Safety Analysis Report for the Model 880 Series Transport Package

QSA Global, Inc. Burlington, Massachusetts December 2015 - Revision 10 Page 2-43 1

2.12.11 Test Report #1 for Test Plan 186 Rev 1 (minus Sections 8.4 & 8.5)



Document Number F-E-1808-2 Test Report Cover Sheet

Revision

1

TEST REPORT #1 FOR TEST PLAN 186

Model 880 Pipeliner Type (B) Transport Package Test Results

10 CFR 71, Packaging and Transportation of Radioactive Materials
 Subpart F – Package, Special Form, and LSA-III Tests
 Sect 71.71 Normal Conditions of Transport
 Sect 71.73 Hypothetical Accident Conditions

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Section 1 Introduction

This document describes the mechanical test results for the Model 880 Pipeliner Projector to meet NRC requirements for Type B(U)-96 packages as described in the Code of Federal Regulations, 10 CFR Part 71, revised as of January 1, 2009.

The test report also covers the criteria stated in the International Atomic Energy Agency (IAEA), Safety Standards Series No. TS-R-1, Regulations for the Safe Transport of Radioactive Material, 1996 Edition, Section VI.

This document describes the test package specifications, testing equipment, testing results, describes the package orientations for the different test specimens and records of the tests performed and results of those tests.

This series of tests evaluated the Pipeliner Jacket assembly mounted on the Model 880 Projector.

Section 2 Construction and Acceptance of Test Specimens

The Model 880 assemblies used for these devices were originally manufactured by QSA Global as production Model 88015.

The assemblies were retrofitted to the PipeLiner configuration by QSA Global production personnel under TMI279.

The PipeLiner retrofit components for these devices were supplied and assembled by IRSS.





FIGURE 2.2 MODEL 880 PROJECTOR WITH PIPELINER JACKET, DN 88095 Rev A

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Section 3 Test Objectives and Orientations

Objectives

The purpose of this series of tests is to demonstrate that the Model 880 Pipeliner projector complies with the Type B(U)-96 transport package test requirements as described in the Code of Federal Regulations, 10 CFR Part 71, revised as of January 1, 2009 and the International Atomic Energy Agency (IAEA), Safety Standards Series No. TS-R-1, Regulations for the Safe Transport of Radioactive Material, 1996 Edition, Section VI.







Section 4 Test Data

1.2m Free Drop Test Set-up

Serial Number TP186A

Initial setup for TP186A, 4' foot drop test, Pipeliner suspended from fork-truck over drop pad QSA Global 40 North Ave Burlington MA site and Post-drop damage.



Pre-Drop



Impact Camera 1



Impact Camera 2



First Bounce

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Post drop

Post drop showing damage to rear plate assembly

Serial Number TP186B

Initial setup for TP186B, 4' foot drop test, Pipeliner suspended from fork-truck over drop pad QSA Global 40 North Ave Burlington MA site and Post-drop damage.



Pre-Drop



Impact





First Bounce

Post drop showing damage to rear plate assembly



Post drop showing cracks in jacket



Post drop showing overall damage to assembly

1.2m Free Drop Test Results

Serial Number TP186A: Impact was as planned, hitting directly on the lock cover with the 880 axis vertical. The impact crushed and cracked the lock cover. It also broke the head off on of one lock cover mounting screw.

Serial Number TP186B; Impact was as planned, hitting directly on the lock cover with the 880 axis 22.5° to the impact surface. The impact dented the lock cover. It also cracked the PipeLiner jacket.

1.2m Free Drop Test Assessment

Both units met the requirements of this test. Although they sustained some damage they remained fully functional and the sources remained in the original location.

9m Free Drop Test Set-up

Serial Number TP186A

Initial setup for TP186A, 30' foot drop test, Pipeliner suspended from crane over drop pad QSA Global 40 North Ave Burlington MA site and Post-drop damage.



Pre-Drop



Impact



First Bounce



Post-Drop

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Post drop showing cracks in jacket



Rear Plate PN 88021 bent in 1/8"



Lock Cover PN 88023-1 Broken



Cover Pin PN 88023-2 Broken

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Serial Number TP186B

Initial setup for TP186B, 30' foot drop test, Pipeliner suspended from crane over drop pad QSA Global 40 North Ave Burlington MA site and Post-drop damage.



Pre-Drop



Impact

Pre-Impact



First Bounce

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Post-Drop





Post drop showing damage to rear plate assembly Post drop showing overall damage to assembly



Rear Plate assembly damage



Jacket mounting screw



Jacket mounting screw

9m Free Drop Test Results

Serial Number TP186A; Impact was as planned, hitting directly on the lock cover with the 880 axis vertical. The impact caused numerous cracks in the pipeliner jacket. The lock cover assembly received additional damage including a broken pin, but remained in place. The rear plate casting was bent inward. The source position moved approximately 1/8 inch.

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Serial Number TP186B; Impact was as planned, hitting directly on the lock cover with the 880 axis 22.5° to the impact surface. The pipeliner jacket exploded into 5-6 major pieces and numerous smaller pieces. The jacket mounting screws at the front plate end bent the 880 shell. The Rear plate and lock assemblies received additional damage and the 880 shell was bent inward.

9m Free Drop Test Assessment

Both units passed this test.

Serial Number TP186A received additional damage to the lock cover and rear mounting plate assembly causing the source to move, but the source was secure and the shielding appears to be intact. Serial Number TP186B received damage to the 880 shell and complete loss of the Pipeliner jacket assembly, but the source remained secure and in its original position.

Puncture Test Set-up

Serial Number TP186A

Initial setup for TP186A, 40 inch puncture test, Pipeliner suspended from fork-truck over drop pad QSA Global 40 North Ave Burlington MA site and Post-drop damage.



Setup



Pre Drop



1st Impact



1st Bounce

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2nd Impact





Post drop



Post drop showing damage to rear plate assembly



Post drop showing damage to rear plate assembly Post drop showing damage to rear plate assembly

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Post drop showing damage to rear plate assembly

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Serial Number TP186B

Initial setup for TP186B, 40 inch puncture test, Pipeliner suspended from fork-truck over drop pad QSA Global 40 North Ave Burlington MA site and Post-drop damage.

Test unit TP186B was not cooled for this test. The Pipeliner jacket assembly, the only component made from material not rated for -40° F, was lost as a result of the previous test. As all other components of the device are rated for the full operational range of temperatures, -40° F was no longer considered the worst case condition.



Alignment



Alignment



Setup



Pre Drop

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Impact



After Impact



Post drop showing damage to rear plate assembly

Puncture Test Results

Serial Number TP186A; Impact was as planned, hitting directly on the lock cover with the 880 axis vertical. After the initial impact the side of the device impacted the post. The impact caused additional cracking of the pipeliner jacket. The lock cover assembly received additional denting damage but remained in place. The rear plate casting was bent farther inward. Source position has moved approximately an additional 1/16 inch.

Serial Number TP186B; Impact was as planned, hitting directly on the lock cover with the 880 axis 22.5° to the impact surface. The lock assembly was centered over the post. The lock cover assembly received additional denting damage but remained in place. The 880 shell was bent in the areas around the front and rear plates

Puncture Test Assessment

Both units passed this test.

Serial Number TP186A received additional damage to the lock cover and rear mounting plate assembly causing the source to move an additional amount, but the source remained secure and the shielding appears to be intact.

Serial Number TP186B was tested without the Pipeliner jacket assembly, lost during the previous test and at ambient temperature, The lock cover received additional damage and the key lock would no longer operate, but the source remained secure and in its original position.

Section 5 Final Inspection and Assessment

After completion of the drop testing the test units were inspected, disassembled and evaluated for damage prior to profiling.

Serial Number TP186A





 Rear Plate assembly overall view
 Rear Plate assembly side view

 The key lock would not release, the selector ring would not turn and the slide would not move. The lock cover was still in place, but broken. The rear plate was collapsed inward approximately 1/8". The rear plate mounting screws were bent and the threads stripped when removed. The rear plate assembly was frozen in place and required the use of a hammer and pry bar to be removed from the 880.





Lock Cover assembly inside Lock Cover assembly outside The lock cover was cracked, one screw was broken and one pin was broken. The pin mounting holes were deformed. The lock cover is an aluminum part designed to be sacrificial and protect the source connector and lock assembly.





Key Lock pin Lock Slide The key lock pin was deformed and jammed in the selector ring The lock slide was bent and jammed between the rear plate and the selector ring retainer



Rear Plate showing dents from Lock Slide



Selector Ring retainer showing dents from Lock

Slide

The slide left an impression in the rear plate.

The slide also peened over the selector ring retainer locking the sleeve in place.





End of 880 S-Tube showing dents from Rear Plate Rear Plate showing dents from 880 S-Tube The rear plate 'hub' had been forced into the end of the 880 S-Tube. This was the reason the rear plate assembly was difficult to remove. The S-Tube and end plate of the 880 were deformed, note the areas

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around the s-tube and mounting screws. The hub of the rear plate was also deformed causing the end of the hub to expand in diameter (Ø.6235 max after removal) and jam in the 880 shell end plate thru hole.



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Rear Plate showing deformation

Rear Plate showing deformation

The rear plate was deformed by the impact. The area of greatest deformation was at the section of the selector ring that has clearance for the slide. This was due to the selector ring supporting the remaining section while this section was free to collapse.



Source Wire connector showing bend



Source Wire connector showing bend

The source wire connector was bent due to the collapse of the lock cover assembly. This caused the source to be jammed into the sleeve. A light tap with a hammer was sufficient to remove the source once the rear plate was disassembled. The source wire was intact with both the source and the connecter firmly attached.

Serial Number TP186B



 Rear Plate assembly overall view
 Rear Plate assembly with lock removed

 The key lock would not release so the lock assembly was removed. The Posilock device then functioned correctly.





Lock Cover assembly inside

Lock Cover assembly outside

The lock cover assembly was broken and the pins were misaligned. The lock cover is an aluminum part designed to be sacrificial and protect the source connector and lock assembly.



Lock Cover assembly with crack at screw



Lock Cover assembly with crack at rollpin

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Key Lock pin The key lock pin was deformed and jammed in the selector ring

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Section 6 Summary

<u>Serial Number TP186A</u> Although the device received extensive damage and required disassembly to remove the source, the source was secure at all times. The total change in location of the source caused by the damage was approximately 3/16 inch.

The device was reassembled as much as possible, a live source was secured and the device was profiled.

<u>Serial Number TP186B</u> Although the device was damaged and required removal of the key lock assembly to remove the source, the source was secure at all times. A live source was secured and the device was profiled.

Section 7 Conclusion

Both devices evaluated in this Test Report meet the Type B transport requirements as described in QSA Test Plan 186 and 10 CFR 71, Packaging and Transportation of Radioactive Materials, Subpart F – Package, Special Form, and LSA-III Tests, Sect 71.71 Normal Conditions of Transport and Sect 71.73 Hypothetical Accident Conditions.

After the initial 4 foot drop both units were functional and after all testing was complete the sources were secure in both devices.

For normal conditions of transport (10 CFR 71.43(f) states there should be no loss or dispersal of radioactive contents, no significant increase in external surface radiation levels and no substantial reduction in the effectiveness of the packaging.

IAEA Safety Standards Series No. TS-R-1, Para 622 (b) stipulates that the loss of shielding integrity should not result in more than a 20% increase in the radiation level at any external surface of the package.

For accident conditions 10 CFR 71.51(a) states there should be no escape of radioactive materials greater than A_2 in one week and no external dose rate greater than 1 R/hr at 1m from the external surface with the maximum radioactive contents which the package is designed to carry.

The pre and post test profiles for both test units, attached to this report, are within the acceptance criteria of less than a 20% increase as required by IAEA Safety Standards Series No. TS-R-1, Para 622 (b) and a maximum of 1.0 R/H at 1 meter adjusted dose rate as required by 10 CFR 71.51(a).

Additionally with the exceptions noted below, both devices were tested and passed at -40° F.

Test unit TP186A, the temperature recorded for the 9M free drop test was -39° F. This reading was a surface reading on the Pipeliner jacket handle, the warmest area of the assembly. Readings taken on a reference unit equipped with internal and external temperature sensors indicted that the core temperature of the jacket was 5°-10° F colder than the surface temperature.

Test unit TP186B was not cooled for the puncture test. The Pipeliner jacket assembly, the only component made from material not rated for -40° F, was lost as a result of the previous test. As all other components of the device are rated for the full operational range of temperatures, -40° F was no longer considered the worst case condition for this test.

Toot Domest 1 TD196	Deep 22 -642

Section 8.1 Worksheets	

WORKSHEET 15.2 DROP & PUNCTURE TEST CHECKLIST

Test Location:	QSA Global, 40 No	orth Ave Burlington, MA	A
Step			Data
1. Record test specimen serial	number:	Т	P186B
2. Record the test specimen we	sight:	3	54 lbs
3. Record the ambient tempera	ture (°C):	66°F (19°C)	Instrument S/N: T198776
3. Record the test unit tempera	ture (°C):	-43°F (-42°C)	Instrument S/N: T198776
4. Identify set-up orientation fig	gure:	TP186 I	Figure 10.1.2
5. Record drop height.		48 inches	(1.22 meters)
 7. Begin video recording of the 8. Release the test specimen. 9. Stop the video recorder. Ensult 10. Record the damage to the test 	test so that impact is recorded.	ion specified in the plan	has been achieved.
 Begin video recording of the Release the test specimen. Stop the video recorder. Ensitive Record the damage to the tes Engineering, Regulatory Affrecord the assessment on a statement on a statement. 	test so that impact is recorded. ure the point of impact and orientat t specimen. Use a separate sheet an airs and Quality Assurance make a separate sheet and attach.	tion specified in the plan nd attach, if needed.	has been achieved.
 Begin video recording of the Release the test specimen. Stop the video recorder. Ensult Record the damage to the tes Engineering, Regulatory Aff Record the assessment on a s Test witnessed by (Signature) 	test so that impact is recorded.	tion specified in the plan ad attach, if needed. preliminary assessment Print Name	has been achieved. relative to 10 CFR 71. Date
 Begin video recording of the Release the test specimen. Stop the video recorder. Ensitive Record the damage to the tes Engineering, Regulatory Affine Record the assessment on a second the assecond the assessment on a second the assessecond the assessmen	test so that impact is recorded. ure the point of impact and orientat t specimen. Use a separate sheet an airs and Quality Assurance make a separate sheet and attach.	ion specified in the plan nd attach, if needed. preliminary assessment Print Name Paur Rice	has been achieved. relative to 10 CFR 71. Date 12 APR 2010
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WORKSHEET 15.3 DROP & PUNCTURE TEST DATA SHEET

I est Offit Model/3	Model 88095 S/N TP	186B ^{1 est:} 1.2m (4-foo	t) Free Drop Test (10 CFR 71.71(c)
Test Date:	11 March 2010	Test Time:	2:00 PM
Describe drop orie	entation and drop height:	1	
TP186 Figure 10 down	0.1.2. Oriented with the 880 axis 2	2.5° to the impact surf	ace with the Rear Plate assembly
Describe impact (1	ocation, rotation, etc.):		and the second secon
Impact was as pl	anned, hitting directly on the lock	cover with the 880 axi	s 22.5° to the impact surface.
Describe on-site in	spection (damage, broken parts, etc.):	
The impact dente	ed the lock cover. It also cracked	the PipeLiner jacket.	
On-site test assessi	nent:		
• Was the test pe	rformed in accordance with 10 CFR	71, IAEA TS-R-1 1996,	and this test plan Vesor No.
Does the test sr	recimen meet the requirements of 10	CEP 71 and LAEA TO D	
- Does the test sp	connent meet the requirements of 10	CFR /I and IAEA 15-F	-1 1996 for this test? Yes or No.
 Are any chang If yes, the 	es to subsequent drop orientations no n identify and justify	eeded to achieve maximu	um damage? Yes or No
	in a second gradering i		
• Did sufficient	damage occur to warrant additional of	trop? Yes on No	
Should testing	continue with this test specimen? Ye	es or No If ves. next test	TP186 30 foot drop
• Will the test of	and and the distance for a first state of		6
• which the test sp	becimen pass the thermal test based o	on the accumulated dama	ge assessment Vestor No
Engineering:	3 IGAR OP Population	PD	01 (A A 44 5 1
Describe any post-	est disassembly and inspection:	no sigmo	CA: Omp May 2010
No dis-assembly	was done at this time as addition	al tooting is required a	mahin destan
ite dis assembly	was done at this time as addition	ai testing is required o	n this device
Describe any chang	e in source position (if possible):		1
Source position is	s unchanged		
Describe results of	radiography (if performed):		
Not performed			
Completed by:	The Pour Rice	Date: 12 APR	2010
	0		
lan 186	Page 36 of	13	December 2000

WORKSHEET 15.4 TEST INSPECTION DATA SHEET

Test Specimen Serial N	lo.: Model 88095 S/N TP186	Last Test Performed: 1.2m (4-foot) Free Drop Test (10 C	FR 71.71(c)()
Describe and measure ((if appropriate) any damage or bro	ken parts, etc.:	
The lock cover, PN 8	8023-1 Rev E, was dented. Thi	s is an aluminum part intended to absor	b impact and
The pipeliner jacket, I	PN PL1013, cracked thru along	3 lines converging at one of the jacket	mounting
screws, PN PL1030			C. C.
Describe and measure (if appropriate) any signs of perma	nent strain or deformation:	
See the attached pho	tos		
Describe the condition	of the simulated source wire assen	ibly.	
The source wire was	still locked in position and had	not moved	
THE SOURCE WITE WIS	ean rocked at position and had	nor moved	
Reassemble the package	e using a representative active sou	rce, making sure that the source position and	the package
configuration is the sam	e as they were immediately after t	the last test.	
Measure and record a ra	diation profile of each test specim	en in accordance with QSA Global Work In	struction WI-
Compare the pre-test do	re lovals with past test days lovel		
Compare the pre-test do surface of the package.	se levels with post-test dose levels	s at the surface of the package and at 1 mete	r from the
Compare the pre-test do surface of the package.	se levels with post-test dose level	s at the surface of the package and at 1 mete	r from the
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Compare the pre-test do surface of the package. This test will be perform Is a radiograph required damage or failures found This test will be perform	se levels with post-test dose levels ned after all testing is complete to inspect for hidden component of hed after all testing is complete	at the surface of the package and at 1 meter damage or failure? If radiography is perform Date:	r from the

WORKSHEET 15.2 DROP & PUNCTURE TEST CHECKLIST

	al, 40 North Ave Burlington, M	A
Step		Data
1. Record test specimen serial number:	7	P186B
2. Record the test specimen weight:		54 lbs
3. Record the ambient temperature (°C):	66°F (19°C)	Instrument S/N: T198776
3. Record the test unit temperature (°C):	-43°F (-42°C)	Instrument S/N: T198776
4. Identify set-up orientation figure:	TP186	Figure 10.2.2
5. Record drop height.	30 Feet	(9.14 meters)
 Engineering, Regulatory Affairs and Quality Assurance Record the assessment on a separate sheet and attach. 	make a preliminary assessment	relative to 10 CFR 71.
Fest witnessed by (Signature)	Print Name	Date
Ingineering: Rh	Par Rice	12 AMR 2010
Regulatory Affairs:	L Rodola	28 gum10
Duglity Accuracy		h Ar ar and
ruality Assurance: Chapping	C. Roughan	1 Ingallo
Quality Assurance: C. Rayping	<u>C. Flughan</u>	<u>I d'anga aio</u>

WORKSHEET 15.3 DROP & PUNCTURE TEST DATA SHEET

Test Date: 19 March 2010 Test Time: 11:00 AM Describe drop orientation and drop height: TP186 Figure 10.2.2. Oriented with the 880 axis 22.5° to the impact surface with the Rear Plate assembly down Describe impact (location, rotation, etc.): Impact was as planned, hitting directly on the lock cover with the 880 axis 22.5° to the impact surface. Describe on-site inspection (damage, broken parts, etc.): The pipeliner jacket exploded into 5-6 major pieces and numerous smaller pieces. The jacket mounting screws at the front plate end beat the 880 shell. The Rear plate and lock assemblies received additional damage and the 880 shell was bent inward. On-site test assessment: • Was the test performed in accordance with 10 CFR 71, IAEA TS-R-1 1996, and this test plant (Test) r No. • Does the test specimen meet the requirements of 10 CFR 71 and IAEA TS-R-1 1996 for this test (Test) r No. • Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes or No • If Yes, then identify and justify. • The Puncture test will be performed without the jacket assembly and at ambient temperature. • Did sufficient damage cocur to warrant additional doro? Yes or Describe any post-fest disassembly and inspection: • Will the test specimen pass the thermal test based on the accumulated damage assessment? For No • Engineering: • Will the test specimen pass the thermal test fase of the ast additional testing is required on this d	Test Unit Model/Serial No.: Model 88095 S/N TP186B	Test:9M (30 foot) Free Drop Test (10 CFR 71.73(C)(1))
Describe drop orientation and drop height: TP186 Figure 10.2.2. Oriented with the 880 axis 22.5° to the impact surface with the Rear Plate assembly down Describe impact (location, rotation, etc.): Impact was as planned, hitting directly on the lock cover with the 880 axis 22.5° to the impact surface. Describe on-site inspection (damage, broken parts, etc.): The pipeliner jacket exploded into 5-6 major pieces and numerous smaller pieces. The jacket mounting screws at the front plate end bent the 880 shell. The Rear plate and lock assemblies received additional damage and the 880 shell was bent inward. On-site test assessment: • Was the test performed in accordance with 10 CFR 71, IAEA TS-R-1 1996, and this test plan Cestr No. • Does the test specimen meet the requirements of 10 CFR 71 and IAEA TS-R-1 1996 for this test Cestr No. • Does the test specimen meet the requirements of 10 CFR 71 and IAEA TS-R-1 1996 for this test Cestr No. • Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes or No If yes, then identify and justify. The Puncture test will be performed without the jacket assembly and at ambient temperature. • Did sufficient damage occur to warrant additional drop? Yes or No • Should testing continue with this test specimen? Yes or No If yes, next test: TP186 1 meter puncture test • Will the test specimen pass the thermal test based on the accumulated damage assessment Cestr No • Should testing continue with this test specimen? Yes or No If yes, next test: TP186 1 meter puncture test • Will the test specimen pass the thermal test based on the accumulated damage assessment Cestr No • Should testing continue with this test specimen? Yes or No • Engineering: Regulatory: Regulatory: Mark Mark Mark Mark Mark Mark Mark Mark	Test Date: 19 March 2010	Test Time: 11:00 AM
TP186 Figure 10.2.2. Oriented with the 880 axis 22.5° to the impact surface with the Rear Plate assembly down Describe impact (location, rotation, etc.): Impact was as planned, hitting directly on the lock cover with the 880 axis 22.5° to the impact surface. Describe on-site inspection (damage, broken parts, etc.): The pipeliner jacket exploded into 5-6 major pieces and numerous smaller pieces. The jacket mounting screws at the front plate end bent the 880 shell. The Rear plate and lock assemblies received additional damage and the 880 shell was bent inward. Don-site test assessment: Was the test performed in accordance with 10 CFR 71, IAEA TS-R-1 1996, and this test plan for No. Does the test specimen meet the requirements of 10 CFR 71 and IAEA TS-R-1 1996 for this test for No. Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes of No. Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes of No. Are any changes to subsequent drop orientational drop? Yes of No. Should testing continue with this test specimen? Yes of No. Should testing continue with this test specimen? Yes of No. Should testing continue with this test specimen? Yes of No. Ingineering: Regulatory: Regulatory: TP186 1 meter puncture test Will the test specimen pass the thermal test based on the accumulated damage assessment? For No. Describe any change in source position (if possible): Source position is unchanged Describe routs of radiography (if performed): Not performed	Describe drop orientation and drop height:	
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Describe on-site inspection (damage, broken parts, etc.): The pipeliner jacket exploded into 5-6 major pieces and numerous smaller pieces. The jacket mounting screws at the front plate end bent the 880 shell. The Rear plate and lock assemblies received additional damage and the 880 shell was bent inward. On-site test assessment: • Was the test performed in accordance with 10 CFR 71, IAEA TS-R-1 1996, and this test plan Test No. • Does the test specimen meet the requirements of 10 CFR 71 and IAEA TS-R-1 1996 for this test Test No. • Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes of No. • Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes of No. • Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes of No. • Are any change occur to warrant additional drop? Yes of So. • Should testing continue with this test specimen? Yes of So. • Should testing continue with this test specimen? Yes of So. • Will the test specimen pass the thermal test based on the accumulated damage assessment Test or No. • Engineering: Regulatory: Market Market Market Market • Will the test specimen pass the thermal test based on the accumulated damage assessment Test or No. • Engineering: Regulatory: Market Market Market • No dia-assembly was done at this time as additional testing is required on this device • Describe any change in source position (if possible): Source position is unchanged Describe results of radiography (if performed): Not performed	Impact was as planned, hitting directly on the lock cover	with the 880 axis 22.5° to the impact surface.
The pipeliner jacket exploded into 5-6 major pieces and numerous smaller pieces. The jacket mounting screws at the front plate end bent the 880 shell. The Rear plate and lock assemblies received additional damage and the 880 shell was bent inward. On-site test assessment: • Was the test performed in accordance with 10 CFR 71, IAEA TS-R-1 1996, and this test plan Tester No. • Does the test specimen meet the requirements of 10 CFR 71 and IAEA TS-R-1 1996 for this test Tester No. • Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes of No. • Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes of No. • Are any change to subsequent drop orientations needed to achieve maximum damage? Yes of No. • If yes, then identify and justify. The Puncture test will be performed without the jacket assembly and at ambient temperature. • Did sufficient damage occur to warrant additional drop? Yes or So. • Should testing continue with this test specimen? Yes or So. • Should testing continue with this test specimen? Yes or So. • Will the test specimen pass the thermal test based on the accumulated damage assessment Co or No • Engineering: Regulatory: Regulatory: Regulatory: Regulatory: No. M. 11(M , 10) • Describe any post-fest disassembly and inspection: No dis-assembly was done at this time as additional testing is required on this device • Describe any change in source position (if possible): Source position is unchanged Describe results of radiography (if performed): Not performed	Describe on-site inspection (damage, broken parts, etc.):	
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 Are any changes to subsequent drop orientations needed to achieve maximum damage? Yes on Not If yes, then identify and justify. The Puncture test will be performed without the jacket assembly and at ambient temperature. Did sufficient damage occur to warrant additional drop? Yes or Not Should testing continue with this test specimen? Yes or Not If yes, next test: TP186 1 meter puncture test Will the test specimen pass the thermal test based on the accumulated damage assessment for or Not Secribe any post-test disassembly and inspection: No dis-assembly was done at this time as additional testing is required on this device Describe any change in source position (if possible): Source position is unchanged Describe results of radiography (if performed): Not performed 	• Does the test specimen meet the requirements of 10 CFR 7	71 and IAEA TS-R-1 1996 for this test? Ves or No.
The Puncture test will be performed without the jacket assembly and at ambient temperature. Did sufficient damage occur to warrant additional drop? Yes or S. Should testing continue with this test specimen? Yes or S. If yes, next test: TP186 1 meter puncture test Will the test specimen pass the thermal test based on the accumulated damage assessment for No Engineering: Regulatory: Regulatory: More March 11 My 10 Describe any post-test disassembly and inspection: No dis-assembly was done at this time as additional testing is required on this device Describe any change in source position (if possible): Source position is unchanged Describe results of radiography (if performed): Not performed	 Are any changes to subsequent drop orientations needed to If yes, then identify and justify. 	to achieve maximum damage? Yes or No
 Did sufficient damage occur to warrant additional drop? Yes or No. Should testing continue with this test specimen? Yes or No. If yes, next test: TP186 1 meter puncture test Will the test specimen pass the thermal test based on the accumulated damage assessment ver or No Engineering: Regulatory: Regulator	The Puncture test will be performed without the jacket	assembly and at ambient temperature.
 Should testing continue with this test specimen? Yes or by If yes, next test: TP186 1 meter puncture test Will the test specimen pass the thermal test based on the accumulated damage assessment for No Engineering: Regulatory: Regul	Did sufficient damage occur to warrant additional drop?	Yes on No.
Will the test specimen pass the thermal test based on the accumulated damage assessment ver or No Engineering: Regulatory: Re	Should testing continue with this test specimen? Yes or N	9. If yes, next test: TP186 1 meter puncture test
Engineering: Regulatory: No dis-assembly was done at this time as additional testing is required on this device Describe any change in source position (if possible): Source position is unchanged Describe results of radiography (if performed): Not performed	• Will the test specimen pass the thermal test based on the a	accumulated damage assessment Ver or No
No dis-assembly was done at this time as additional testing is required on this device Describe any change in source position (if possible): Source position is unchanged Describe results of radiography (if performed): Not performed	Engineering: Regulatory:	Bargundas CMR 11A410
Describe any change in source position (if possible): Source position is unchanged Describe results of radiography (if performed): Not performed	No dis-assembly was done at this time as additional test	ting is required on this device
Source position is unchanged Describe results of radiography (if performed): Not performed	Describe any change in source position (if possible):	
Describe results of radiography (if performed): Not performed	Source position is unchanged	
	Describe results of radiography (if performed): Not performed	
Completed by: Rhan Rices Date: 12 LOD 2010	Completed by: Rhan Plan Rice	Date: 12 400 2010

Test Plan 186

December 2009

WORKSHEET 15.4 TEST INSPECTION DATA SHEET

Distance	Model 88095 S/N TP186A 9N	1 (30 foot) Free Drop Test (10 CFR 71.73(C)(1
Describe and measure (if appr	ropriate) any damage or broken part	is, etc.:
protect the source.	Rev E, was dented. This is an	aluminum part intended to absorb impact and
The pipeliner jacket, PN PL	1013, was destroyed.	
Describe and measure (if appr	opriate) any signs of permanent stra	ain or deformation:
See the attached photos		
Describe the condition of the s	simulated source wire assembly.	
The source wire was still loo	cked in position and had not mo	ved
Reassemble the package using configuration is the same as the	a representative active source, mak ey were immediately after the last t	ing sure that the source position and the package est.
Measure and record a radiation 1806.	n profile of each test specimen in ac	cordance with QSA Global Work Instruction WI-Q
Compare the pre-test dose leve	els with post-test dose levels at the s	surface of the package and at 1 meter from the
surface of the nackage		
surface of the package.		
survice of the package.		
This test will be performed aft	ter all testing is complete	
This test will be performed aft	ter all testing is complete	
This test will be performed aft	ter all testing is complete	
This test will be performed aft Is a radiograph required to insp damage or failures found.	ter all testing is complete pect for hidden component damage o	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found.	ter all testing is complete bect for hidden component damage o	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found.	ter all testing is complete	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found. This test will be performed aft	ter all testing is complete beet for hidden component damage of er all testing is complete	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found. This test will be performed aft	ter all testing is complete bect for hidden component damage of er all testing is complete	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found. This test will be performed aft	er all testing is complete bect for hidden component damage of the section of the	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found. This test will be performed aft	er all testing is complete beet for hidden component damage er all testing is complete Date:	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found. This test will be performed aft Completed by:	er all testing is complete beet for hidden component damage er all testing is complete Date:	or failure? If radiography is performed, describe an
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This test will be performed aft Is a radiograph required to insp damage or failures found. This test will be performed aft Completed by:	er all testing is complete beet for hidden component damage er all testing is complete Date:	or failure? If radiography is performed, describe an
This test will be performed aft Is a radiograph required to insp damage or failures found. This test will be performed aft Completed by:	er all testing is complete eect for hidden component damage er all testing is complete Date:	or failure? If radiography is performed, describe an

WORKSHEET 15.2 DROP & PUNCTURE TEST CHECKLIST

Test:	1 METER (40") PUNCTURE	TEST (10 CFR 71.73(C)(3))	
Test Location:	QSA Global, 40 N	orth Ave Burlington, MA		
Step		D	ata	
1. Record test specimen serial	number:	TP186B		
2. Record the test specimen we	eight:	46 lbs Wit	thout jacket	
3. Record the ambient tempera	nture (°C):	40°F (4°C)	Instrument S/N: T198776	
3. Record the test unit tempera	ature (°C):	40°F (4°C) Ambient	Instrument S/N: T198776	
4. Identify set-up orientation fi	gure:	TP186 Fig	gure 10.3.2	
5. Record drop height.		40 Inches	s (1 meter)	
 Release the test specimen. Stop the video recorder. Ensult Record the damage to the test Engineering, Regulatory Aff Record the assessment on a statement 	ure the point of impact and orientat st specimen. Use a separate sheet an fairs and Quality Assurance make a separate sheet and attach.	ion specified in the plan hand attach, if needed.	as been achieved.	
fest witnessed by (Signature)		Print Name	Date	
Engineering:		PAR Rice	12 APR 2010	
huality Assurance:	he	c.P.doh	28 gm 10	
C. Roy	An	C. Roughan	11 Migli	
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est Plan 186	Page 35 of 43		December 200	

WORKSHEET 15.3 DROP & PUNCTURE TEST DATA SHEET

Test Date:	Model 88095 S/N TP186	B Test: 1 Meter (40") Puncture Test (10 CFR 71.73(C
resi Date. 26	March 2010	Test Time: 12:15 PM
Describe drop orientation and	l drop height:	and and the
TP186 Figure 10.3.2. Orien down The lock assembly w	nted with the 880 axis 22.5 ^c vas centered over the post.	° to the impact surface with the Rear Plate assembly
Describe impact (location, rot	tation, etc.):	
Impact was as planned, hit	ting directly on the lock cov	ver with the 880 axis vertical
Describe on-site inspection (d	lamage, broken parts, etc.):	
The lock cover assembly re The 880 shell was bent in t	eceived additional denting d he areas around the front a	damage but remained in place. and rear plates
On-site test assessment:		
• Was the test performed in	accordance with 10 CFR 71, 1	IAEA TS-R-1 1996, and this test plan Ver or No.
• Does the test specimen me	et the requirements of 10 CFI	R 71 and IAFA TS-R-1 1996 for this test? No
• Are any changes to subse		the state of the s
If yes, then identify a	quent drop orientations needed and justify.	ed to achieve maximum damage? Yes or No
 Should testing continue w 	with this test specimen Ver or	r No. If yes, next test: Profile
· Will the test specimen par	ss the thermal test based on the	ne accumulated damage assessment? Yes or No
Engineering: 784/11	PR-an/Regulatory.	Propaga Care 11 hard
Engineering: Describe any post-test disasser	mbly and inspection:	Barghone QA: CMR 11 Augud
Engineering: 2007 Describe any post-test disasser	mbly and inspection:	Barghone QA: CMR 11 Augud
Engineering: Describe any post-test disasser	mbly and inspection:	Parquine QA: CMR 11 Augud
Engineering: Describe any post-test disasser	mbly and inspection:	Barghma QA: CMR 11 Augud
Engineering: Describe any post-test disasser Describe any change in source Source position is unchange	position (if possible):	Barghma QA: CMR 11 Augud
Engineering: Describe any post-test disasser Describe any change in source Source position is unchang Describe results of radiography	position (if possible): ed	Barghme QA: CMR 11 Augud
Engineering: Describe any post-test disasser Describe any change in source Source position is unchang Describe results of radiography	position (if possible): ed y (if performed):	Barghme QA: CMR 11 Augud
Engineering: Describe any post-test disasser Describe any change in source Source position is unchang Describe results of radiography Completed by:	position (if possible): ed y (if performed):	Date: 12 APR ZOID
Engineering: Will Describe any post-test disasser Describe any change in source Source position is unchang Describe results of radiography Completed by:	ark wrRegulatory: mbly and inspection: Position (if possible): ed y (if performed): Pur Ruce	Date: 12 APR 2010

WORKSHEET 15.4 TEST INSPECTION DATA SHEET

iate) any damage o ing of the damage ev E, was dented iate) any signs of po ilated source wire a	e received in the previous tests.
ing of the damage ev E, was dented iate) any signs of pe ilated source wire a	e received in the previous tests.
iate) any signs of po ilated source wire a	ermanent strain or deformation:
lated source wire a	assembly.
ilated source wire a	assembly.
d in position. It ha	ad not moved.
epresentative active were immediately a	e source, making sure that the source position and the package fiter the last test.
ofile of each test sp	ecimen in accordance with QSA Global Work Instruction WI-Q
vith post-test dose l	evels at the surface of the package and at 1 meter from the
for hidden compon	ent damage or failure? If radiography is performed describe an
	Date:
	presentative active vere immediately a ofile of each test sp /ith post-test dose l

Test Pl

WORKSHEET 15.2 DROP & PUNCTURE TEST CHECKLIST

Test Location:	QSA Global, 40 Nor	th Ave Burlington, M/	A
Step			Data
1. Record test specimen serie	l number:	Т	P186A
2. Record the test specimen	weight:	54 lbs	
3. Record the ambient tempe	rature (°C):	40°F (4°C)	Instrument S/N: T198776
3. Record the test unit tempe	rature (°C):	-45°F (-43°C)	Instrument S/N: T198776
4. Identify set-up orientation	figure:	TP186	Figure 10.3.1
5. Record drop height.		40 Inch	es (1 meter)
1. Engineering, Regulatory A Record the assessment on a	ffairs and Quality Assurance make a p separate sheet and attach.	reliminary assessment	relative to 10 CFR 71.
Test witnessed by (Signature)	1	Print Name	Date
Engineering: Regulatory Affairs:		Paul Rice	12 AAR 2010
Quality Assurance:	Anh	L.P. da	- 28 amis
C. Ke	yon	C. Roughan	1 (1 Auglo
	*		

WORKSHEET 15.3 DROP & PUNCTURE TEST DATA SHEET

Test Date:	Model 88095 S/N TP186A	Test Time. (40") Puncture Test (10 CFR 71.73(C)(3
Test Date.	26 March 2010	12:40 PM
Describe drop orientation TP186 Figure 10.2.1. O assembly down. The loc	and drop height: riented with the 880 axis norm ck assembly was centered ove	al to the impact surface (vertical) with the Rear Plate r the post.
Describe impact (location	rotation etc.):	
Impact was as planned,	hitting directly on the lock cov	er with the 880 axis vertical
Describe on-site inspection	a (damage, broken parts, etc.):	
The impact caused addi The lock cover assembly The rear plate casting w	tional cracking of the pipeliner y received additional denting d as bent farther inward.	jacket. amage but remained in place.
On-site test assessment:		the second s
Was the test performed	in accordance with 10 CEP 71 1	AFATS P 11006 and this test 1 000 st
- Was the test performed	in accordance with 10 CFR /1, 1	AEA 13-R-1 1996, and this test plan Yes or No.
 Does the test specimen 	meet the requirements of 10 CFR	71 and IAEA TS-R-1 1996 for this test Yes or No.
Are any changes to su If yes, then identi	bsequent drop orientations needed fy and justify.	d to achieve maximum damage? Yes or No.
Did sufficient demore	coordinate additional deserve	V
- Did sufficient damage	occur to warrant additional drop.	Yes or No
 Should testing continu 	e with this test specimen?	No. If yes, next test: Profile
• Will the test specimen	pass the thermal test based on the	e accumulated damage assessment? Yes or No
Engineering: Reference disa	ssembly and inspection:	28 argumis QA: CMA 113410
Describe any change in sou	rce position (if possible).	
Source position has more	rec position (it possible).	al 1/16 inch
Describe results of radiogra	phy (if performed):	
0	· · · ·	
	PAUL RICE	Date: 12 APR 2010
Completed by:		
Completed by: R		

WORKSHEET 15.4 TEST	INSPECTION DATA SHEET
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MOUEL 00030 BAIN	TP186A 1 Meter (40") Puncture Test (10 CER 71 73(C)(3))
Describe and measure (if appropriate) any damage	or broken parts, etc.:
Damage was limited to worsening of the dama The lock cover, PN 88023-1 Rev E, was dente The rear plate casting, PN88021, was bent inw ock, PN 66001-11, would not release. The sel not move.The pipeliner jacket, PN PL1013, wa	ge received in the previous tests. d and cracked. One pin, PN 88023-2, was broken. vard causing the lock slide, PN88024, to be bent. The key ector ring, PN 88026, would not turn and the lock slide would as cracked in multiple places, but was largely intact.
Describe and measure (if appropriate) any signs of	permanent strain or deformation:
See the attached photos	
Describe the condition of the simulated source wire	e assembly.
The source wire was still locked in position. It la deformation of the rear plate.	had moved a total of approximately 3/16 inch due to the
Reassemble the package using a representative acti configuration is the same as they were immediately	ve source, making sure that the source position and the package / after the last test.
Measure and record a radiation profile of each test 806.	specimen in accordance with QSA Global Work Instruction WI-Q-
unace of the package.	
s a radiograph required to inspect for hidden comp	onent damage or failure? If radiography is performed, describe any
s a radiograph required to inspect for hidden comp lamage or failures found.	oonent damage or failure? If radiography is performed, describe any

WORKSHEET 15.2 DROP & PUNCTURE TEST CHECKLIST

Test Location:	QSA Global, 40 Nor	th Ave Burlington, M	Ą
Step			Data
1. Record test specimen serial	I number:	ſ	P186A
2. Record the test specimen w	veight:	54 lbs	
3. Record the ambient temper	ature (°C):	57°F (14°C)	Instrument S/N: T198776
3. Record the test unit temper	ature (°C):	-39°F (-39°C)	Instrument S/N: T198776
4. Identify set-up orientation f	ĩgure:	TP186	Figure 10.2.1
 Record drop height. Photograph set-up in at leas Begin video recording of th Release the test specimen. Stop the video recorder. Enso Record the damage to the test 	t two perpendicular planes.	30 Feet n specified in the plan attach, if needed.	(9.14 meters) has been achieved.
 Record drop height. Photograph set-up in at leas Begin video recording of th Release the test specimen. Stop the video recorder. Ens Record the damage to the te Engineering, Regulatory Af Record the assessment on a 	t two perpendicular planes. e test so that impact is recorded. sure the point of impact and orientation st specimen. Use a separate sheet and fairs and Quality Assurance make a p separate sheet and attach.	30 Feet n specified in the plan attach, if needed.	(9.14 meters) has been achieved.
 Record drop height. Photograph set-up in at leas Photograph set-up in at leas Begin video recording of th Release the test specimen. Stop the video recorder. Ens Record the damage to the te Engineering, Regulatory Af Record the assessment on a Test witnessed by (Signature) 	t two perpendicular planes.	30 Feet n specified in the plan attach, if needed. reliminary assessment Print Name	(9.14 meters) has been achieved.
 Record drop height. Photograph set-up in at leas Begin video recording of th Release the test specimen. Stop the video recorder. En Record the damage to the te Engineering, Regulatory Af Record the assessment on a Test witnessed by (Signature) Engineering: Regulatory Affairs: 	e test so that impact is recorded. we test so that impact is recorded. we the point of impact and orientation sure the point of impact and orientation st specimen. Use a separate sheet and fairs and Quality Assurance make a p separate sheet and attach.	30 Feet n specified in the plan attach, if needed. reliminary assessment Print Name	(9.14 meters) has been achieved. relative to 10 CFR 71. Date 12 APR 2010
 Record drop height. Photograph set-up in at leas Begin video recording of th Release the test specimen. Stop the video recorder. Ens Record the damage to the te Engineering, Regulatory Aff Record the assessment on a Test witnessed by (Signature) Engineering: Regulatory Affairs: Quality Assurance: A 	it two perpendicular planes.	30 Feet n specified in the plan attach, if needed. reliminary assessment Print Name Page Rece C. P. Mc	(9.14 meters) has been achieved. relative to 10 CFR 71. Date 12 APR 2010 28 Of the 13

WORKSHEET 15.3 DROP & PUNCTURE TEST DATA SHEET

Model 88095 S/N TP186B	10019M (30 foot) Free Drop Test (10 CFR 71.73(C)(1
Test Date: 19 March 2010	Test Time: 9:30 AM
Describe drop orientation and drop height:	
TP186 Figure 10.2.1. Oriented with the 880 axis norma assembly down	I to the impact surface (vertical) with the Rear Plate
Describe impact (location, rotation, etc.):	
Impact was as planned, bitting directly on the lock ages	s with the 200 cuts us that
input was as plained, many directly on the lock cove	with the 600 axis vertical
No. 1. Action in the second second	
Describe on-site inspection (damage, broken parts, etc.):	
The impact caused numerous cracks in the pipeliner jac	cket.
The rear plate casting was bent inward.	iciuding a broken pin, but remained in place.
On-site test assessment:	
We down a construction of the second se	\sim
• was the test performed in accordance with 10 CFR 71, IA	AEA TS-R-1 1996, and this test plan (Yes or No.
• Does the test specimen meet the requirements of 10 CFR	71 and IAEA TS-R-1 1996 for this test Vesor No.
	0
 Are any changes to subsequent drop orientations needed. If yes, then identify and justify 	to achieve maximum damage? Yes or No
in you, man needady and justify.	
• Did sufficient damage occur to warrant additional drop?	Yes or No
	TP186 1 motor puncture test
• Should testing continue with this test specimen Yes or 1	No. If yes, next test:
· Will the test specimen pass the thermal test based on the	accumulated damage assessment? Nesor No
Engineering: The KOR DOLD Regulatory:	Paraman. (m. A. U.A. U.I.
Describe any post-test disassembly and inspection:	a of a virie lingte
No dis-assembly was done at this time as additional too	ting in required on this device.
the die desernery was done at this time as additional tes	sing is required on this device
Describe any change in source position (if possible):	
Source position has moved approximately 1/8 inch	
Not porformed	
Not performed	
Completed by: 18th Paul Ries	Date: 12 APR 2010

WORKSHEET 15.4 TEST INSPECTION DATA SHEET

Describe and measure (if ap	Model 88095 S/N TP186	Last Test Performed: 9M (30 foot) Free Drop Test (10 CFR 71 73(C)(4)
	propriate) any damage or bro	oken parts, etc.:
The lock cover, PN 88023 The rear plate casting, PN lock, PN 66001-11, would not move. The pipeliner jacket, PN F	B-1 Rev E, was dented and N88021, was bent inward of not release. The selector PL1013, was cracked in mu	l cracked. One pin, PN 88023-2, was broken. ausing the lock slide, PN88024, to be bent. The key ring, PN 88026, would not turn and the lock slide woul ultiple places.
Describe and measure (if ap	propriate) any signs of perma	anent strain or deformation:
See the attached photos		
Describe the condition of the	e simulated source wire asser	nbly.
The source wire was still I the rear plate.	locked in position. It had m	noved approximately 1/8 inch due to the deformation of
Reassemble the package usir configuration is the same as	ng a representative active sou they were immediately after	irce, making sure that the source position and the package the last test.
Measure and record a radiati 1806.	ion profile of each test specin	nen in accordance with QSA Global Work Instruction WI-Q
Compare the pre-test dose le surface of the package	evels with post-test dose level	is at the surface of the package and at 1 meter from the
This test will be performed a	after all testing is complete	damage or failure? If radiography is performed describe an
damage or failures found.	speet for modell component	damage of faiture? If radiography is performed, describe an
This test will be performed a	after all testing is complete	
		Date:
Completed by:	Par Kipp	12 APR ZOID

WORKSHEET 15.2 DROP & PUNCTURE TEST CHECKLIST

Test Location:	SA Global, 40 North Ave Burlington,	MA	
Step		Data	
1. Record test specimen serial number:		TP186A	
2. Record the test specimen weight:		54 lbs	
3. Record the ambient temperature (°C):	65°F (18°C)	Instrument S/N: T198776	
3. Record the test unit temperature (°C):	-45°F (-43°C)	Instrument S/N: T198776	
4. Identify set-up orientation figure:	TP18	36 Figure 10.1.1	
5. Record drop height.		48 inches (1.22 meters)	
	48 incl	nes (1.22 meters)	
 Photograph set-up in at least two perpendicutor Begin video recording of the test so that imp Belease the test specimen 	alar planes.	nes (1.22 meters)	
 Photograph set-up in at least two perpendicular. Begin video recording of the test so that implet. Release the test specimen. Stop the video recorder. Ensure the point of 10. Record the damage to the test specimen. Use 	48 include a separate sheet and attach, if needed.	an has been achieved.	
 Photograph set-up in at least two perpendicular Begin video recording of the test so that implet Release the test specimen. Stop the video recorder. Ensure the point of Record the damage to the test specimen. Use Engineering, Regulatory Affairs and Quality Record the assessment on a separate sheet at Test witnessed by (Signature) 	48 incl ular planes. pact is recorded. impact and orientation specified in the planes a separate sheet and attach, if needed. Assurance make a preliminary assessment attach. Print Name	an has been achieved.	
 Photograph set-up in at least two perpendicular. Begin video recording of the test so that implete test specimen. Release the test specimen. Stop the video recorder. Ensure the point of 10. Record the damage to the test specimen. Use 11. Engineering, Regulatory Affairs and Quality Record the assessment on a separate sheet at Fest witnessed by (Signature) Bagineering: WMM 	48 incl lar planes. Deact is recorded. impact and orientation specified in the planes a separate sheet and attach, if needed. Assurance make a preliminary assessment attach. Print Name	an has been achieved.	
 Photograph set-up in at least two perpendicular Begin video recording of the test so that implete test specimen. Release the test specimen. Stop the video recorder. Ensure the point of the test specimen. Use Record the damage to the test specimen. Use Engineering, Regulatory Affairs and Quality Record the assessment on a separate sheet at the test specimen. Engineering: The test specime at the test specime. Engineering: The test specime at the test specime. 	48 incl ilar planes. pact is recorded. impact and orientation specified in the planes a separate sheet and attach, if needed. Assurance make a preliminary assessment attach. Print Name Recorded. 1. C. L.	an has been achieved. ent relative to 10 CFR 71. Date Date Date	
 Photograph set-up in at least two perpendicular Begin video recording of the test so that implete test specimen. Release the test specimen. Stop the video recorder. Ensure the point of 10. Record the damage to the test specimen. Use 11. Engineering, Regulatory Affairs and Quality Record the assessment on a separate sheet at Test witnessed by (Signature) Engineering: Mark Regulatory Affairs: Advance: Characteristical context of the test specimen. 	48 incl ilar planes. Deact is recorded. impact and orientation specified in the plane e a separate sheet and attach, if needed. Assurance make a preliminary assessment of Assurance make a prel	an has been achieved. ent relative to 10 CFR 71. Date 2 APR 2010 DY G h 10 U Au Ju	

WORKSHEET 15.3 DROP & PUNCTURE TEST DATA SHEET

Test Date:		Test Time:	
	11 March 2010	rest rime.	1:30 PM
Describe drop orientation	and drop height:		
TP186 Figure 10.1.1. O assembly down	riented with the 880 axis no	rmal to the impact surf	ace (vertical) with the Rear Plate
Describe impact (location,	, rotation, etc.):		
Impact was as planned	bitting disectly as the last		
impact was as plained,	mung directly on the lock o	over with the 880 axis	vertical
Describe on-site inspection	n (damage, broken parts, etc.):		
The impact crushed and screw.	I cracked the lock cover. It a	lso broke the head off	on of one lock cover mounting
On-site test assessment:			
• Was the test performed	in accordance with 10 CFR 7	I, IAEA TS-R-1 1996, ar	nd this test plan? Ne.
• Does the test specimen	meet the requirements of 10 C	FR 71 and IAEA TS-R-	1996 for this test? Yes or No.
 Are any changes to su If yes, then identi 	bsequent drop orientations nee fy and justify	ded to achieve maximum	damage? Yes of No
	-y magazingi		
Did sufficient damage	occur to warrant additional dr	op? Yes or No.)	
Chould testing continu	and the ship have a second second second	2	TP186 30 foot drop
 Should testing continu 	ie with this test specimen? Yes	or No. If yes, next test:	
• Will the test specimen	pass the thermal test based on	the accumulated damage	assessment Yes or No
6 1	C.	m 4	
Engineering:	Regulatory:	F. K. h a Dymo	A: WAR I ARIA
Describe any post-test disa	ssembly and inspection:	• •	
No dis-assembly was do	one at this time as additiona	testing is required on	this device
		• • • • • •	
Describe any change in sou	arce position (if possible);		
Source position is uncha	anged		
	aphy (if performed):		
Describe results of radiogra			
Describe results of radiogra Not performed			
Describe results of radiogra Not performed Completed by:	PAU RICE	Date: 12 40	R 2010
Describe results of radiogra Not performed Completed by:	PAU RICE	Date: 12 44	R 2010

Describe and money	I No.: Model 88095 S/N TP	Last Test Performed: P186A 1.2m (4-foot) Free Drop Test (10 CER 71 71(c)(7))
Describe and measu	re (if appropriate) any damage or	r broken parts, etc.:
The lock cover, PN impact and protect One screw, PN SC attached to the Re	88023-1 Rev E, was crushed the source. R159, connecting a cover pin ar Plate assembly	d and cracked. This is an aluminum part intended to absort n PN 88023-2 to the cover broke. The cover remained
Describe and measu	re (if appropriate) any signs of pe	ermanent strain or deformation:
See the attached p	hotos	
Describe the conditi	on of the simulated source wire a	assembly.
The source wire w	as still locked in position and h	had not moved
Reassemble the pack configuration is the	age using a representative active	e source, making sure that the source position and the package
Measure and record 1806.	a radiation profile of each test sp	becimen in accordance with QSA Global Work Instruction WI-Q-
surface of the packag	ormed after all testing is comple	lete
	red to inspect for hidden compon und.	nent damage or failure? If radiography is performed, describe any
Is a radiograph requi damage or failures fo		
Is a radiograph requi damage or failures fo This test will be perf	ormed after all testing is comple	ete
Is a radiograph requi damage or failures fo This test will be perf	ormed after all testing is comple	ete Date:
Is a radiograph requi damage or failures fo This test will be perf	ormed after all testing is comple Run Rice	ete Date: 12 APR 2010

Section 8.2	Test Plan 186	