

APPENDIX B

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AEAT - 2568

Issue 1 Testing of BNFL DN3516
Type A(F) Container

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N A H Palmer
J E Gillard

November 1997

RESTRICTED - COMMERCIAL

AEAT- 2568 issue 1

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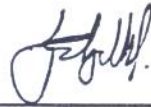


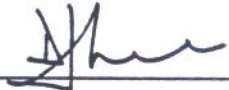
November 1997

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Executive Summary

Testing of a DN3516 Type A(F) was carried out by AEA Technology at the Outdoor Drop Test Facility and the Pool Fire Test Facility during the period April to October 1997 for BNFL AGR Division, Springfields.

The tests were in support of a safety submission to the UK Department of Transport, Environment and the Regions (DETR). Tests were specified in accordance with IAEA Regulations for Safe Transport of Radioactive Material and were detailed in BNFL specification FEDR 95/2171 issue 2. The tests consisted of:

1. A stacking test with an applied load of five times the package gross weight
2. 1.0 m Penetration test
3. Four 0.3 m drop tests onto the package lid corners
4. 1.2 m drop onto the edge
5. 9.0 m drop with package vertical
6. 1.0 m Punch test.
7. Pressure test
8. Thermal test

This report describes the testing of the package and details the damage sustained during testing.

The package sustained no visible damage as a result of the stacking test and only very minor surface damage from the penetration test. The corner drops caused localised damage to the container corner angles and flange, secondary impact damage was avoided as far as possible. The 1.2 m drop resulted in further bending of the container corner angles and flange on the impact edge, some gross distortion of the container resulted as a result of the internals moving. The 9 m drop caused substantial distortion in the impact area, including damage to the lid bolts along the impact edge. Some gross distortion of the entire package also occurred which was partly the result of the package internals shifting. The punch test caused localised damage including the failure of two of the bolts damaged by the 9 m drop. Following all the drop tests there was no visible breach of the container and the container had remained substantially structurally intact.

The drop tested package was subjected to a 30 minute hydrocarbon pool fire. Package instrumentation comprised non-reversible temperature indicating labels installed at 9 locations inside the package. External instrumentation comprised four directional flame thermometers. Following the fire there were no visible signs of further damage to the package. The outer and inner lids were removed in accordance with BNFL specification FEDR 95/2178 issue 2 and the contents examined. There was some charring at the edge of the insulating panel on top of the inner lid and some soot on the underside of the inner lid but no damage or disturbance of the pails or their contents other than some condensation of water vapour. The highest internal temperature recorded during the fire was 116°C near corner 'C' and the lowest recorded temperature was 60°C on top of the central pail.

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1 Introduction

The testing of a DN3516 Type A(F) package was carried out at the AEA Technology Winfrith Outdoor Drop Test Facility during April 1997 on behalf of BNFL. Tests were carried out in accordance with BNFL specification FEDR 95/2171 iss. 2 and AEA Technology Test Specification and Quality Plan for testing of BNFL DN3516 Type A(F) container (see appendices 1 & 2).

The DN3516 Type A(F) package complete with dummy contents was provided by BNFL. Testing consisted of:

1. A stacking test with an imposed load of at least five times the package weight.
2. A 1.0 m penetration test carried out with a standard missile.
3. 0.3 m drops onto each corner of the package lid (4 number in total).
4. A 1.2 m drop onto the top edge of the package defined by ends A & B. See FEDR 95/2171 iss. 2 appendix A.
5. A 9 m drop onto the top edge of the package defined by ends A & B. See FEDR 95/2171 iss. 2 appendix A.
6. A 1.0 m punch test such that the impact was in the centre of edge AB.
7. Thermal test consisting of subjecting the whole package to a temperature in excess of 800 °C for 30 minutes. The package was tested in the state following the above drop tests.
8. Dismantling of the package following the thermal test. See FEDR 95/2178 iss.2.
9. Pressure test of a spare undamaged inner pail.

On completion of the test programme the container and contents were dismantled and visual inspection was performed. All hardware was then returned to BNFL Springfields.

2 Test Facilities

2.1 DROP TEST FACILITY

The Winfrith outdoor drop test facility was used for these tests. The facility comprises:-

1. A permanent reinforced concrete target of 700 tonne, measuring 6.1m x 6.1m x 7.1m deep, with 75mm thick steel plates forming the upper surface. This is enclosed within a steel mesh safety fence 5 metres high.
2. 150 tonne capacity crawler crane, capable of lifting 70 tonnes over the drop test target.
3. An electromechanical release system for single point suspension of the test piece. This method of suspension and release ensures that the test piece attitude is not affected by the release process.

2.2 MEASURING EQUIPMENT

The following measuring equipment was used to carry out the required quality measurements:

1. Knock back measurements were carried out using a quality engineer's ruler.
2. 10 tonne calibrated load cell serial no. 85-AP2.
3. Drop height was measured using a plumb line calibrated against a quality steel metre rule and attached to the container.
4. Non-reversible temperature indicating labels covering the range 37°C to 260°C.
5. Calibrated Orion data logger and thermocouples assembled into Directional Flame Thermometers (dft).
6. The pressure test was carried out using the calibrated FLITE leak test equipment.

2.3 FIRE TEST FACILITY

The Winfrith Pool Fire Test Facility was used for the thermal test. The facility consists of a waterproof concrete base and walls enclosing an area measuring 9.4m x 6.4m. The pool is filled with fresh water to a predetermined level and the fuel is added to float on top of the water. For this test the fuel was 8000 litres of kerosene to BS2869 Class C2 enclosed within a steel bund 6.5m x 6.2m.

2.4 TEST HARDWARE

The following test hardware was provided for the tests:

- 1 One Type 3516 Transport Container for Fuel Assemblies loaded with 9 pails containing simulant powder and weights as BNFL drawing PK324031 iss B.
- 2 One Type 3518 Inner pail for pressure testing BNFL drawing PK324038 iss A.

3 Test Procedures

The drop tests and associated activities were carried out in accordance with the BNFL specification FEDR 95/2171 ISS. 2, the AEA Technology Specification and Quality Plan for Testing of BNFL 3516 Type A(F) Container. In addition the following work instructions were applied:

General Drop Test Instruction	AEAT/GWI/19/4102
Lifting Aspects of Drop Testing	AEAT/GWI/19/4103
Photographic Aspects of Drop Testing	AEAT/GWI/19/4104
Undertaking Thermal Tests	AEAT/GWI/19/4107
Stacking Tests	AEAT/GWI/19/4109

The work instructions are identified with the relevant activity in the Quality Plan.

Prior to the commencement of the drop tests the outer and inner lids were removed and temperature sensing strips installed around the internal pails ready for the thermal tests which followed on from the drop tests.

3.1 STACKING TEST

The package was weighed using a calibrated 10 tonne load cell, recorded weight was 0.70 tonne. The container was placed onto the target and the load was applied via the corner angles with two 75 mm steel plates (see figure 1). The load applied was 4.2 tonne. The load was applied for 24 hours and unloaded in the presence of the DETR Inspector.

3.2 PENETRATION TEST

A 32 mm bar with hemispherical end weighing 6 kg was dropped from 1 m onto the flange package lid. The bar was dropped through a tube to ensure hitting the selected target. The bar was marked so that when the mark was at the top of the tube the bottom of the bar was 1 m above the bottom of the tube. The above test was recorded on video.

3.3 CORNER DROP TESTS

Four 0.3 m drop tests were carried out onto each of the lid corners. To prevent slap-down to the package tyres were placed to absorb the secondary impact, the arrangement can be seen in figures 2 and 3. The drops were carried out in sequence on corners A to D. To achieve the correct angle of drop the package was suspended from the diagonally opposite base, e.g. to impact on corner A the package was slung from base G. Photographs of all the tests were taken but are not included in the report, each test was recorded on video and measurements taken of the resulting damage.

3.4 EDGE DROP FROM 1.2 m

A 1.2 m drop was carried out onto edge A-B as per the specification. Figure 5 shows the package suspended prior to release, the drop height was determined by attaching a pre-measured plumb line to the bottom of edge A-B. The drop test was recorded on video and the resulting damage recorded photographically and measurements taken of the resulting damage.

3.5 VERTICAL 9 m DROP

The orientation of the package was the same as for the 1.2 m drop as instructed by the DETR Inspector. Figure 15 shows the package suspended prior to release, the drop height was determined by a plumb line attached to edge AB. The drop test was recorded on video, however, the recording was lost when the punch test was accidentally taped over the 9 m drop. Photographs of the resulting damage were taken and measurements taken.

3.6 PUNCH TEST

The drop orientation required by the DETR Inspector was such that the edge AB would impact onto the punch at the centre bolt, with the C of G acting through the impact point. The orientation was achieved by slinging the package from G and H. Figure 21 shows the package suspended prior to release. The 1.0m. drop height was determined by a plumb line attached to edge AB and the package positioned with the plumb line centred on the punch. The drop test was recorded on video and the resulting damage recorded photographically and measurements taken.

3.7 FIRE TEST

The fire test was witnessed by the DETR inspector.

The package, instrumented with non-reversible temperature indicating labels, was supported base down in the fire test pool on 4 water cooled supports positioned centrally. Four dfts were positioned 0.5m away from the centre of each vertical face of the package to monitor local flame temperature. See figure 26. The dfts were connected to a data logger situated in the instrument hut.

Fresh water was fed into the pool until a depth of 405 mm was reached. 8000 litres of kerosene were then fed in to the inside of the 6.2m x 6.5m bund from the bulk storage tank.

When the weather conditions were satisfactory (average wind speed less than 2m/s) the fire was ignited (figure 27) and the data logger was started. Temperatures were logged every minute. The start time of the test was denoted by all 4 dfts indicating a temperature in excess of 800°C. The fire was allowed to burn for the required 30 minutes, then for a further 2 minutes. Refer to figures 28 - 31. The fire was then extinguished using foam directed onto the surface of the pool. There was no artificial cooling of the package. The package was allowed to cool overnight before being removed to a workshop area.

3.8 PACKAGE DISMANTLING

Dismantling of the package was in accordance with BNFL FEDR 95/2178 and was supervised by BNFL and witnessed by DETR. The outer lid was removed without undue difficulty although the effect of distortion of the twist locks caused by the drop testing was evident.

3.9 PRESSURE TEST

An empty pail was supplied separately for pressure testing. A silicone rubber seal ring was fitted to the lid rim. The lid was drilled to take a pressure test fitting. A transducer block with calibrated 2bara transducer was connected to the pail and a regulated supply of dry high purity nitrogen at 1.75bara. Pressure and temperature were monitored using a FLITE meter in the manual mode. Readings were recorded at the start and after 10 and 20 minutes. Leak rate and SLR were calculated from the pressure at 10 and 20 minutes. The procedure was repeated with two further seals of the same type. After the second test the complete pail was immersed in cold water whilst still pressurised.

4 Test Results

The results of the tests are described in the following sections and photographs.

4.1 STACKING TEST

No damage or permanent distortion was visible when the 4.2 tonne load was removed, therefore the package had passed the stacking test.

4.2 PENETRATION TEST

The damage to the lid resulting from the impact was small, resulting in an indentation of about 20 mm in diameter and less than 3 mm deep. See figure 25.

4.3 CORNER DROP TESTS

Impact damage to the corner upright angle and flange was similar for all drops. The flanges were bent over a length of about 30 mm and the angle by about 40 mm, there was no visual evidence of weld damage or damage to the lid. Figure 4 shows typical resulting damage to a flange and upright angle. Details of damage to corners A,B,C,D are shown in figures 6,7,8,9 respectively.

4.4 EDGE DROP FROM 1.2 m

Figures 11,12,13 and 14 show the resulting damage. Most of the impact was absorbed by the corners A and B which resulted in further distortion of the angles and flanges at corners. The lid had also buckled at the corners and some distortion had occurred to the lid along the edge AB. The package internal had shifted resulting in the face ABEF bowing.

4.5 VERTICAL 9 m DROP

Figures 16 to 20 show the damage to the package following the 9 m drop onto edge AB. Considerable distortion occurred at the corners resulting in failure of the weld between the angles and the flange and further buckling of the lid (see figures 18 and 19). The impact also caused the sides BCFG and ADEH to buckle (see figures 16 and 17). Movement of the package internals had resulted in further bowing of face ABEF and the package lid had also bowed considerably (see figure 17). The impact also damaged the lid bolts on edge AB all of which had cracked. Some distortion was noted to the edge CD which had bent at the centre towards AB.

4.6 PUNCH TEST

The damage resulting from the punch test was generally localised to edge AB. Figures 22 to 24 show the resulting damage. The punch caused some distortion to the lid flange along edge AB (see figure 22),

punched the centre bolt almost through the hole (see figure 23) and caused the bolts at corners A and B to fail (see figure 24).

4.7 FIRE TEST

The temperature-time plot for the pool fire is shown in figure 32.

There was some fragmentation of the edges of the Newtherm insulation material. (See figures 34 and 35.) The extent of severe heating of the package was evidenced by the discoloration seen in figure 36. The inner lid was removed and inspected. There was some sooting on the edge of the underside of the lid but no discoloration of the Plastazote pads or of the pail lids. (See figures 37 and 38.) The temperatures indicated by darkening of the sensitive areas of the labels were noted. The maximum internal temperatures are shown in figure 39. The pails were removed from the container and the lids opened. There was no discoloration or derangement of the powder contained in polythene bags. When the bags were removed from the pails there was some evidence of condensation of water vapour on the inside of the walls (Figures 40 and 41).

4.8 PRESSURE TEST

Results are shown in figure 42. During a 4 minute period two small bubbles emerged from the region of the pail lid but it is uncertain whether or not they contained gas from the inside of the pail or air trapped on the outside of the lid during immersion.

5 Conclusions

The tests described in the previous sections were carried out in accordance with BNFL specification FEDR 95/2171 and the instructions of the DETR inspector. As a result of the tests carried out the DN3516 Type A(F) container sustained the damage described in the previous sections. The container remained structurally intact and there was no visual evidence of containment breach. The integrity of the container was maintained throughout the thermal test. Pressure testing of an undamaged pail using three seals of the same design gave acceptable leak rates.

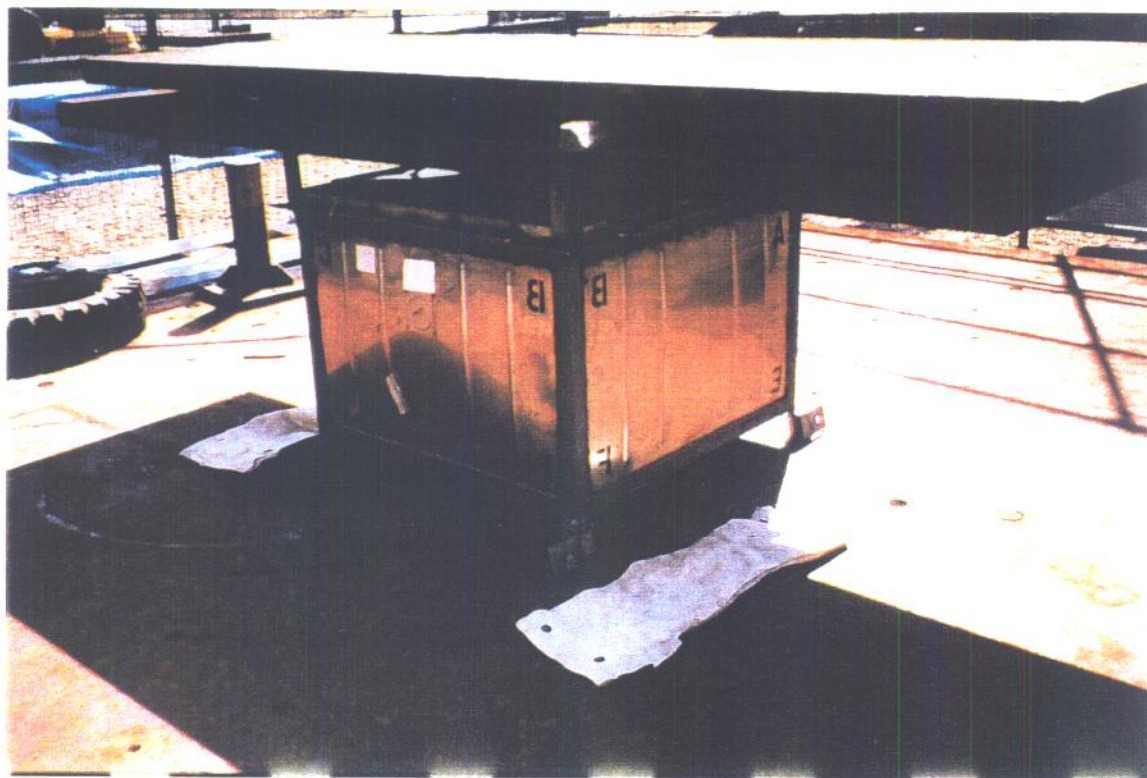


Figure 1 - Stacking Test



Figure 2 - Slings Arrangement for 0.3 m Corner Drops

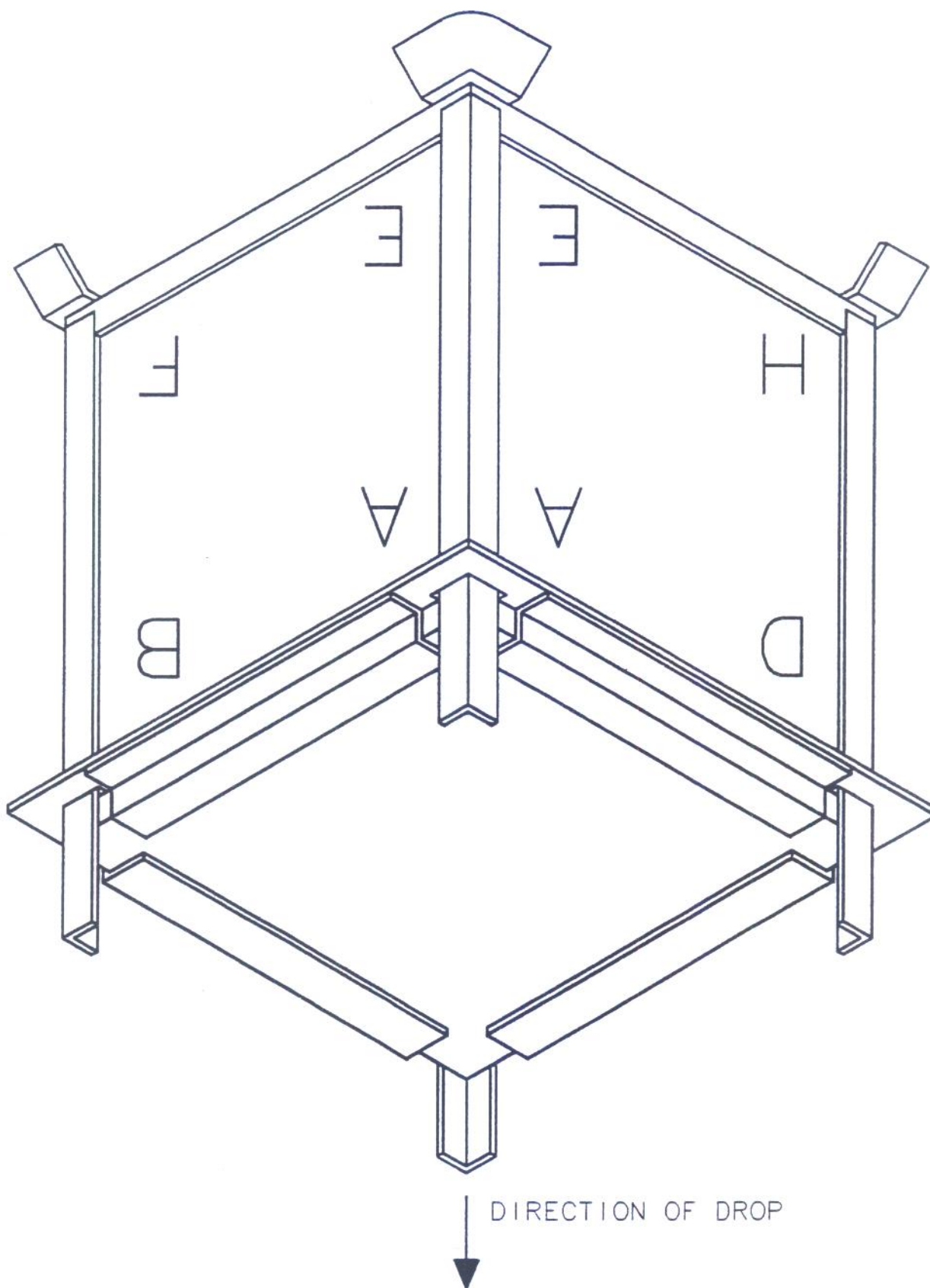


Figure 3 - Basic Orientation of Package for 0.3m Drops



Figure 4 -Typical Damage to Package Following 0.3 m Corner Drop



Figure 5 - Package Suspended for 1.2m Drop Test

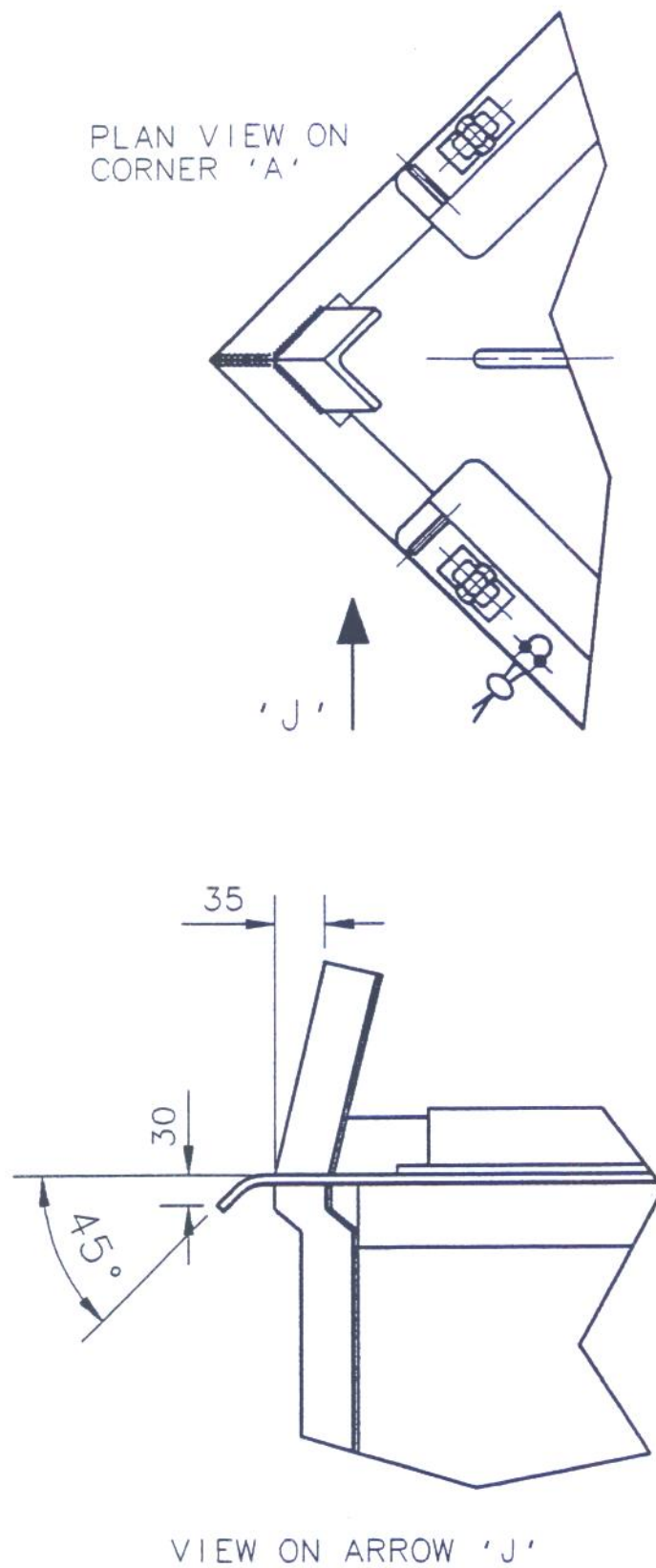


Figure 6 - Damage to Corner A after 0.3m Drop

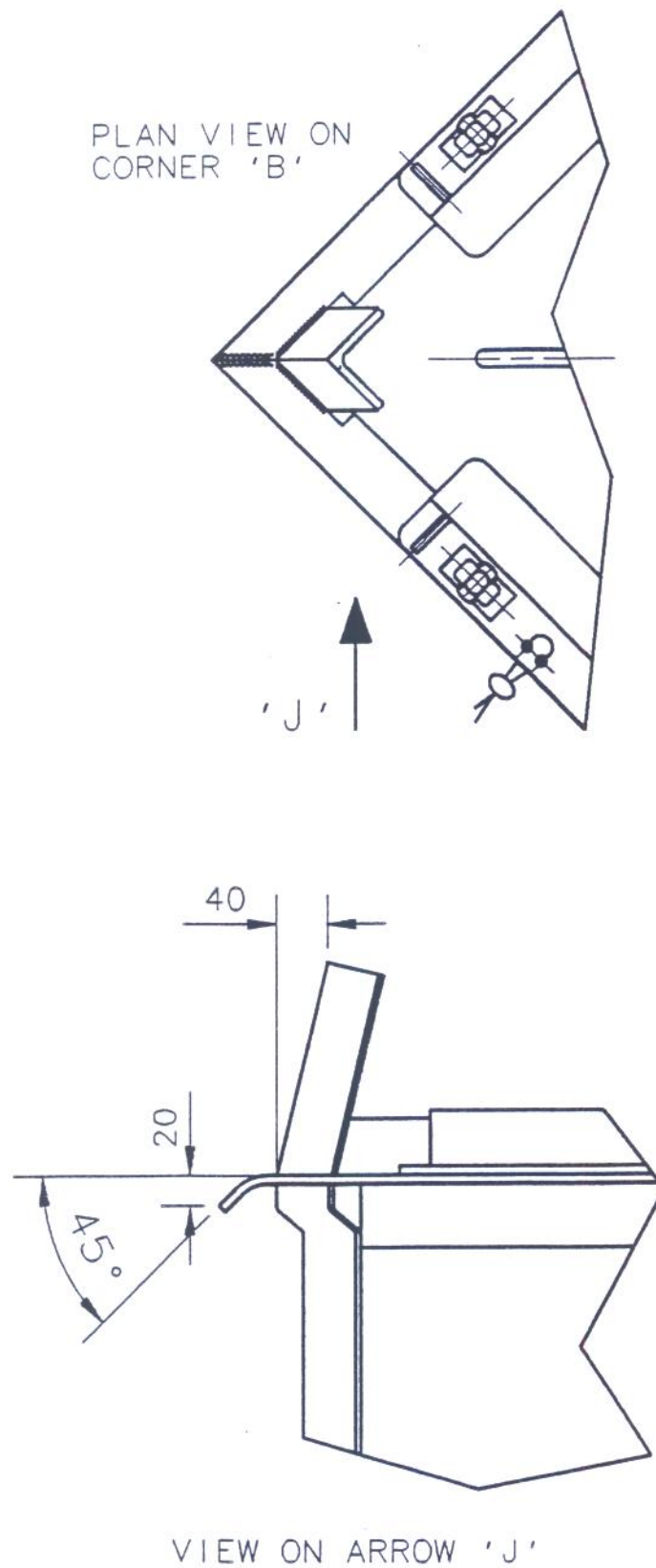


Figure 7 - Damage to Corner B after 0.3m Corner Drop

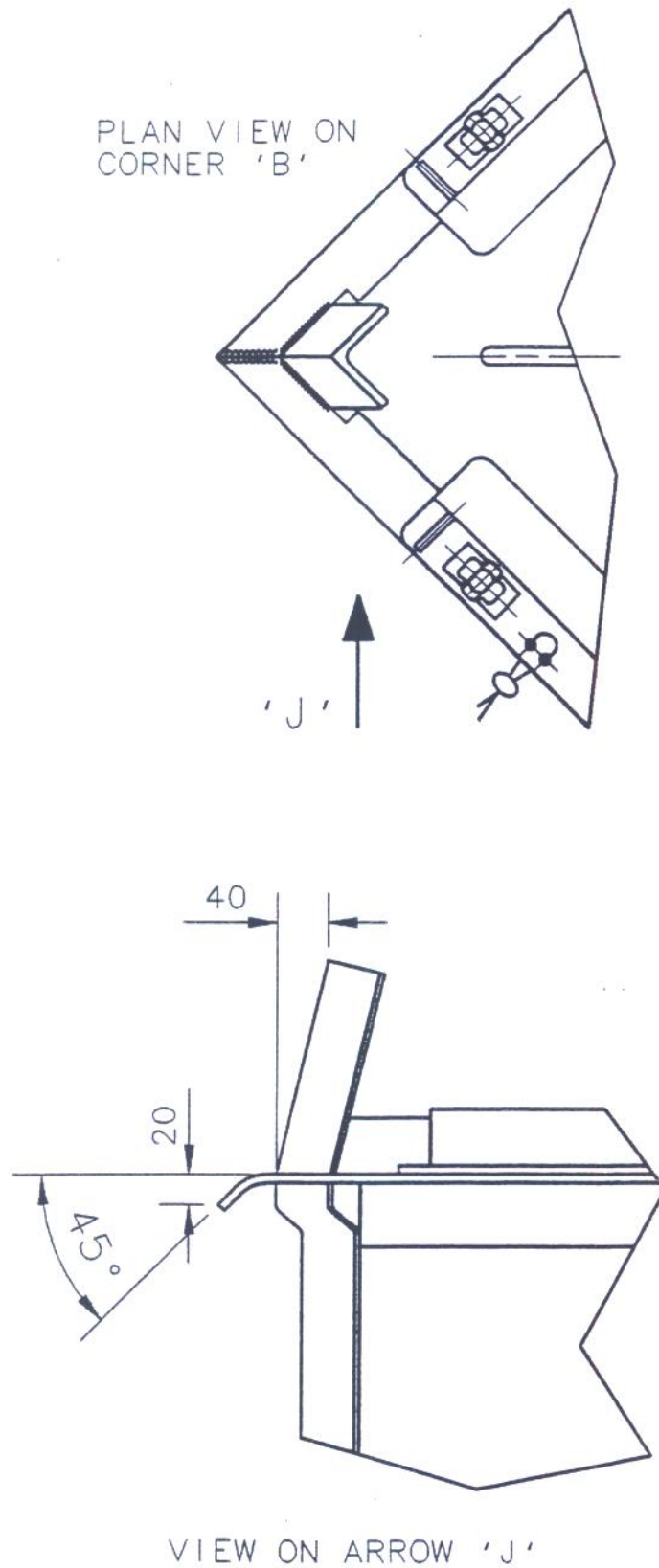


Figure 8 - Damage to Corner C after 0.3m Drop

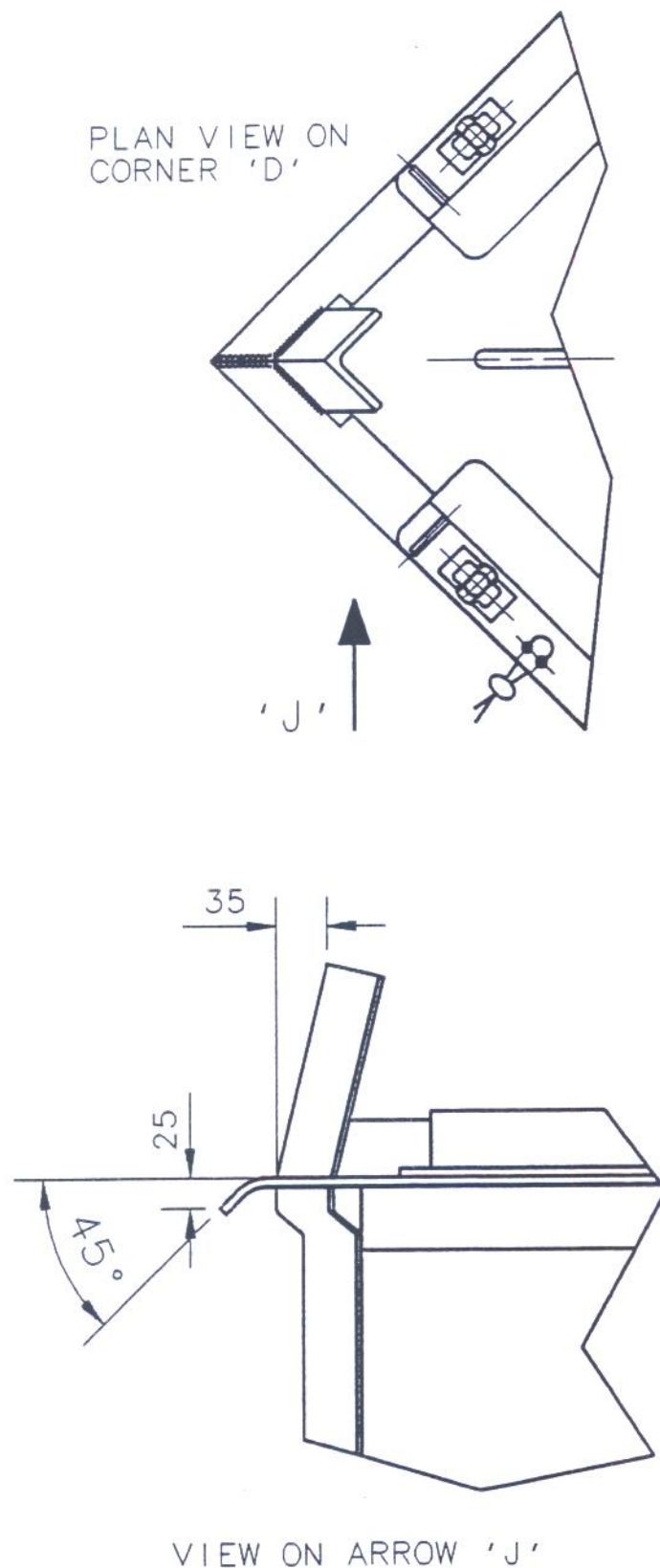


Figure 9 Damage to Corner D after 0.3m Drop

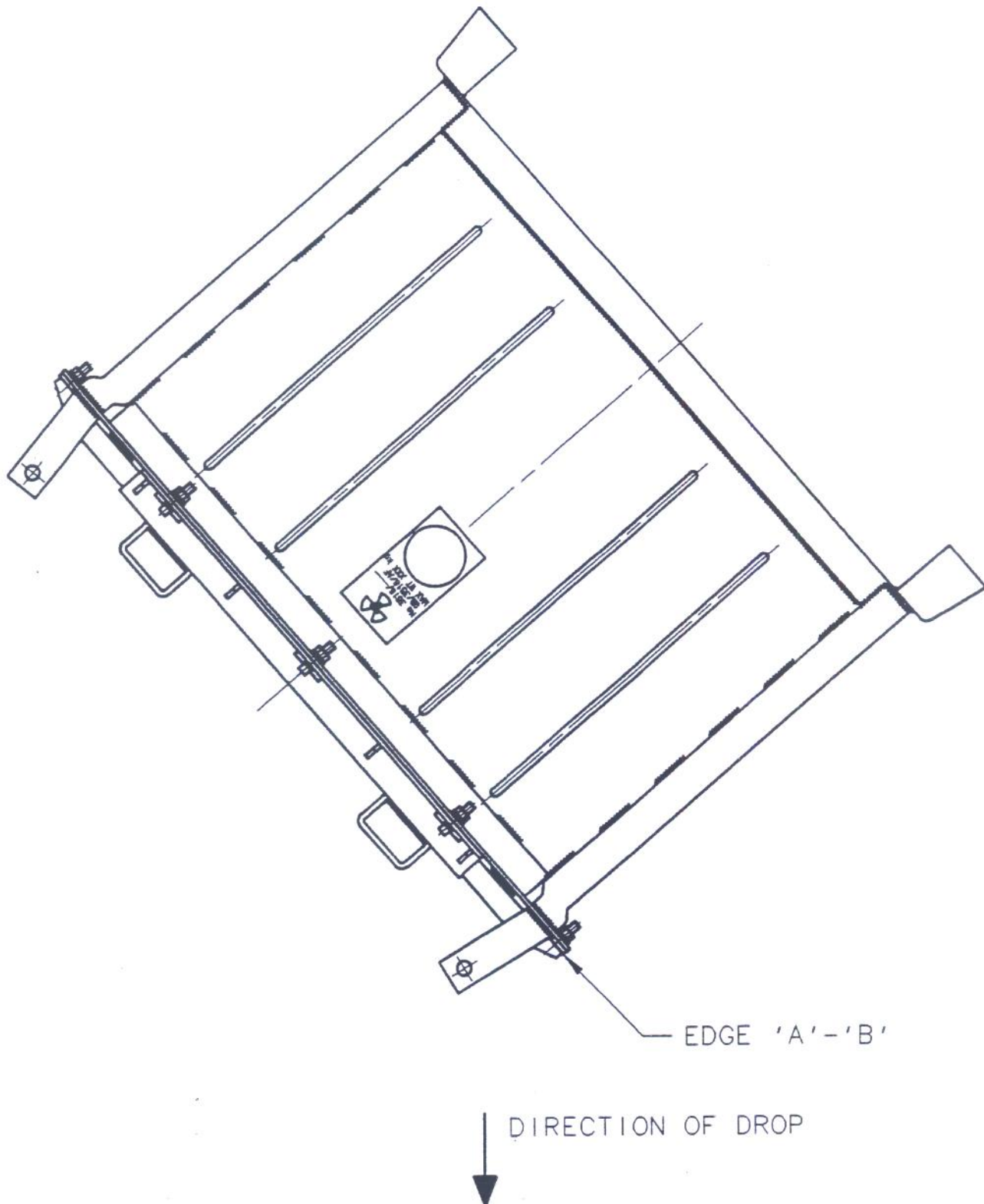


Figure 10 - Orientation of Package for 1.2m Drop, 9.0m Drop & Punch Test



Figure 11 - View of Damage after 1.2m Drop From Corner A



Figure 12 - View of Damage after 1.2m Drop From Corner B

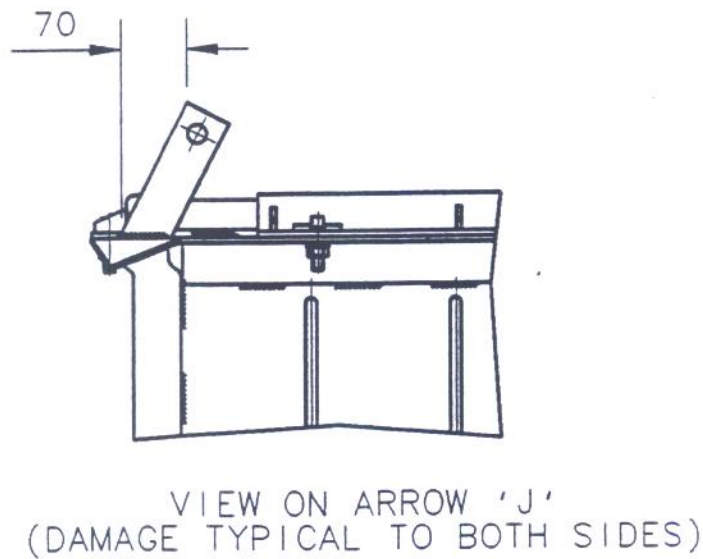
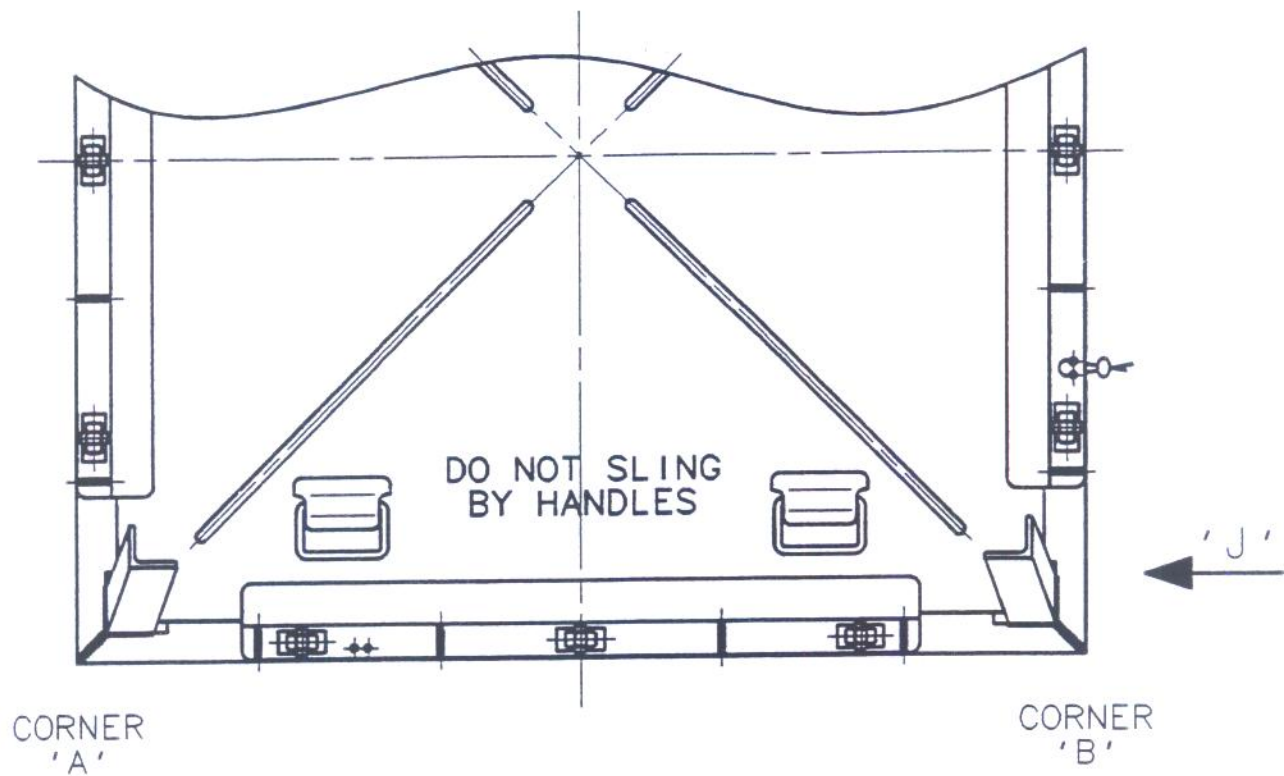


Figure 13 - Damage along Edge A-B Subsequent to 1.2m Drop

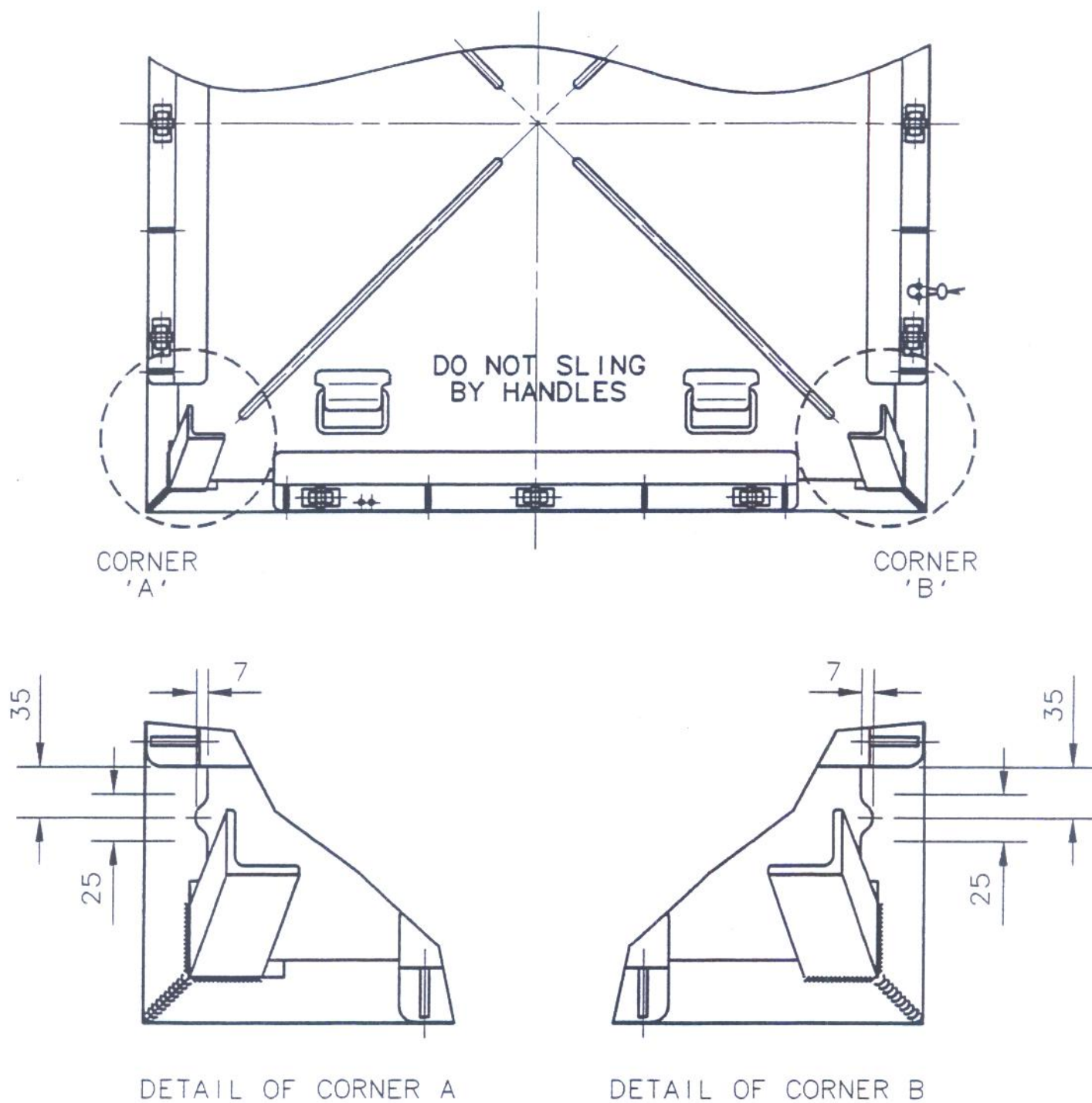


Figure 14 - Rippling of Lid Edge Subsequent to 1.2m Drop



Figure 15 - Package Suspended Prior to Lifting to 9.0m Edge Drop



Figure 16 - Package Following 9.0m Drop onto Edge A-B Viewed from A-E



Figure 17 - Package Following 9.0m Drop onto Edge A-B Viewed from B-F

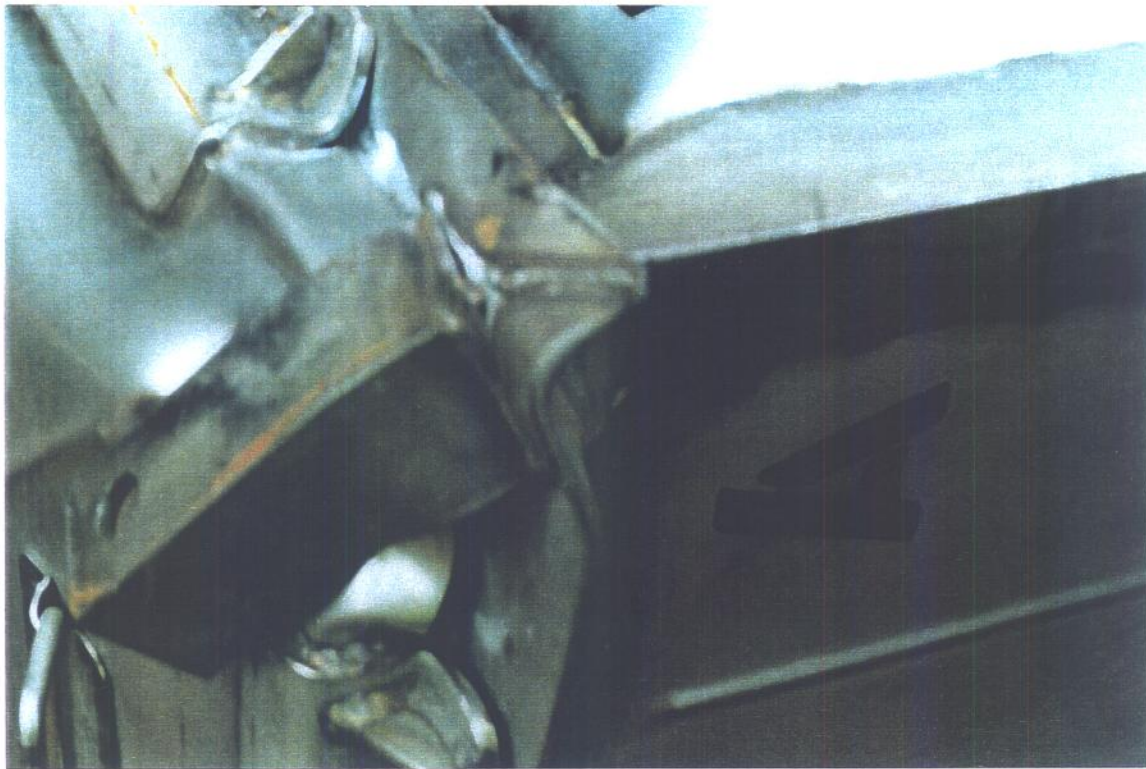


Figure 18 - Close-Up of Damage to Corner A Following 9.0m Edge Drop

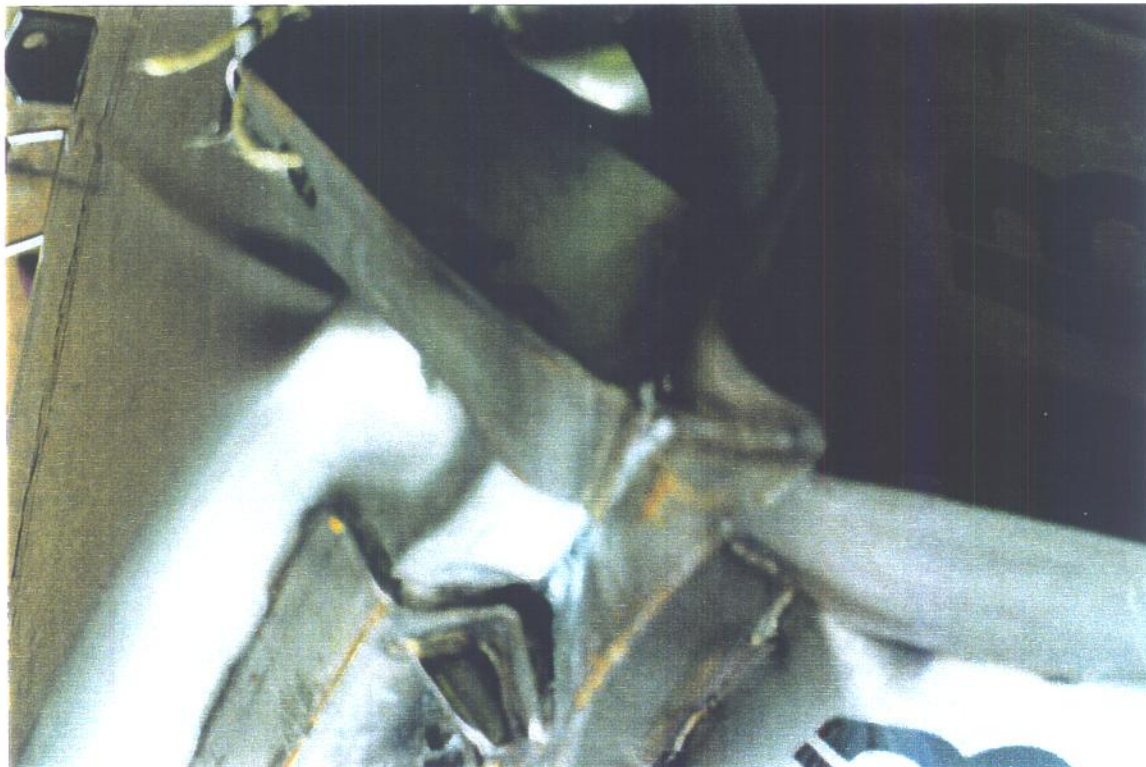


Figure 19 - Close-Up of Damage to Corner B Following 9.0m Edge Drop

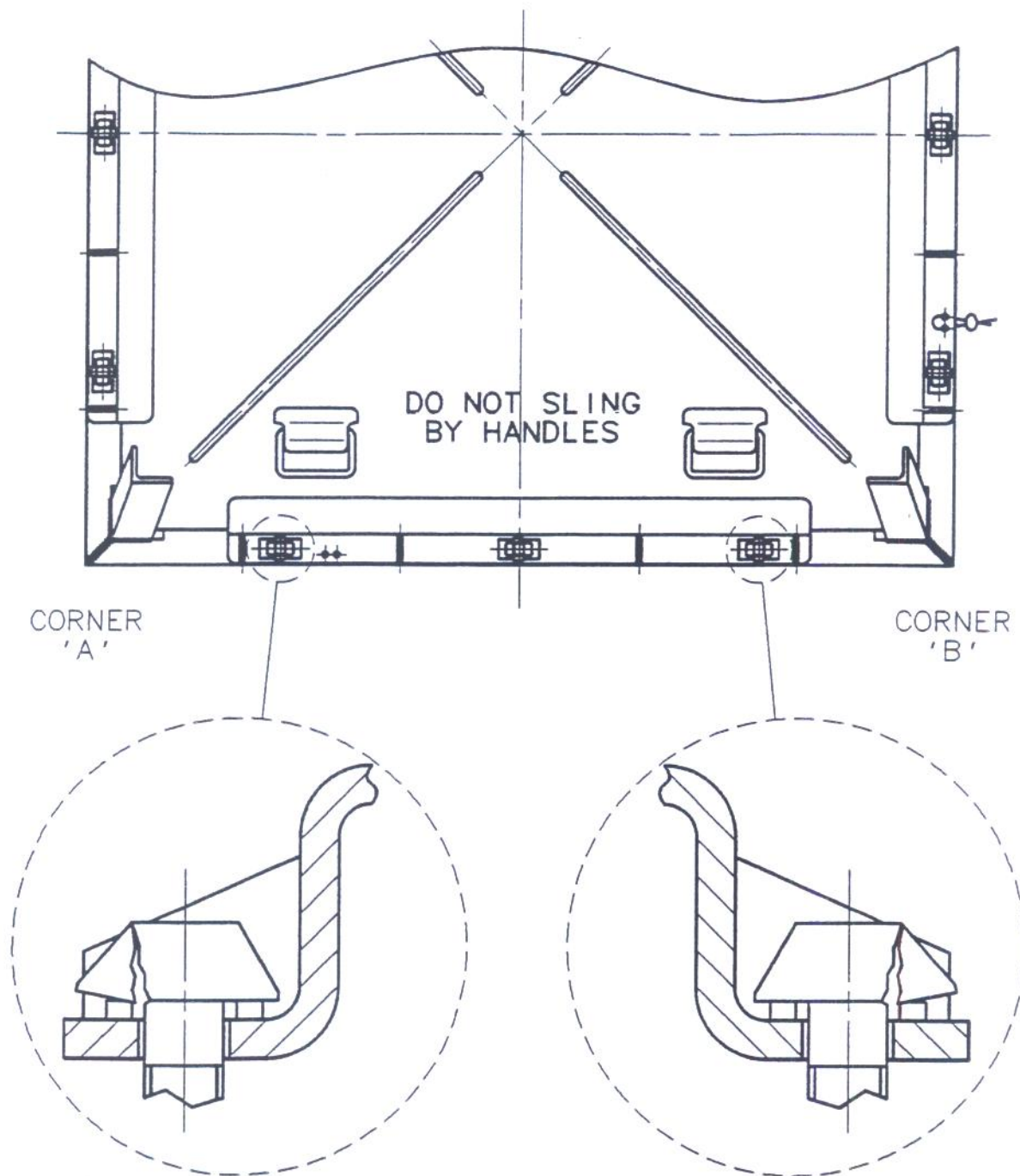


Figure 20 - Cracks in Bolt Heads on Edge A-B Subsequent to 9.0m Drop



Figure 21 - Package Suspended Prior to 1.0m Punch Test

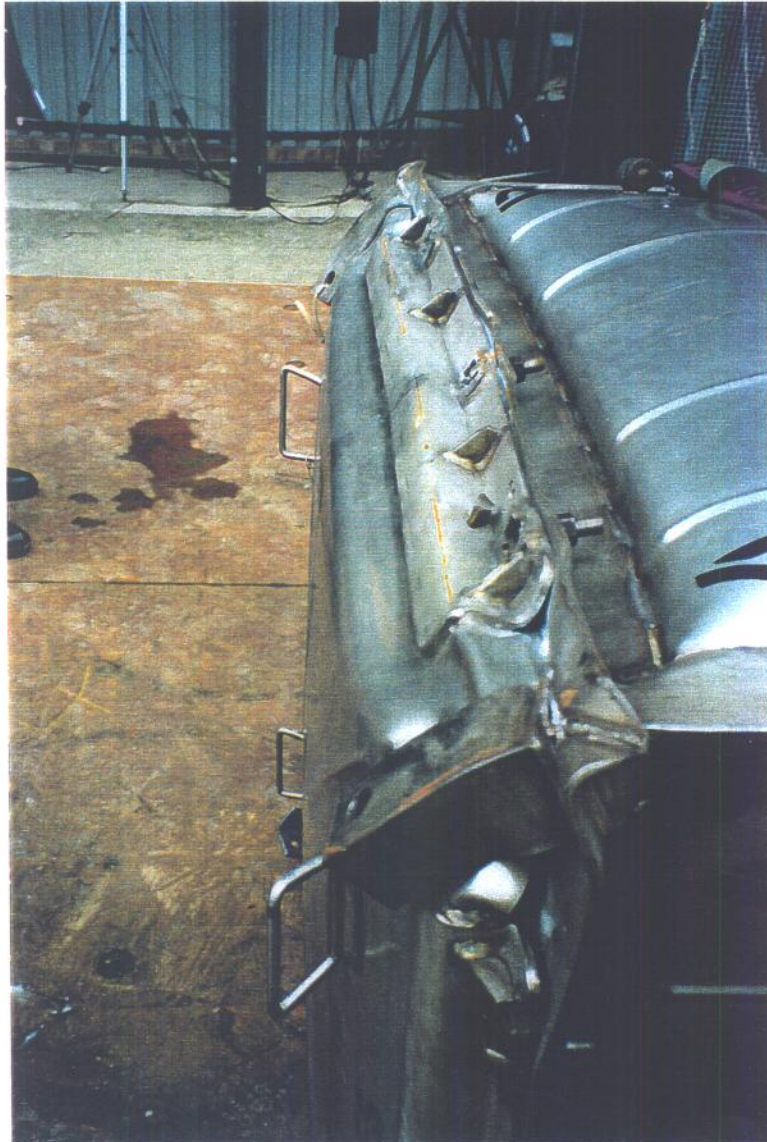


Figure 22 - Damage to Edge A-B Following 1.0m Punch Test



Figure 23 - Close Up of Centre Bolt Following 1m Punch Test

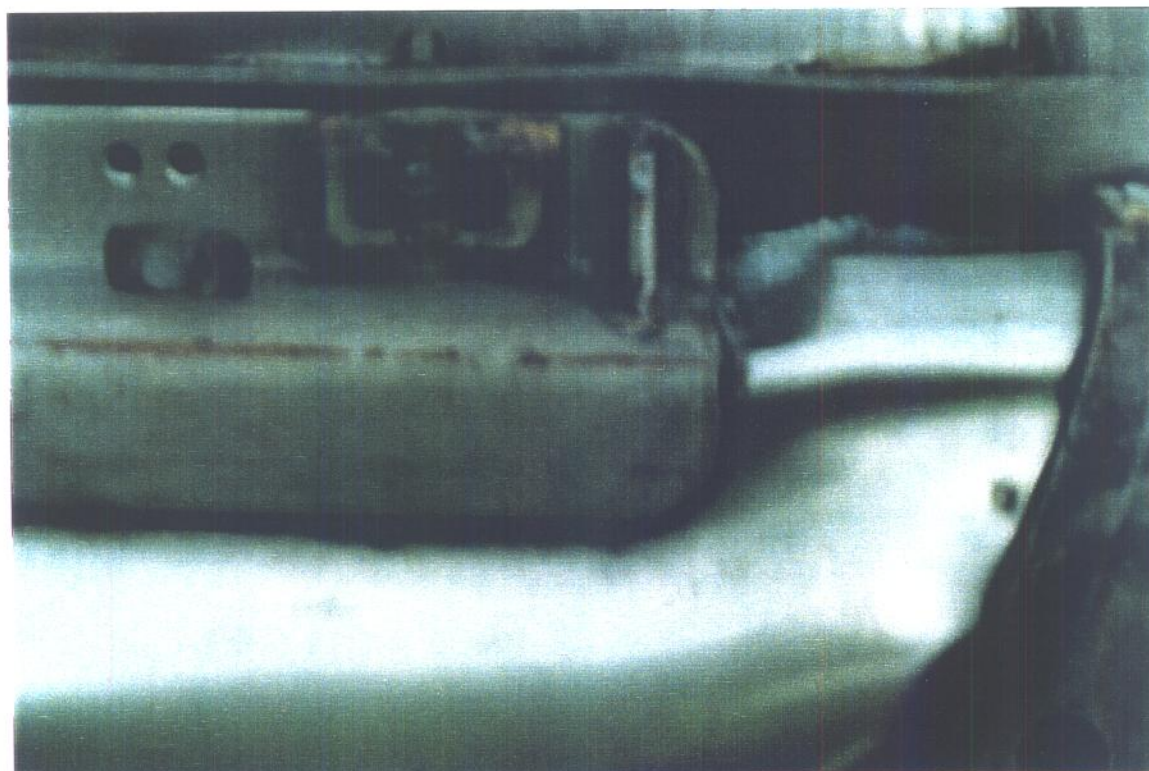


Figure 24 - Close-up of Corner Bolt Following 1m Punch Test

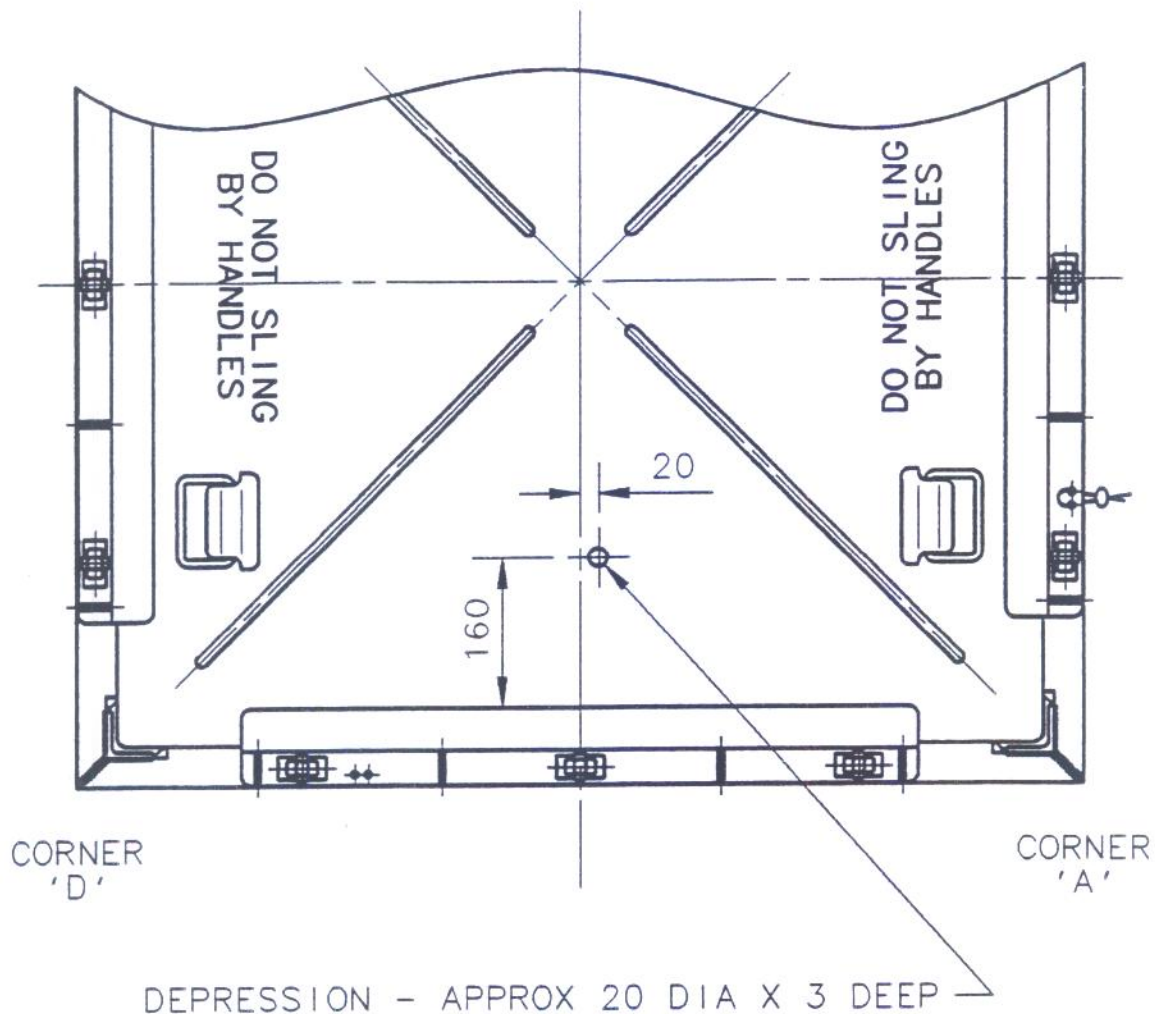


Figure 25 - Damage to Lid Subsequent to Penetration Test



Figure 26 - Package Sited in Fire Test Pool



Figure 27 - Initiation of the Pool Fire



Figure 28 - View of Fully Developed Engulfing Fire From West Side



Figure 29 - View of Fully Developed Engulfing Fire From North Side



Figure 30 - General View of Pool at Conclusion of Fire



Figure 31 - View of Package at Conclusion of Fire

3516 Fire Test

3 June 1997

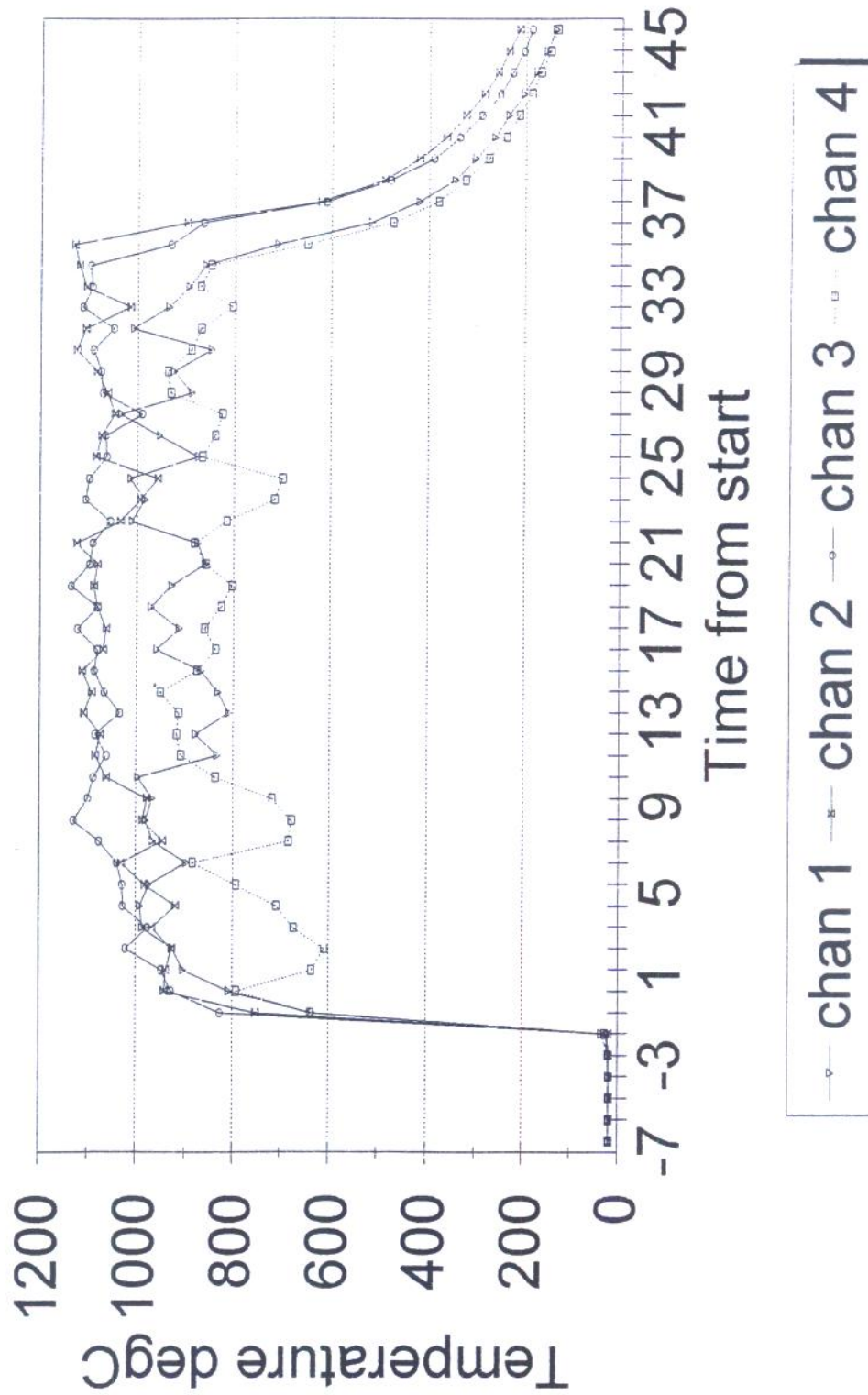


Figure 32 - Plots of Package Ambient Temperature During Fire Test



Figure 33 - Package Showing Outer Lid Removed Following Fire Test

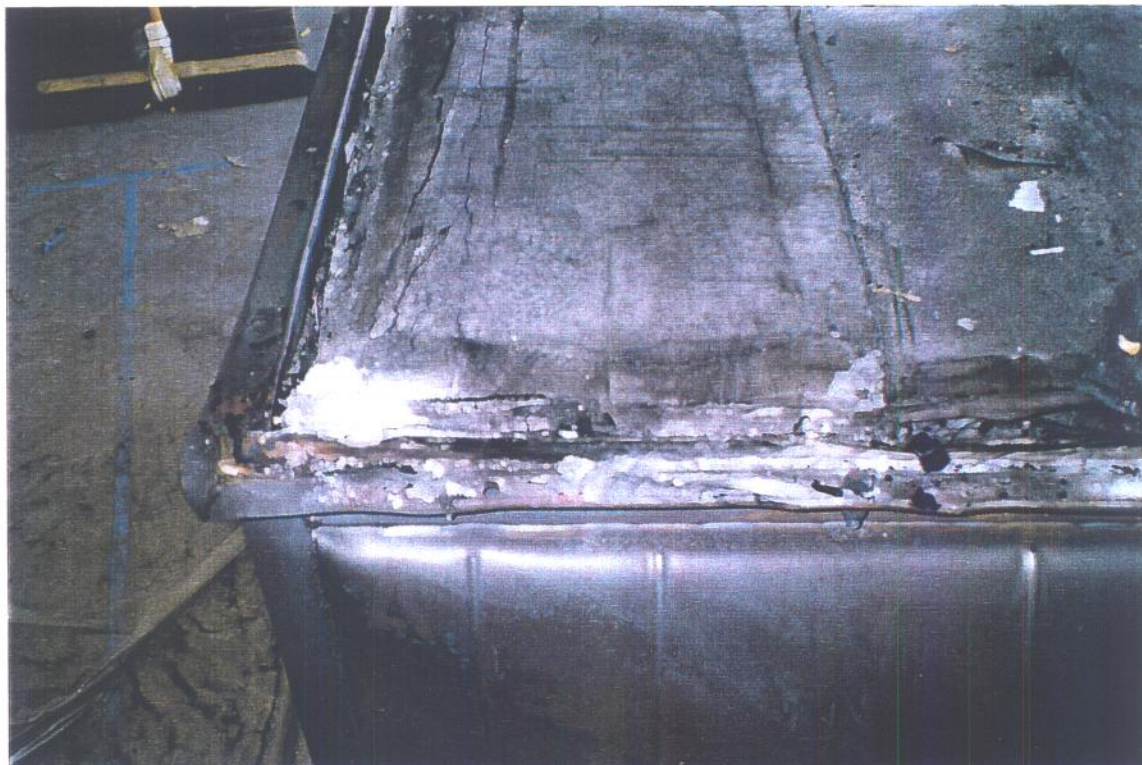


Figure 34 - Damage to Edge of Insulating Panel



Figure 35 - Top of Inner Lid Showing Fragmentation of Insulating Panel



Figure 36 - Upper Edge of Package Showing Extent of Severe Heating



Figure 37 - Underside of Inner Lid



Figure 38 - Package with Inner Lid Removed

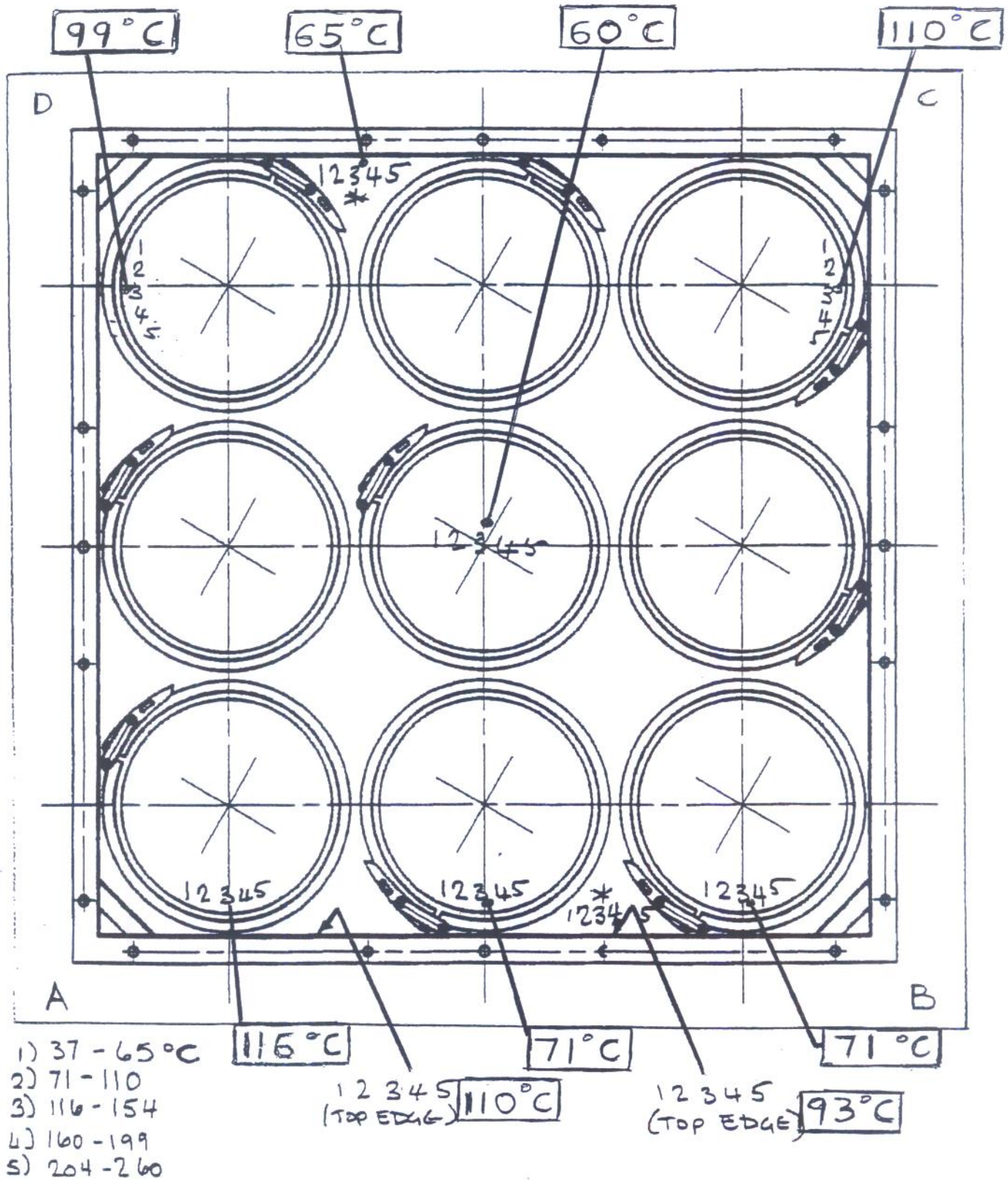


Figure 39 - Maximum Recorded Internal Temperatures

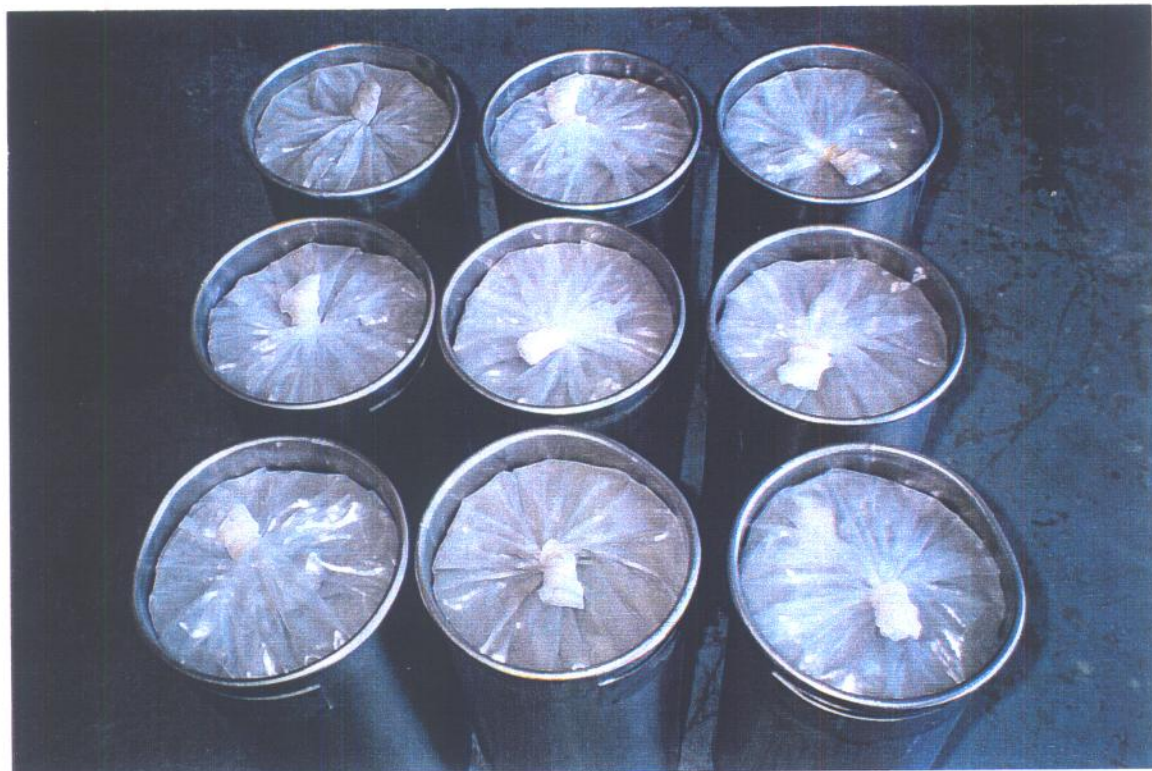


Figure 40 - Pails with Lids Removed



Figure 41 - Internal View of Pail with Contents Removed



AEA Technology

Test Certificate

Rig/Job:- BNFL 3516 Container/ Pail leak test
Measurement ident:-

Manufacturer(s):-

BNFL

Type(s):-

3518, drawing PK324038

Serial No(s):-

0012

Inspector(s):- (Signed)

(Name) J E Gillard

Date of Test

23 October 1997

Calibrated equipment:-

Flite meter B52/32LM89 ser 10668/70

Channel allocation:-

Ch1 ambient Ch2 pail test

Test gas:-

High purity nitrogen

Test location:-

B45 Winfrith

Procedure ref:- BNFL FEDR 95/2171 iss 2

Certificate No:- 12733/01

Silicone seal no.1		Silicone seal no.2		Silicone seal no.3		Neoprene seal no.1	
Pressure barA	Time second	Pressure barA	Time second	Pressure barA	Time second	Pressure barA	Time second
1.7530	0	1.7500	0	1.7495	0	1.7272	0
1.7437	600	1.7431	600	1.7534	600	1.5865	600
1.7396	1200	1.7393	1200	1.7563	1200	1.4925	1200
				1.7601	3600		
				1.7599	4500		
				1.7599	4800		
Leak rate 600-1200s	1.21×10^{-1}	Leak rate 600-1200s	1.12×10^{-1}	Leak rate 600-1200s	-8.59×10^{-2}	Leak rate 600-1200s	2.79
SLR	5.95×10^{-2}	SLR	5.52×10^{-2}	SLR	-4.14×10^{-2}	SLR	n/a

Notes- Tests witnessed by Mr M Towey. Leak rate and SLR calculated in accordance with AECF 1068 Appendix J assuming atmospheric pressure of 1.00barA and ignoring viscosity-temperature effects. Equipment used in manual mode. Leak rate for seal no.3 is zero at end of test.

Uncertainty of measurements:-
0.5mbar

Room Temperature:-
17.72 °C to 18.25 °C

Limitations on use:-
n/a

Test type:- Routine Pre-adjustment

Post-adjustment

Approval:- (Signed)

(Printed) J E GILLARD

Date of Certificate:-

4 Nov 97

Re-test due:-

n/a

Figure 42 - Test Certificate for Pail Leak Test

Appendices

CONTENTS

Appendix 1	Specification for Testing of BNFL 3516 Type A(F) Container
Appendix 2	Quality Plan for Testing of BNFL 3516 Type A(F) Container
Appendix 3	Equipment Calibration Sheets

Appendix 1

Test Specification

CONTENTS

1	Specification for Testing of BNFL 3516 Type A(F) Container
---	--

PACKAGE TESTING - SPECIFICATION	
Title: Testing of BNFL DN3516 Type A(F) Container	Page: 1 of 5 Issue: 1 Date: 15-Apr-97

TECHNICAL CONSULTANCY & TRANSPORT DEPARTMENT

SPECIFICATION FOR TESTING OF BNFL DN3516 TYPE A(F) CONTAINER

ISSUE: 1

CONTRACT REF:

X400585

AEA TECHNOLOGY

PACKAGE TESTING - SPECIFICATION


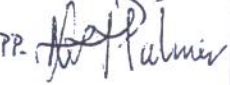
Title: Testing of BNFL DN3516 Type A(F) Container

Page: 2 of 5

Issue: 1

Date: 15-Apr-97

This Issue	Previous Issue	Changes	Issued by	On
1	Draft	As requested by BNFL ref. faxes JK97082 & JK97087	N Palmer	15/4//97

		ACCEPTED BY:-	APPROVED BY:-	QA CHECKED BY:
ISSUE		CUSTOMER BNFL	TC&TD Drop Test Manager	DWMS Group QA Representative
1	Name: Signed: Date:	G. NICHOLSON  17.4.97	J. E. GILLARD PP.  15/4/97	HIC GARDNER HUGARDNER 16/4/97
	Name: Signed: Date:			
	Name: Signed: Date:			

All work of AEA Technology plc is carried out in accordance with BS EN ISO 9001:1994. This is documented in the AEA Technology Quality Manual AEAT/QM/01.

AEA TECHNOLOGY

PACKAGE TESTING - SPECIFICATION	
Title: Testing of BNFL DN3516 Type A(F) Container	Page: 3 of 5 Issue: 1 Date:15-Apr-97

CUSTOMER: BNFL Fuel Division Springfields

CUSTOMER CONTACT: Commercial: John Kenny
Technical: Graham Nicholson

CUSTOMER ADDRESS: B321 Springfields, Preston Lancs. PR4 0XJ

CUSTOMER TELEPHONE: 01772 763700

CUSTOMER FAX: 01772 762429

TC&TD CONTACT: John Gillard

SPECIFICATION AND PROGRAMME DISCUSSIONS TOOK PLACE ON

Phone/fax discussions

CUSTOMER SPECIFICATION: Testing- FEDR 95/2171 issue 2
Dismantling- FEDR 95/2178 issue 2

PURPOSE OF TEST(S): Type A(F) tests to IAEA Safety Series No. 6

BRIEF OUTLINE OF PROPOSED TESTS:

Para 623	Test 1	stacking 3.5 te load
Para 624	Test 2	penetration 1m
Para 622b	Tests 3A, 3B, 3C, 3D	corner 0.3m
Para 622a	Test 4	1.2m drop
Para 627a	Test 5	9m drop
Para 627b	Test 6	1m punch
Para 628	Test 7	pool fire
Para 534	Test 8	pressure test

RECORDS REQUIRED (INC. NO. OF REPORTS)

One full report

NUMBER OF MEETINGS AND VISITS

During test programme only. Tests to be witnessed by Department of Transport.

AEA TECHNOLOGY

PACKAGE TESTING - SPECIFICATION	
Title: Testing of BNFL DN3516 Type A(F) Container	Page: 4 of 5 Issue: 1 Date: 15-Apr-97

TEST NOS.	1, 2, 3A, 3B, 3C, 3D, 4, 5, 6, 7, 8
ITEM TO BE TESTED:	<i>from</i> <i>PK3256912</i> DN3516 container to BNFL drawing PK324038 . Pressure test pail too BNFL drawing PK324038
SUPPLIED BY:	BNFL
PRE TEST INSPECTION REQUIREMENTS:	Inspected by BNFL prior to dispatch Internal temperature indicating strips to be attached by AEA Technology at locations to be agreed. Container lid securing bolts to have torque loading verified.
POST TEST INSPECTION REQUIREMENTS:	Photography and dismantling in accordance with BNFL quality plan FEDR 95/2178.
PRE TEST LEAK TEST REQUIREMENTS:	None
POST TEST LEAK TEST REQUIREMENTS:	Pressure test on pail at 0.25 bar
TEST PIECE WEIGHT:	To be determined prior to test 1
DROP WEIGHT:	As test piece
DROP HEIGHT AND ATTITUDE:	Various, see FEDR 95/2171
FACILITY TO BE USED:	Winfrith Outdoor Drop Test Facility
GUIDANCE:	none
INSTRUMENTATION REQUIREMENTS:	Non-reversible internal temperature indicating strips. (60 off 8-level)
THERMOCOUPLES:	Qty 4 external
Locations:	North, south, east, west. 0.3m from package faces on horizontal axes.

PACKAGE TESTING - SPECIFICATION	
Title: Testing of BNFL DN3516 Type A(F) Container	Page: 5 of 5 Issue: 1 Date:15-Apr-97

DATA RECORDING ON:

Orion data logger, 3 1/2 in disk

TEST No.

2,3,4,5,6,7

PHOTOGRAPHIC REQUIREMENTS:

VIDEO:

single camera, drop tests at 1/1000 s shutter speed, Fire test at normal shutter speed.

COPIES TO BE SUPPLIED:

one

FORMAT (VHS/UMATIC)

VHS

HIGH SPEED FILM:

none

TITLED:

Type 3516 Verification Tests in Accordance with IAEA Safety Series 6

SPEED (frames per sec):

FILM TO BE SUPPLIED SEPARATELY:

STILL PHOTOGRAPHS:

6"x 4" colour prints of all tests

TIMING MARKER:

none

OTHER PHOTOGRAPHIC REQUIREMENTS:

none

OTHER REQUIREMENTS (LIFTING POINTS, DRAWINGS, HANDLING, TRANSPORT, DISPOSAL) ETC.

4 off lifting holes on lower corners - BNFL to confirm that these are certified lifting features. (Note: confirmed)
Modification to pail to allow pressure testing to be agreed with BNFL.
Disposal instructions to be provided by BNFL.

Appendix 2

Test Quality Plan

CONTENTS

1	Quality Plan for Testing of BNFL 3516 Type A(F) Container
---	---

PACKAGE TESTING - QUALITY PLAN	
Title: Testing of BNFL DN3516 Type A(F) Container	Page: 1 of 18 Issue: 1 Date:15-Apr-97

TECHNICAL CONSULTANCY & TRANSPORT DEPARTMENT

QUALITY PLAN FOR TESTING OF BNFL DN3516 TYPE A(F) CONTAINER

ISSUE: 1

CONTRACT REF:

X400585

c:\msoffice\esproj\3516\bnqapl

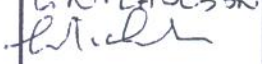
Title: Testing of BNFL DN3516 Type A(F) Container

Page: 2 of 18

Issue: 1

Date: 15-Apr-97

This Issue	Previous Issue	Changes	Issued by	On
1	Draft	As requested by BNFL ref. faxes JK97082 & JK97087	N Palmer	15/4/97

		ACCEPTED BY:-	APPROVED BY:-	QA CHECKED BY:
ISSUE		CUSTOMER BNFL	TC&TD Drop Test Manager	DWMS Group QA Representative
1	Name: Signed: Date:	G. NICHOLSON  17.4.97	J. E. GILLARD pp. N Palmer 15/4/97	H. GARDNER Hugane 16/4/97
	Name: Signed: Date:			
	Name: Signed: Date:			

All work of AEA Technology plc is carried out in accordance with BS EN ISO 9001:1994.
This is documented in the AEA Technology Quality Manual AEAT/QM/01.

PACKAGE TESTING - QUALITY PLAN	
Title: Testing of BNFL DN3516 Type A(F) Container	Page: 3 of 18 Issue: 1 Date: 15-Apr-97

TITLE **Testing of BNFL DN3516 Type A(F) Container**

CUSTOMER **BNFL Fuel Business Group, Springfield**

CUSTOMER REP **Mr G Nicholson** **AEA TECHNOLOGY REP** **Mr J Gillard**

VERIFYING AUTHORITY

ORGANISATION	POSITION	NAME	ABBREV.
AEA Technology plc	Drop Test Controller	N A H Palmer	DTC
AEA Technology plc	Drop Test Manager	J E Gillard	DTM
AEA Technology plc	Instrumentation Manager	J E Gillard	IMR
AEA Technology plc	Section Manager	K Stevens	SMR
BNFL Fuel Division	Project Manager	G Nicholson	BNFL

CRITERIA

TERM	DEFINITION	ABBREVIATION
ACCEPTANCE	Work shall not proceed beyond this point until authorised by the signature.	A
WITNESS	The authority identified shall be notified to enable the activity to be witnessed.	W
REPORT	A report of the activity shall be generated by the authority and held as objective evidence.	R
DOCUMENT CHECK	All documents relevant to the activity shall be received by the authority	D
SURVEILLANCE	Examination of the activity/documentation at the discretion of the authority.	S
CONFIRMATION	The authority identified shall confirm the completion of the activity by inspection.	C

PACKAGE TESTING - QUALITY PLAN

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Date: 15-Apr-97

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ELIMINARY ACTIVITIES





	Specification and Quality Plan submitted to customer for approval	GW/19/4101	Specification Quality Plan	DTM	C			
1								
2	Specification and Quality Plan approved by customer	GW/19/4101	Approved Specification and Quality Plan	DTM 16/4/17	D			
3	All measuring equipment and facilities checked and calibrated	GW/19/4102	Calibration certificates	DTM 17/4/17	D			
4	Test Certificates for lifting features available	AEAT/SI/ GW/19/4103	Test Certificates	DTM 16/4/17	D			
5	Lifting procedures agreed	AEAT/SI/19 GW/19/4103	Quality Plan	DTM 16/4/17	C			
6	Fully assembled container received and placed in covered storage area	PK325692	Container Quality Plan	DTM 16/4/17	C			
7	Identification and orientation reference markings present on container	FEDR 95/2171 appendix A	Quality Plan Photographs, report	DTM 16/4/17	C			

T	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	VERI AUTH	AWRDSC
				SIGN	DATE	SIGN	DATE	SIGN	DATE

EQUIPMENT PREPARATION									
8	Spare								
9	Drop test target and punch prepared		Quality Plan	DTC	C				
10	Allocate lifting equipment necessary for drop tests.	GW1/19/4103	Quality Plan	DTC	17/4/97				
11	Check drop test area and equipment - video equipment, release unit and lifting tackle	GW1/19/4103 GW1/19/4102 GW1/19/4104	Quality Plan	DTC	17/4/97				
12	Fit temperature indicators to pail Lids and container .	Fax JK97083 & Sketch	Quality Plan	IMR	17/4/97				
13	Spare				18/4/97				
14	Spare								
15	Spare								

CT O.	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	DATE	SIGN	DATE	SIGN	AWRDSC
				DTC	C	DTC	C	DTC	C	DTC	C	
												SIGN
STACKING TEST IAEA SS 6 para 623												
16	Weigh container	GW1/19/4102	Quality Plan	DTC	C							
17	Set up container in stacking test area		Photographs Quality Plan	DTC	21.4.97 C							
18	Weigh test loads and apply 5x container	GW1/19/4103	Quality Plan Report	DTC	21.4.97 C							
19	Spare				21.4.97							
20	Spare											
21	After 24 hours remove test load and inspect for damage	GW1/19/4109	Report Photographs	DTC	C							
					22.4.97							

ACT D.	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	VERI AUTH	AWRDSC
				SIGN	DATE	SIGN	DATE	SIGN	DATE

	PENETRATION TEST IAEA SS 6 para 624								
22	Set up container on drop test target and impact penetration test missile on weakest part of package	GW1/19/4102	Quality Plan photograph video record	DTC 	C 22-4-97		22/6/97		
23	Inspect for damage	GW1/19/4102	Quality Plan photograph	DTC 	C 22-4-97		22/6/97		
24	Spare								
25	Spare								
26	Spare								
27	Spare								

PACKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container

Issue: 1

Date: 15-Apr-97

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CT O.	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	DATE	SIGN	DATE	VERI AUTH	AWRDSC	DATE
				SIGN									
28	CORNER DROP A 0.3M IAEA SS 6 para 622b Suspend model at the correct drop attitude for corner 0.3m drop no.3A Take pre-drop photographs.	GWI/19/4102 GWI/19/4103	Photographs Report	DTC									
				<i>WPR</i>	22-4-97								
29	Hold point Confirm orientation	GWI/19/4102	Quality Plan	DTC	A	BNFL	A						
				<i>WPR</i>	22-4-97	<i>BNFL</i>							
30	CARRY OUT DROP TEST No3A FROM 0.3 m	GWI/19/4102	Video	DTC	CR								
				<i>WPR</i>	22-4-97	<i>BNFL</i>							
31	Record post drop external damage to container.	GWI/19/4102	Photographs Report	DTC	CR								
				<i>WPR</i>	22-4-97	<i>BNFL</i>							

TECHNOLOGY

CKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container	Issue: 1	Date: 15-Apr-97	Page: 9 of 18
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ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC
			SIGN	DATE	SIGN	DATE

2	CORNER DROP B 0.3M Suspend model at the correct drop attitude for corner 0.3m drop no.3B Take pre-drop photographs.	GW1/19/4102 GW1/19/4103	Photographs Report	DTC [Signature]	CR 22.4.97	✓ 22/4/97
3	Hold point Confirm orientation	GW1/19/4102	Quality Plan	DTC [Signature]	A 22.4.97	BNFL 22/4/97
4	CARRY OUT DROP TEST No3B FROM 0.3 m	GW1/19/4102	Video	DTC [Signature]	CR 22.4.97	✓ 22/4/97
5	Record post drop external damage to container.	GW1/19/4102	Photographs Report	DTC [Signature]	CR 22.4.97	✓ 22/4/97

PACKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container

Issue: 1

Date: 15-Apr-97

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ACT D.	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	VERI AUTH	AWRDSC
				SIGN	DATE	SIGN	DATE	SIGN	DATE

CORNER DROP C 0.3M									
36	Suspend model at the correct drop attitude for corner 0.3m drop no.3C Take pre-drop photographs.	GW1/19/4102 GW1/19/4103	Photographs Report	DTC APR 22.4.97	CR				22/4/97
37	Hold point Confirm orientation	GW1/19/4102	Quality Plan	DTC APR 22.4.97	A	BNFL	A		
38	CARRY OUT DROP TEST No3C FROM 0.3 m	GW1/19/4102	Video	DTC APR 22.4.97	CR	BNFL			
39	Record post drop external damage to container.	GW1/19/4102	Photographs Report	DTC APR 22.4.97	CR				
				DTC APR 22.4.97					22/4/97

PACKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container

Issue: 1 Date: 15-Apr-97

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T	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	VERI AUTH	AWRDSC
				SIGN	DATE	SIGN	DATE	SIGN	DATE

40	CORNER DROP D 0.3M Suspend model at the correct drop attitude for corner 0.3m drop no.3D Take pre-drop photographs.	GWI/19/4102 GWI/19/4103	Photographs Report	DTC	CR	✓	22/4/97		
				APP	22.4.97				
				DTC	A	BNFL	A		
41	Hold point Confirm orientation	GWI/19/4102	Quality Plan	DTC	22.4.97	BNFL	22/4/97		
				APP	22.4.97				
				DTC	CR				
42	CARRY OUT DROP TEST No3D FROM 0.3 m	GWI/19/4102	Video	DTC	22.4.97	✓	22/4/97		
				APP	22.4.97				
				DTC	CR				
43	Record post drop external damage to container.	GWI/19/4102	Photographs Report	DTC	22.4.97	✓	22/4/97		
				APP	22.4.97				
				DTC	CR				

PACKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container

Issue: 1 Date: 15-Apr-97

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CT NO.	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	VERI AUTH	AWRDSC
				SIGN	DATE	SIGN	DATE	SIGN	DATE

44	1.2M DROP IAEA SS 6 para 627b Suspend model at the correct drop attitude for 1.2m drop Take pre-drop photographs.	GWI/19/4102 GWI/19/4103	Photographs Report	DTC	CR	✓	22/4/97		
				APP	22.4.97				
				DTC	A	BNFL	A		
45	Hold point Confirm orientation	GWI/19/4102	Quality Plan	DTC	22.4.97	BNFL	22/4/97		
				APP	22.4.97				
				DTC	CR	✓	22/4/97		
46	CARRY OUT DROP TEST FROM 1.2 m	GWI/19/4102	Video	DTC	22.4.97	✓	22/4/97		
				APP	22.4.97				
				DTC	CR				
47	Record post drop external damage to container.	GWI/19/4102	Photographs Report	DTC	22.4.97	✓	22/4/97		
				APP	22.4.97				
				DTC	CR				

PACKAGE TESTING - QUALITY PLAN

Issue: 1

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	DROP 9.0M IAEA SS 6 para 627a								
48	Suspend model at the correct drop attitude for corner 9.0m drop no.5 Take pre-drop photographs.	GW1/19/4102 GW1/19/4103	Photographs Report	DTC	CR	✓	22/4/97		
49	Hold point Confirm orientation	GW1/19/4102	Quality Plan	DTC	A 22-4-97	BNFL	A		
50	CARRY OUT DROP TEST No.5 FROM 9.0m	GW1/19/4102	Video FALLING TO BENCH. Jen	DTC	22-4-97	(Signature)	22/4/97		
51	Record post drop external damage to container.	GW1/19/4102	Photographs Report	DTC	22-4-97	✓	22/4/97		

PACKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container

Issue: 1 Date: 15-Apr-97

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ACT NO.	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	VERI AUTH	AWRDSC
				SIGN	DATE	SIGN	DATE	SIGN	DATE

	PUNCH TEST 1.0M IAEA SS 6 para 627b								
52	Suspend model at the correct drop attitude for 1.0m punch test Take pre-drop photographs.	GW1/19/4102 GW1/19/4103	Photographs Report	DTC	CR	✓	22/4/97		
53	Hold point Confirm orientation	GW1/19/4102	Quality Plan	DTC	22.4.97 A	BNFL	A		
54	CARRY OUT PUNCH TEST FROM 1.0 m	GW1/19/4102	Video	DTC	22.4.97 CR	RAIL	22/4/97		
55	Record post drop external damage to container.	GW1/19/4102	Photographs Report	DTC	22.4.97 CR	✓	22/4/97		
				DTC	22.4.97	✓	22/4/97		

PACKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container	Issue: 1	Date: 15-Apr-97	Page: 15 of 18
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T	ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDSC	VERI AUTH	AWRDSC	VERI AUTH	AWRDSC
				SIGN	DATE	SIGN	DATE	SIGN	DATE

56	THERMAL TEST IAEA SS 6 para 628 Procure fuel, set up package supports, bund and flame guides	GW1/19/4107	Quality Plan	DTM <i>Jeffrey</i>	CR				
57	Set up and test data logger, check weather, instruments and thermocouples	GW1/19/4107	Quality Plan	DTM <i>Jeffrey</i>	A	2/6/97			
58	Give 24 hours notice of test to relevant authorities	GW1/19/4107	Quality Plan	DTM <i>Jeffrey</i>	CR	2/6/97	BNFL <i>enid</i>	S	2/6/97
59	Fill pool with water to required depth and check cooling of package supports	GW1/19/4107	Quality Plan Photographs	DTM <i>Jeffrey</i>	CR		u		
60	Place package on supports in required orientation	GW1/19/4107		DTM <i>Jeffrey</i>	C	3/6/97	u		
61	Hold point - Activities 56 to 60 complete	GW1/19/4107	Quality Plan	DTM <i>Jeffrey</i>	A	2/6/97	BNFL <i>enid</i>	A	2/6/97
						3/6/97			3/6/97

CKAGE TESTING - QUALITY PLAN

Testing of BNFL DN3516 Type A(F) Container	Issue: 1	Date: 15-Apr-97	Page: 17 of 18
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ACTIVITY DESCRIPTION	SPEC PROCEDURE DRAWING	OBJECTIVE EVIDENCE GENERATED	VERI AUTH.	AWRDCS	VERI AUTH	AWRDCS	VERI AUTH	AWRDCS
			SIGN	DATE	SIGN	DATE	SIGN	DATE

69	Set up barriers around pool. Notify Site Control and leave package in position overnight.	GW1/19/4107	Quality Plan	DTM	C			
70	Disconnect thermocouples and remove package to workshop for dismantling.	GW1/19/4107	Quality Plan	DTM	C			
71	Consult manager of site effluent system and drain residue from pool if no significant fuel content, otherwise transfer surplus fuel to local storage.	GW1/19/4107	Quality Plan	DTM	C			
72	Dismantle package in accordance with specification.	BNFL FEDR 95/2178	Photographs	DTM	C	BNFL	S	

PACKAGE TESTING - QUALITY PLAN

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73	Pressure Test IAEA SS 6 para 534 Conduct pressure test on inner pail at 0.95 bar 0.75	BNFL FEDR 95/2171	Report		DTM	R				
74	Compile report and submit to customer for approval		Report		<i>Agreed</i> DTM	23/10/97 D				
75	Incorporate mods and issue final report		Report		<i>Agreed.</i> DTM	23/10/97 D				
76	Hold Project Review		Project file		<i>Agreed.</i> DTM	24/10/97 D				
77	Archive records		Quality Plan		DTM	C				
78	Invoice customer		Quality Plan SIRS		DTM	D				

Appendix 3

Equipment Calibration

Certificates

CONTENTS

1	10 tonne load cell serial no. 85-AP2
2	Orion data logger
3	DFT thermocouples

AUSTIN & McLEAN LIMITED

LIFTING EQUIPMENT AND INDUSTRIAL DOOR ENGINEERS

Registered Office: Tel: (01202) 511315

7 Denmark Road, Fax: (01202) 529866

Winton,

Bournemouth

BH9 1PD

VAT Reg GB 185 3047 59

Registered in England No 350683



We are members of the LIFTING EQUIPMENT ENGINEERS ASSOCIATION who set, maintain and approve our technical standards.

am
am

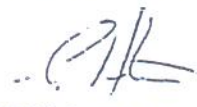
CERTIFICATE OF CALIBRATION

CERTIFICATE NO. AMCAL96053
DATE OF ISSUE 26th September 1996
MANUFACTURER Dynafor
PRODUCT Tensile Load Link, SWL 10 tonne
SERIAL NO. 85-AP2
ACCURACY $\pm 2\%$

TEST RESULTS

APPLIED LOAD	1	2	3
2000 kg	1.94 tonne	1.94 tonne	1.93 tonne
4000 kg	3.92 tonne	3.93 tonne	3.92 tonne
6000 kg	5.93 tonne	5.93 tonne	5.93 tonne
8000 kg	7.90 tonne	7.91 tonne	7.91 tonne
10000 kg	9.87 tonne	9.86 tonne	9.87 tonne
Zero	0.00 tonne	0.00 tonne	0.00 tonne

The tests were undertaken on a 50 Ton Mechanical Lever Horizontal Tensile Test Machine Ser. No. 38 Calibrated to BS EN 10002-2:1992 Grade 1.0

TEST CONDUCTED BY  G. HICKSON



AEA Technology

Calibration Certificate

Rig/Job:- General use equipment *MMTT 016* Date of Calibration 17 February 1997
Measurement ident:- Data Logger Transfer Standard equipment:- Fluke 515A
Manufacturer(s):- Schlumberger Calibrator ser 2200008 on hire from Microlease
Type(s):- Orion 3531D
Serial No(s):- 100157
Inspector(s):- (Signed) *[Signature]*
(Name) *JE Gillard*
Procedure ref:- see sheet 2 Certificate No:- 41410/02 sheet 1 of 2

Input V dc	Indication	Input V dc	Indication	Input	Indication	
0.00000	0.000002	0.00000	0.000001	0.000	00.0002	
0.10000	0.100006	1.00000	1.00001	1.00 400Hz	1.0020	
0.20000	0.200006	2.00000	2.0000	10.0 400Hz	10.019	
0.30000	0.29999	3.00000	2.9999			
0.40000	0.40000	4.00000	4.0000	10.0 4kHz	10.023	
0.50000	0.50000	5.00000	5.0000	Input	Type K	Spec
0.60000	0.60000	6.00000	6.0001	000uV dc	-0.03degC	0.0
0.70000	0.70000	7.00000	7.0001	198uV dc	5.00	5.0
0.80000	0.80001	8.00000	8.0000	397uV dc	10.00	10.0
0.90000	0.90001	9.00000	8.9999	597uV	15.00	15.0
1.00000	1.00001	10.0000	10.0000	798uV dc	20.00	20.0
				1000uVdc	25.00	25.0
		100.000	99.991			

Uncertainty of measurements:- 0.003% of input dc volt Room Temperature:- 22 degC
0.06% of input ac
0.06% of input res
2 uV type K range

Limitations on use:-

Calibration type:- Routine Pre-adjustment Post-adjustment

Approval:- (Signed)

[Signature]

Date of Certificate:- 18 February 1997

(Printed)

K. Stevens

Re-calibration due:- 17 February 1998

Calibration Certificate

Rig/Job:- General use equipment *MMTT*
016

Date of Calibration 17 February 1997

Measurement ident:- Data Logger

Transfer Standard equipment:- Fluke 515A

Manufacturer(s):- Schlumberger

Calibrator ser 2200008 on hire from Microlease

Type(s):- Orion 3531D

Serial No(s):- 100157

Inspector(s):- (Signed) *[Signature]*
(Name) J B Gillard

Procedure ref:- see below

Certificate No:- 41410/02 sheet 2 of 2

Input res	Indication 1mA	Input res	Indication 100uA			
0	-0.0057	0.00000	0.0414			
10	9.944	10.0	10.032			
100	99.92	100	100.011			
1000	999.86	1000	999.93			
10000	9999.3	10000	9999.4			
100000	99975					

Procedure: All equipment in lab 24 hours before calibration
Fluke calibrator connected directly to data logger terminals
Logger set to monitor to internal printer. All 'indication' values are mean of at least 3 readings on printout.

Uncertainty of measurements:- see sheet 1

Room Temperature:- see sheet 1

Limitations on use:- see sheet 1

Calibration type:- Routine Pre-adjustment

Post-adjustment

Approval:- (Signed) see sheet 1

Date of Certificate:- see sheet 1

(Printed)

Re-calibration due:- see sheet 1

Calibration Certificate

Rig/Job:- Pool Fire Test Facility
Post - 3516 fire test
Pre- 2999 fire test

Date of Calibration 24 June 1997

Measurement ident:- DFT
(Directional Flame Thermometers)

Transfer Standard equipment:-
Digitron Digital Thermometer T202KC with
type K probe


Manufacturer(s):-
AEA Technology/ TC Limited

Next Calibration 18 June 1998
Current Cert 36499T

Type(s):-
Drawing FSK009 iss.C

Other equipment-
Furnace. Carbolite type LMF5-PID ser.2/79/56

Serial No(s):-
North, South, East, West

Inspector(s):- (Signed) 
(Name) J E Gillard

Procedure ref:- See below

Certificate No:- 12706/1

Sensor	Ambient	700°C set	800°C set	900°C set
Cal	19.2°C	695°C	802°C	906°C
North	19.0°C	677°C	785°C	889°C
South	19.2°C	696°C	802°C	908°C
East	19.3°C	699°C	808°C	913°C
West	19.2°C	707°C	813°C	919°C

Method:

Calibrated probe and the 4 dft assemblies placed close together in Carbolite furnace in Lab B45 Winfrith. Ambient readings noted. Oven controller (uncalibrated) set to 700°C. After 4 hours readings noted. 800°C set. After 40 minutes readings noted. 900°C set. After 90 minutes readings noted.

All readings are with the defined sensor connected to calibrated digital thermometer channel B.

Uncertainty of measurements:-
+/- 10°C due to position in oven

Room Temperature:-
19°C

Limitations on use:-

Pool Fire Test Facility only

Calibration type:- Routine Pre-adjustment Post-adjustment

Approval:- (Signed)

Date of Certificate:- 26 June 1997

(Printed)


J E Gillard

Re-calibration due:-

25 June 1998

Distribution:

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Harwell Reports Centre

Mr P Giddins
Mr J E Gillard

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AEA Technology B44/009 Winfrith