of the bottom and middle panels, cracks in the resin-rich areas of No. 2 rib of all sides, hairline cracks along the base fillets of all sides, an increase in the opacity of the resin along these areas that were slightly opaque before the shock test and two short wales (both less than 0.005 in. high) on the interior surface. After the final blow there was an increase in the intensity and extent of the crazing, and in the number and depth of the cracks in the resin along the interior base fillets. Along interior base fillet CD, where the fabric covering the side and base did not cross the fillet, the resin was chipped away in two places to a depth of about $\frac{1}{8}$ in. before reaching the sub-surface layer of glass fabric. Subsequent to this examination the container was tested for leakage and it was observed that about 1/3 rd of the total leakage of 6 ml in one hour occurred in places, along the junction of side CD and the base. It is probably therefore that the cracks did extend through the glass material, although this was not apparent from the visual examination.

(ii) Bulge between the long sides:- The maximum bulge before the shock test was 0.300 in between points 16 in. from the top of the container. The maximum bulge after the shock test was 0.262 between points 28 in. from the top of the container. The maximum permanent set was 0.104 in. at points 32 in. from the top of the container.

CONCLUSIONS

The experimental thin-panelled homogeneous glass-fibre/resin container made by United Ebonite & Lorival Ltd. for cell Type 8000 had a satisfactory resistance to shock and was only slightly damaged by the shock test. The shock resistance of the container made by Permali Ltd., to the same design was not satisfactory in that the centre vertical rib of one long side was fractured and separated from the side. Both containers bulged considerably and it is possible that the bulge might be excessive at higher temperatures.

TABLE 2

EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD. AND UNITED EBONITE & LORIVAL LTD. FOR CELL TYPE 8000 - SHOCK.

Bulge between long sides of container at 18° to 21°C

Stage of Test	Make of container	Distance from top of container (in.)								
		1	5	8	16	20	24	28	32	35½
		Total bulge (in.)								
Cell assembled before shock test.	Permali	0.081	0.167	0.227	0.274	0.268	0.254	0.215	0.141	0.054
	U.E.L.	0.074	0.163	0.226	0.300	0.289	0.280	0.231	0.141	0.057
Cell assembled after shock test.	Permali	0.038	0.102	0.152	0.209	0.218	0.242	0.249	0.304	0.124
	U.E.L.	0.064	0.101	0.130	0.167	0.189	0.243	0.262	0.230	0.135
Container emptied for final examination.	Permali	0.002	-0.010	-0.018	-0.015	-0.007	0.013	0.049	0.154	0.066
	U.E.L.	-0.003	-0.008	-0.008	-0.016	0.009	0.045	0.081	0.104	0.073

RESTRICTED

EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERM
LONIVAL LTD. FOR SUBMARINE CELL TYPE 80

Results of Shock Test on Container made by

Blow		Damage	Remarks
No.	Height		
1	2 ft 6 in.	Exterior	Centre vertical rib (c.v.r.) of side AB cracked at junction with horizo hairline cracks in resin pool across c.v.r. of side CD just above rib 2. boundaries of the panels as follows:- AB1Rod opaque area 9 in. x $\frac{1}{8}$ in. x $\frac{1}{4}$ in; corner CD1Rc opaque 1 in.^{2}; boundary DA1cd - opaque area 4 in.
		Interior	Increase in opacity of resin and damage to bond between inner cloth and 1/16 in. high; BC2ab - wale 10 in. x $\frac{1}{4}$ in. x 0.001; BC3cd wale 10 in. 8 in. x $\frac{1}{4}$ in. x 0.005 in. high; CD2Rad - wale 8 in. x $\frac{3}{8}$ in. x 0.01 in. 8 in. $\frac{3}{8}$ in. x 0.007 in. high.
2	3 ft	Exterior	Fracture of resin of c.v.r.below rib AB2 to beneath first layer of cloth additional cracks in surface resin above rib CD2. Wale 1 in. x $\frac{1}{4}$ in. DA3c.
3	3 ft 6 in.	Exterior	Probable fracture of c.v.r. of side AB to level of panel. Damage to fil along middle 4 in. of boundary BC1cd, threads of outer cloth white and al nd 1 BC2 cd - opaque are 9 in. x $\frac{1}{4}$ in; BC1cd - ridge 1/16 in. wide in ruptured at junction of panel and chamfer of rib. CD - diagonal cracks and a wale 1/32 in. high in corner 1Rc. Strands of outer cloth at DA1
		Interior	Many additional hairline cracks along base fillet AB and in adjacent re along boundaries of panels as follows:- $\frac{1}{4}$ in. wide band of opaque resi high along AB2Lab and 7 in. x $\frac{1}{8}$ in. x 0.005 in. high along AB2Lbc. Bli to 8$\frac{1}{2}$ in. x $\frac{1}{4}$ in. x 0.01 in. high. Height of wale at DA1cd increased t
4	4 ft	Exterior	Small piece of resin dislodged from boundary of fractured c.v.r. and di fracture indicating separation of lower part from body. Wale about 1/6 along AB2R and 3Rab. Wale along DA1cd now 3/64 in. high; wale 7 in. x corner C. A few additional hairline cracks in chamfers of rib CD2.
5	4 ft 6 in.	Exterior	Centre vertical rib separated from container between 5 in. and 8 in. fr 3(a) and 4(b)). About 20 strands of fibres pulled from surface resin AB3Rod; Additional damage to glass-fibre/resin along boundaries of pan small area of opaque resin in corner BC3c; a few additional hairline c of the resin between the cracks; height of ridge along CD1Rcd increase fibres loose and a few fibres ruptured in the wale along DA1cd (Fig. 5(cracks in resin between cover-securing screw holes Nos. 1,2, and 5 and
		Interior	A few additional hairline cracks in base fillets AB (Fig. 5(c) BC and C panels as follows:- Height of wale at AB1Rcd, increased to 0.007 in.; white in colour and now about 1/16, 1/32 and 1/64 in. high respectively CD2L, 2R, 3L and 3Rac slightly increased in height but all less than 0. wale DA3 c te 1/32 in. high (Fig. 5(b)). The glass-fibre/resin beneat

Note 1. The exterior sides panels and ribs of the containers were marked as shown in Fig. damage to a particular part of the container could be located either on the exter

Note 2. The wales along the boundaries of the panels were cut in several places to in resin was white and powdery and the glass fibres could be scraped easily

TABLE 3

THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD AND UNITED EBONITE & LORIVAL LTD. FOR SUBMARINE CELL TYPE 8000 - SHOCK.

Results of Shock Test on Container made by Permali Limited.

Remarks
ib (c.v.r.) of side AB cracked at junction with horizontal rib 2 and several hairline cracks below. Chain of short n resin pool across c.v.r. of side CD just above rib 2. Resin opaque and strands of outer cloth slightly raised along the panels as follows:- AB1Rcd opaque area 9 in. x $\frac{1}{8}$ in.; BC1 cd - wale 7 in. long 1/64 in. high; BC2cd - opaque area 2$\frac{1}{2}$ in. D1Rc opaque 1 in.^{2}; boundary DA1cd - opaque area 4 in. x $\frac{1}{8}$ in. and wale about 1/64 in. high.
ty of resin and damage to bond between inner cloth and glass-fibre/resin beneath as follows:- BC1ab - wale 4 in. x $\frac{1}{8}$ in. x C2ab - wale 10 in. x $\frac{1}{4}$ in. x 0.001; BC3cd wale 10 in. x $\frac{1}{8}$ in. x 0.005 in. high; CD2Lab and 2Rab - 2 wale each .005 in. high; CD2Rad - wale 8 in. x $\frac{3}{8}$ in. x 0.01 in. high; CD3Lad, wale 9 in. x $\frac{1}{4}$ in. x 0.005 in. high; CD3Rad, wale 07 in. high.
of c.v.r. below rib AB2 to beneath first layer of cloth; a number of additional hairline cracks above fracture, two in surface resin above rib CD2. wale 1$\frac{1}{2}$ in. x $\frac{1}{4}$ in. x 3/32 in. high at CD1Rc: Small areas of opaque resin at CD1Rc and
of c.v.r. of side AB to level of panel. Damage to fibre-glass/resin as follows:- AB1Lcd increase in opacity of resin of boundary BC1cd, threads of outer cloth white and above level of resin; small areas of opaque resin at corners BC1 c aque are $\frac{1}{8}$ in. x $\frac{1}{4}$ in; BC1cd - ridge 1/16 in. wide in an 8 in. x $\frac{5}{8}$ in. band of opaque resin; numerous glass fibres ion of panel and chamfer of rib. CD - diagonal cracks in surface resin across corners 1Lb and 1Ra of chamfers of c.v.r. n. high in corner 1Rc. Strands of outer cloth at DA1d whiter and slightly proud of surface.
airline cracks along base fillet AB and in adjacent resin pools on surface of base. Additional damage to glass-fibre/resin of panels as follows:- $\frac{1}{4}$ in. wide band of opaque resin along midle 3 in. of AB1L and 1Rcd; wale 5 in. x 1/16 in. x 0.005 in. and 7 in. x $\frac{5}{8}$ in. x 0.005 in. high along AB2Lbc. Blister $\frac{1}{4}$ in^2 x 0.01 in. high at AB3Lc; wale at BC3cd increased x 0.01 in. high. Height of wale at DA1cd increased to 1/32 in.
sin dislodged from boundary of fractured c.v.r. and difference of level of 3/64 in. between parts of rib on either side of ng separation of lower part from body. Wale about 1/64 in. high along AB3Rcd and a 4 in. x $\frac{1}{4}$ in. area of opaque resin ab. Wale along DA1cd now 3/64 in. high; wale 7 in. x $\frac{1}{8}$ in. x 0.005 in. high along CD1Rcd with a few hairline cracks at additional hairline cracks in chamfers of rib CD2.
ib separated from container between 5 in. and 8 in. from base and outer cloth delaminated at AB1Lb , and AB1Ra (Figs. About 20 strands of fibres pulled from surface resin along AB1Rcd. Several strands of fibres ruptured in wale along al damage to glass-fibre/resin along boundaries of panels as follows:- Wale along BC1cd now 1/16 in. high (Fig. 3(b)) que resin in corner BC3c; a few additional hairline cracks in c.v.r., between corners AB2Lc and AB2Rd and some granulation een the cracks; height of ridge along CD1Rcd increased to 1/64 in. and cracks along peak (Fig. 4(a)) several strands of a few fibres ruptured in the wale along DA1cd (Fig. 5(a)), (See note 2). Short vertical etween cover-securing screw holes Nos. 1,2, and 5 and interior.
nairline cracks in base fillets AB (Fig. 5(c) BC and CD. Additional damage to glass-fibre/resin along boundaries of :- Height of wale at AB1Rcd, increased to 0.007 in.; surface resin cracked just below AB3Rcd; wales BC1, 2 and 3cd nd now about 1/16, 1/32 and 1/64 in. high respectively; a number of cracks along BC3cd; wales along boundaries 3Rac slightly increased in height but all less than 0.010 in. high. Height of wale DA1cd increased to 1/16 in. high and ? in. high (Fig. 5(b)). The glass-fibre/resin beneath all the wales was probably damaged (See Note 2).

nd ribs of the containers were marked as shown in Fig. 1 and were carried through to the interior so that of the container could be located either on the exterior or interior surface by the same group marking.

les of the panels were cut in several places to inspect the glass-fibre/resin below: in all cases the and the glass fibres could be scraped easily from the resin.

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EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD., AND I
ICRIVAL LTD. FOR SUBMARINE CELL TYPE 2000 - SHOCK

Results of Shock Test on Container made by United Ebonite &

Blow		Damage	Remarks
No.	Height		
1	2 ft 6 in.	Exterior	Areas of faint crazing on panels AB and CD 1L and 1R, BC1, and on base be A number of hairline cracks across chamfers of rib AB2 and a few across 1
		Interior	A few hairline cracks in resin-rich fillets between base and sides AB, BC boundaries AB1L and 1R ab and cd.
2	3 ft	Exterior	Slight increase in intensity of crazing lines in panels AB and CD 1L and and CD 2L and 2R. A few additional hairline cracks across chamfers AB, I
3	3 ft 6 in.	Exterior	Slight increase in intensity of crazing lines in the base and in panels A of hairline cracks across chamfers AB and CD 1Lbc and 1Rcd and across cha Short vertical cracks in resin between cover-securing screw holes Nos. 5
		Interior	Number of additional hairline cracks in resin along fillet between base a other base fillets. Short weal less than 0.005 in. high along boundaries
4	4 ft	Exterior	Many additional crazing lines in bottom panels of all sides and a few in hairline cracks across chamfers CD1L and 1R ab and a few in bottom part o in opacity of resin along short length of chamfer AB3Rda.
5	4 ft 6 in.	Exterior	Increase in intensity of crazing lines in panels AB and CD1L, 2L, 2R and new areas of crazing in top panels of sides AB and CD. Few additional ha AB and CD1L bc and 1Rda, and in resin-rich areas along rib CD and DA1. A sides and centre pad.
		Interior	Increase in opacity of small areas of resin and a number of additional ha BC and CD; along base fillet CD many of these cracks extended to the sub places, the resin forming the fillet was delaminated over small areas (se resin dislodged from base fillet BC. A few hairline cracks along vertica

Note 1. The resin along fillet CD was removed in three places until glass-fibre material and 5/32 in. No ruptured glass fibres were observed or granulation of the resin it is probable that some of these cracks extended beyond this glass-fibre materia

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TABLE 4.

-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD., AND UNITED EBONITE & LORIVAL LTD. FOR SUBMARINE CELL TYPE 8000 - SHOCK

Results of Shock Test on Container made by United Ebonite & Lorival Ltd.

Remarks
' faint crazing on panels AB and CD 1L and 1R, BC1, and on base between short sides and centre pad. (See Note 1 Table 3.) ' of hairline cracks across chamfers of rib AB2 and a few across the chamfers of ribs BC2 and CD2. irline cracks in resin-rich fillets between base and sides AB, BC and CD. Slight increase in opacity of resin along es AB1L and 1R ab and cd.
ncrease in intensity of crazing lines in panels AB and CD 1L and 1R and new areas of faint crazing lines on panels AB L and 2R. A few additional hairline cracks across chamfers AB, BC and CD2.
ncrease in intensity of crazing lines in the base and in panels AB and CD 1L, 2L, 2R and 3L, and panel BC1. A number ine cracks across chamfers AB and CD 1Lbc and 1Rcd and across chamfers of No. 2 rib of all sides. rtical cracks in resin between cover-securing screw holes Nos. 5 and 6 and interior. f additional hairline cracks in resin along fillet between base and side CD and a few additional hairline cracks in se fillets. Short weal less then 0.005 in. high along boundaries CD 2Lab and CD3Lcd.
itional crazing lines in bottom panels of all sides and a few in panels AB and CD 2L and 3L. Numerous additional cracks across chamfers CD1L and 1R ab and a few in bottom part of centre vertical rib (c.v.r.) of side AB. Increase ty of resin along short length of chamfer AB3Rda.
in intensity of crazing lines in panels AB and CD1L, 2L, 2R and 3L (for view of worst area of crazing see Fig. 2a) and s of crazing in top panels of sides AB and CD. Few additional hairline cracks in No. 2 ribs of all sides, in chamfers D1L bc and 1Rda, and in resin-rich areas along rib CD and DA1. A few additional crazing lines on base between short d centre pad. in opacity of small areas of resin and a number of additional hairline cracks along fillets between base and sides AB, D; along base fillet CD many of these cracks extended to the sub surface layer of glass fabric from which, in several the resin forming the fillet was delaminated over small areas (see Fig. 2(b)) (See note 1). A few small flakes of slodged from base fillet BC. A few hairline cracks along vertical fillets A and B.

fillet CD was removed in three places until glass-fibre material was encountered between depths of 3/32 in. ru tured glass fibres were observed or granulation of the resin but from the result of the test for leakage hat some of these cracks extended beyond this glass-fibre material.

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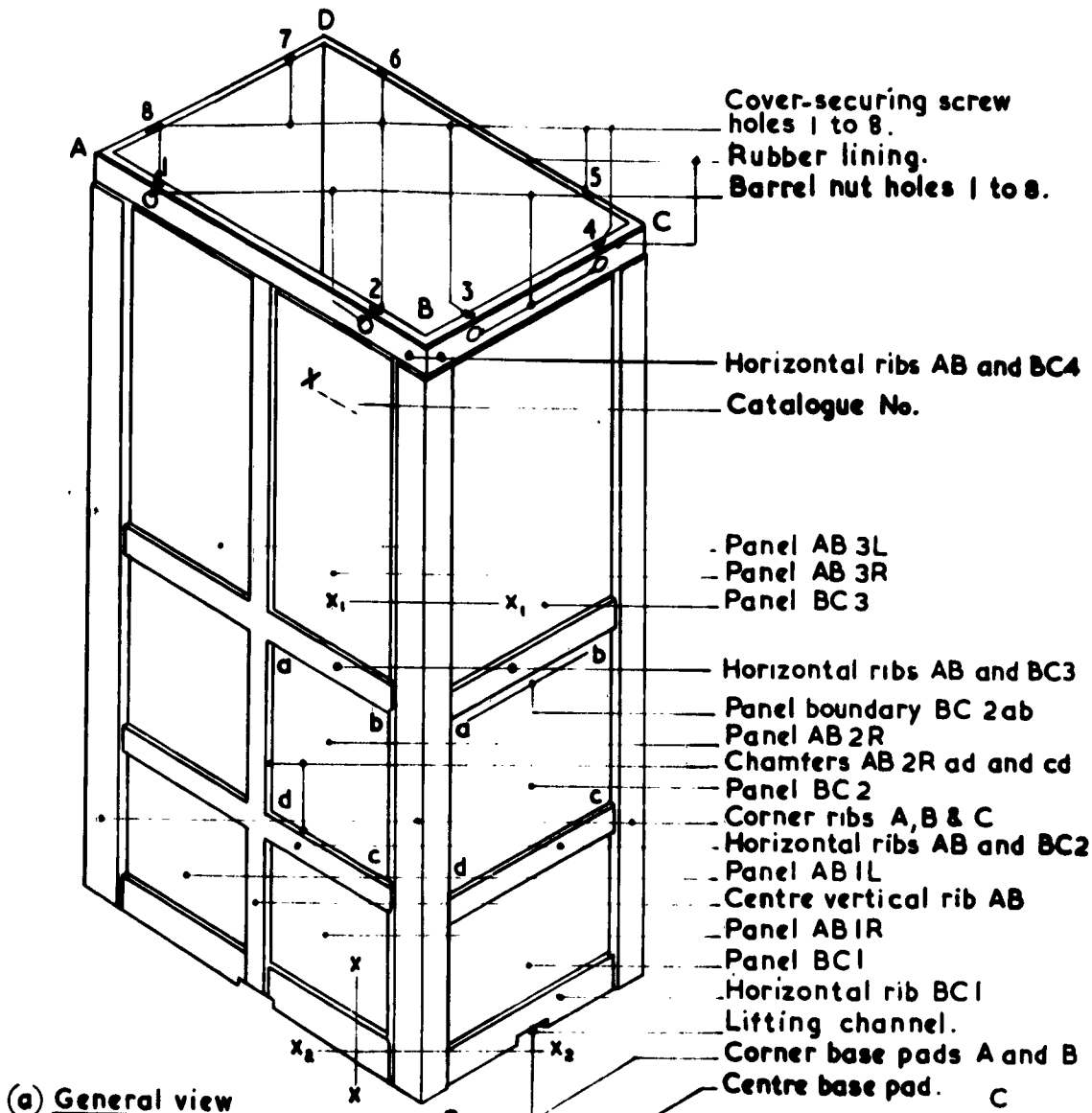
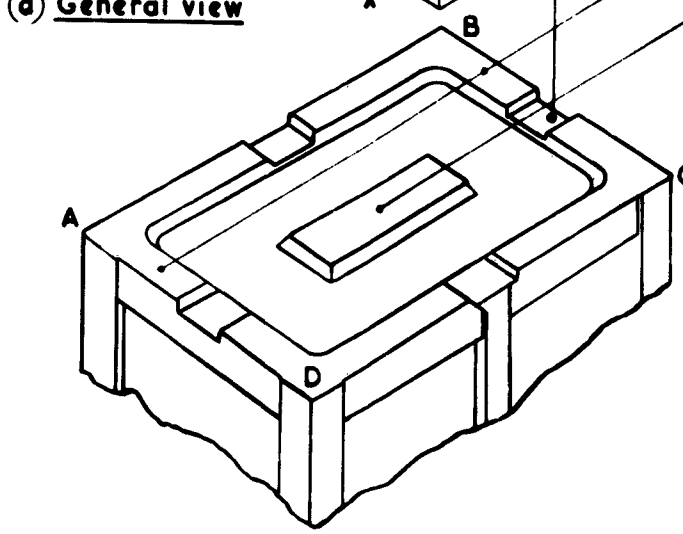
EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY FOR SUBMARINE CELL TYPE 8000 - SHOCK.

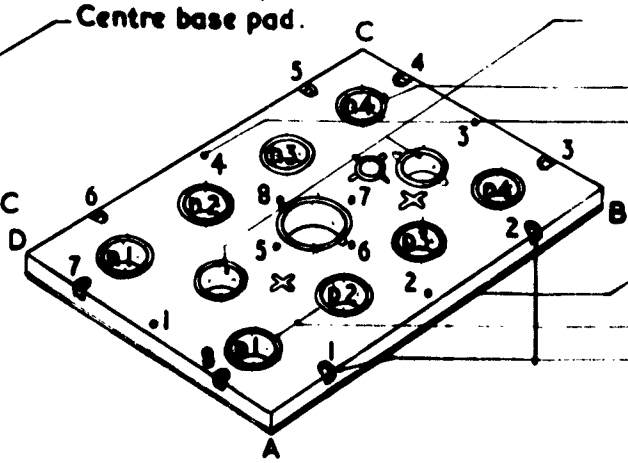
PARTS OF CONTAINER AND COVER.



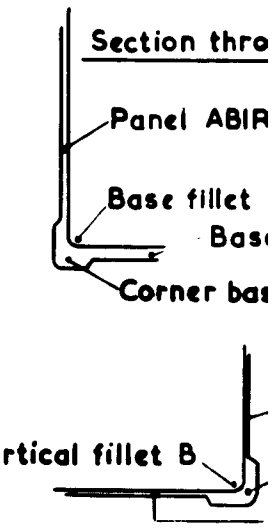
(a) General view



(b) View of underside of base.



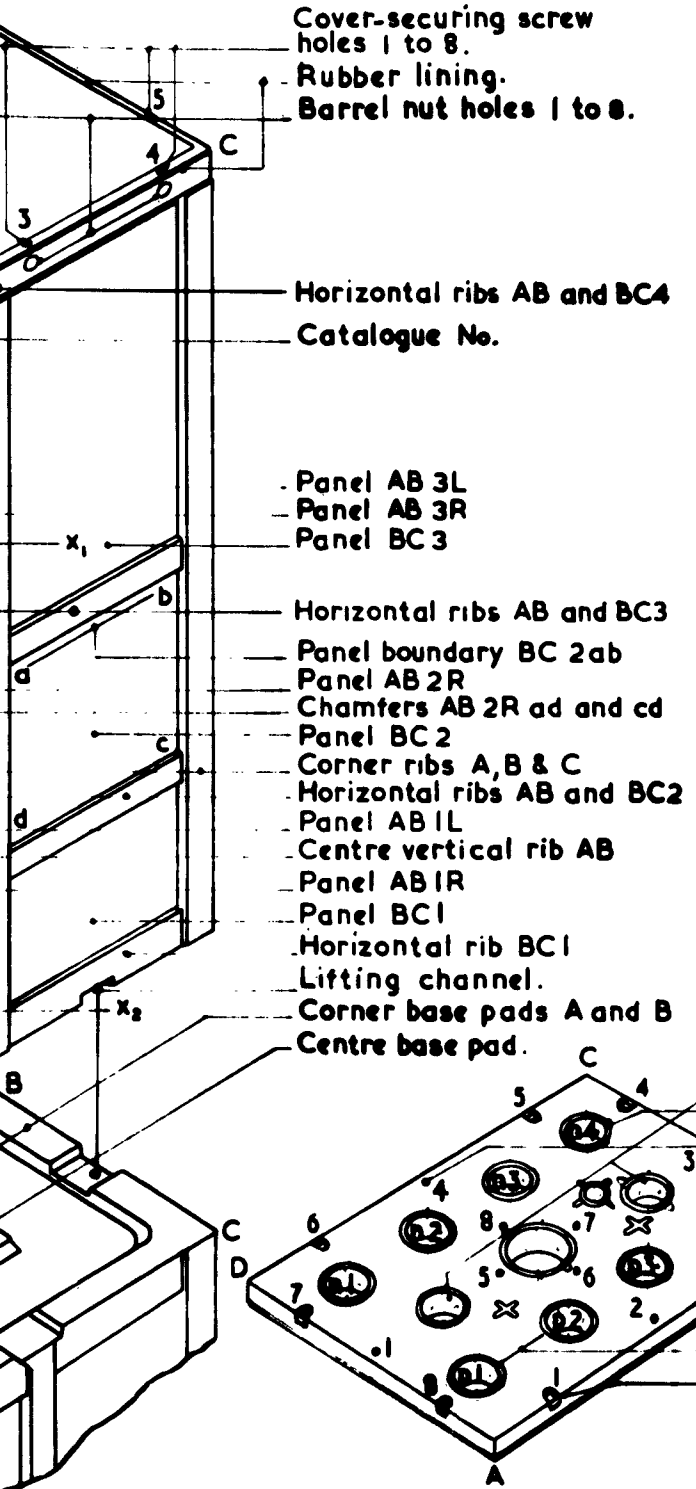
(c) View of cover marked for measurement of distortion.



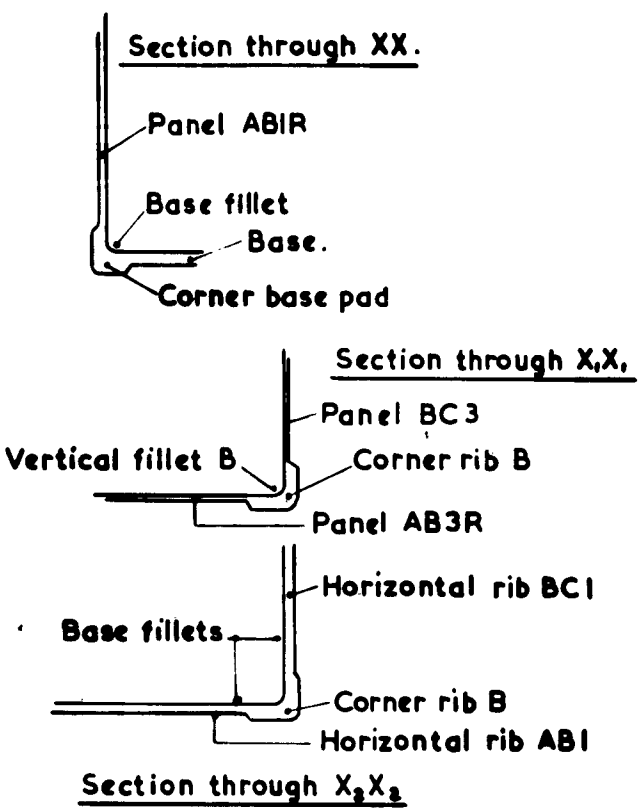
(c) SECTIONS TH

GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD. AND U.E.L.LTD. FOR SUBMARINE CELL TYPE 8000 - SHOCK.

PARTS OF CONTAINER AND COVER.



(c) View of cover marked for measurement of distortion.



(c) SECTIONS THROUGH CORNER RIB B.

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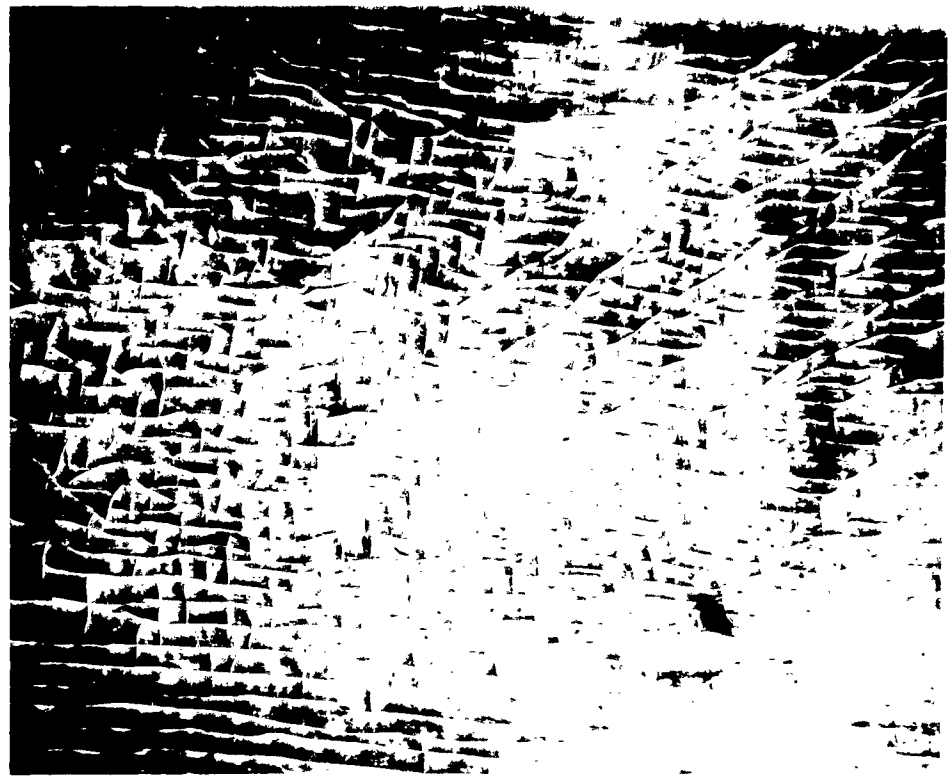
EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD. AND UNITED EBONITE & LORIVAL LTD. FOR CELL TYPE 8000 - SHOCK.

Views showing damage to U.E.L. Container as a result of the shock test.

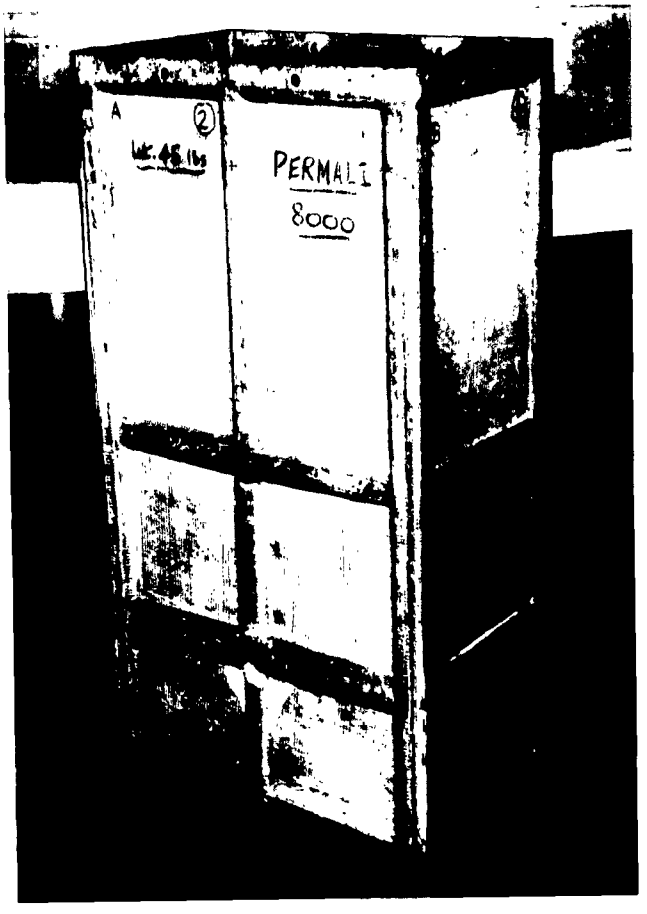


(a) View showing crazing of panel CD1L

(b) View showing cracks and resin-richness of base fillet of side CD.

EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD. AND UNITED EBONITE & LORIVAL LTD. FOR CELL TYPE 8000 - SHOCK.

Views showing damage to the Permali container as a result of the Shock Test.



(a) General view of container.

(b) View showing damage to panel BC1.

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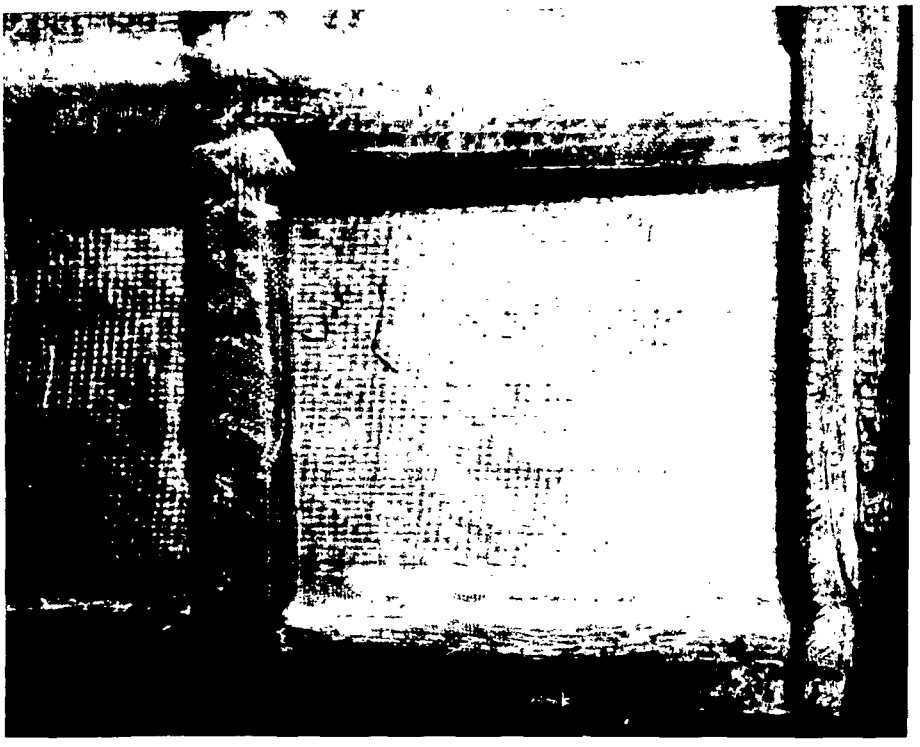
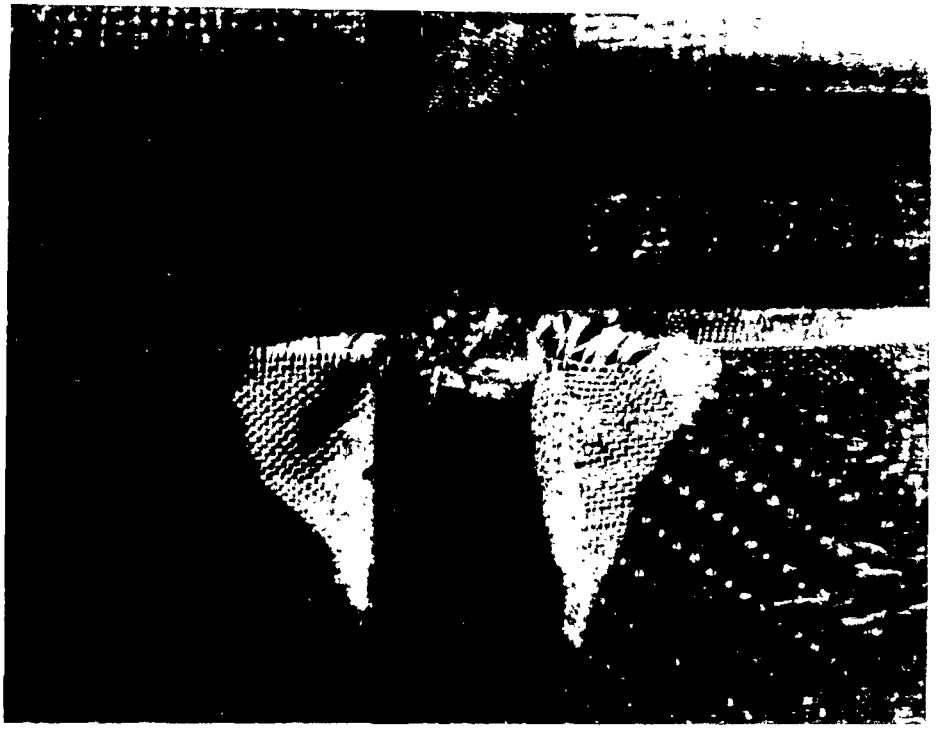
EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD. AND UNITED EBONITE & LORIVAL LTD. FOR CELL TYPE 8000 - SHOCK.

Views showing damage to the Permali container as a result of the shock test.



(a) View showing damage to panel CD1R



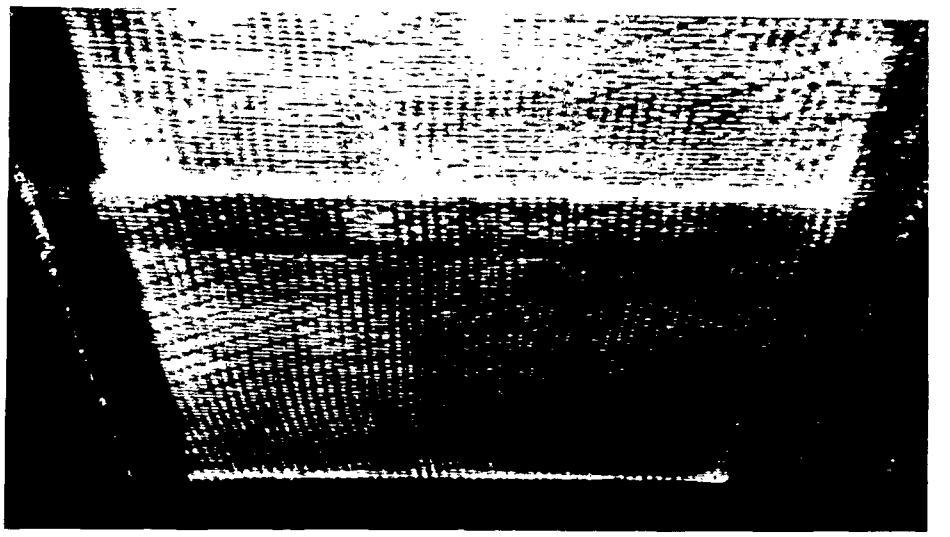
(b) View showing damage to lower part of centre vertical rib of side AB at AB1Lb-AB1Ra.

FIG. 5.

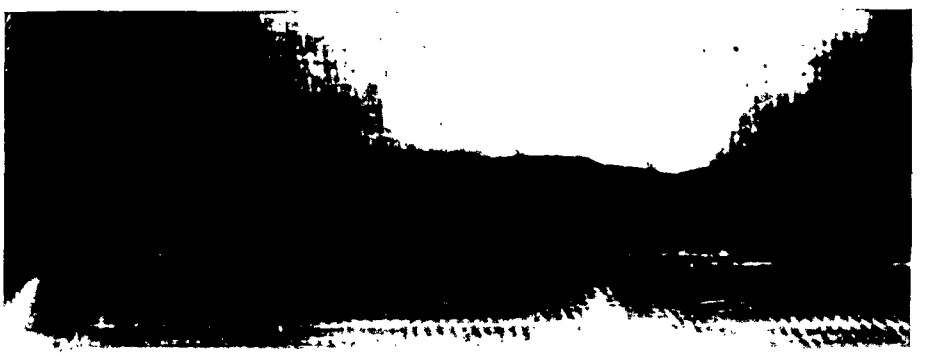
EXPERIMENTAL THIN-PANELLED GLASS-FIBRE/RESIN CONTAINERS MADE BY PERMALI LTD. AND UNITED EBONITE & LORIVAL LTD. FOR CELL TYPE 8000 - SHOCK.

Views showing damage to the Permali container as a result of the shock test.

(a) View showing damage to panel DA1.



(b) View of interior of side DA showing wale above No. 3 rib.



(c) View showing cracks in resin pools, and along fillet between base and side AB.

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AD#: AD361297

Date of Search: 18 November 2008

Record Summary: ADM 227/2621
Title: Experimental thin panelled glass fibre/resin containers for submarine cell type 8000: shock
Availability Open Document, Open Description, Normal Closure before FOI Act: 30 years
Former reference (Department) 2433/3206/29
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