DISTRIBUTION SHEET

To Distribution	From RTG Transportation System	Page 1 of 1 Date 05/25/95
Project Title/Work Order Test Plan/Procedure for the Shock Limiting Device of the Radioisotope Thermoelectric Generator Package Mounting Subsystem 145 (WHC-SD-RTG-TC-006)		EDT No. NA ECN No. 168987

Name	MSIN	Text With All Attach.	Text Only	Attach./Appendix Only	EDT/ECN Only
D. L. Becker	G2-02	X			
J. G. Field	G2-02				X
J. C. McCoy	G2-02	X			
D. W. McNally	G2-03	X			
D. A. Moody	H5-57	X			
M. E. Riste	N1-71	X			
J. A. Satoh	N1-25	X			
T. J. Ward	N1-25	X			
RTG Project File	G2-02	X			
Central Files	L8-04	X			
OSTI (2)	L8-07	X			

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

RECEIVED

JUN 19 1995

OSTI

A

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

MASTER

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

ENGINEERING CHANGE NOTICE

Page 1 of 11

1. ECN 168987

Proj.
ECN

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedure ☐ Cancel/Void ☐	3. Originator's Name, Organization, MSIN, and Telephone No. JA Satoh/2C120/N1-25/373-2903 5. Project Title/No./Work Order No. RTG Transportation System/ 8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-RTG-TC-006, Rev. 0	3a. USQ Required? ☐ Yes ☒ No 6. Bldg./Sys./Fac. No. NA 9. Related ECN No(s). NA	4. Date 05/25/95 7. Approval Designator Q 10. Related PO No. NA
11a. Modification Work ☐ Yes (fill out Blk. 11b) ☒ No (NA Blks. 11b, 11c, 11d)	11b. Work Package No. NA	11c. Modification Work Complete NA Cog. Engineer Signature & Date	11d. Restored to Original Condition (Temp. or Standby ECN only) NA Cog. Engineer Signature & Date
12. Description of Change Changes are indicated by a vertical bar in the left hand column of WHC-SD-RTG-TC-006, Rev. 1. Specific descriptions of those changes are provided on Pages 3 through 11 of this ECN. Pagination changes have automatically occurred in WHC-SD-RTG-TC-006, Rev. 1 to accommodate text additions and deletions.			
13a. Justification (mark one) Criteria Change ☒ Design Improvement ☐ Environmental ☐ Facility Deactivation ☐ As-Found ☐ Facilitate Const ☐ Const. Error/Omission ☐ Design Error/Omission ☐			
13b. Justification Details Changes have been made to WHC-SD-RTG-TC-006, Rev. 1 to clarify testing sequence or procedures. Many of the changes have been made in response to RTG technical community comments.			
14. Distribution (include name, MSIN, and no. of copies)		RELEASE STAMP OFFICIAL RELEASE 20 BY WHC DATE JUN 01 1995 <i>Sta. 21</i>	

ENGINEERING CHANGE NOTICE				Page 2 of 11	1. ECN (use no. from pg. 1) 168987																																																																												
15. Design Verification Required ☐ Yes ☒ No	16. Cost Impact <table style="width: 100%; border-top: 1px solid black;"> <thead> <tr> <th colspan="2" style="text-align: left;">ENGINEERING</th> <th colspan="2" style="text-align: left;">CONSTRUCTION</th> </tr> </thead> <tbody> <tr> <td style="width: 15%;">Additional</td> <td style="width: 15%;">[NA] \$</td> <td style="width: 15%;">Additional</td> <td style="width: 15%;">[NA] \$</td> </tr> <tr> <td>Savings</td> <td>[NA] \$</td> <td>Savings</td> <td>[NA] \$</td> </tr> </tbody> </table>			ENGINEERING		CONSTRUCTION		Additional	[NA] \$	Additional	[NA] \$	Savings	[NA] \$	Savings	[NA] \$	17. Schedule Impact (days) Improvement [NA] Delay [NA]																																																																	
ENGINEERING		CONSTRUCTION																																																																															
Additional	[NA] \$	Additional	[NA] \$																																																																														
Savings	[NA] \$	Savings	[NA] \$																																																																														
18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.																																																																																	
SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐																																																																												
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐																																																																												
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐																																																																												
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐																																																																												
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐																																																																												
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐																																																																												
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐																																																																												
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐																																																																												
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐																																																																												
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐																																																																												
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐																																																																												
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐																																																																												
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐																																																																												
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐	Tickler File	☐																																																																												
Environmental Report	☐	Inspection Plan	☐		☐																																																																												
Environmental Permit	☐	Inventory Adjustment Request	☐		☐																																																																												
19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below. <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%; text-align: left; font-size: x-small;">Document Number/Revision</th> <th style="width: 33%; text-align: left; font-size: x-small;">Document Number/Revision</th> <th style="width: 33%; text-align: left; font-size: x-small;">Document Number Revision</th> </tr> </thead> <tbody> <tr> <td>N/A</td> <td></td> <td></td> </tr> </tbody> </table>						Document Number/Revision	Document Number/Revision	Document Number Revision	N/A																																																																								
Document Number/Revision	Document Number/Revision	Document Number Revision																																																																															
N/A																																																																																	
20. Approvals <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: left;">Signature</th> <th style="width: 10%; text-align: left;">Date</th> <th style="width: 50%; text-align: left;">Signature</th> <th style="width: 10%; text-align: left;">Date</th> </tr> </thead> <tbody> <tr> <td colspan="4">OPERATIONS AND ENGINEERING</td> </tr> <tr> <td>Cog. Eng.: DA Moody <i>(Signature)</i></td> <td>5/25/95</td> <td>PE</td> <td></td> </tr> <tr> <td>Cog. Mgr.: JG Field <i>(Signature)</i></td> <td>5/25/95</td> <td>QA</td> <td></td> </tr> <tr> <td>QA: ME Riste <i>(Signature)</i></td> <td>5/26/95</td> <td>Safety</td> <td></td> </tr> <tr> <td>Safety: DW McNally <i>(Signature)</i></td> <td>5/26/95</td> <td>Design</td> <td></td> </tr> <tr> <td>Environ.: NA</td> <td></td> <td>Environ.</td> <td></td> </tr> <tr> <td>Other: NA</td> <td></td> <td>Other</td> <td></td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> <tr> <td colspan="4">DEPARTMENT OF ENERGY</td> </tr> <tr> <td colspan="4">Signature or a Control Number that tracks the Approval Signature</td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> <tr> <td colspan="4">ADDITIONAL</td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> <tr> <td colspan="4" style="height: 20px;"></td> </tr> </tbody> </table>						Signature	Date	Signature	Date	OPERATIONS AND ENGINEERING				Cog. Eng.: DA Moody <i>(Signature)</i>	5/25/95	PE		Cog. Mgr.: JG Field <i>(Signature)</i>	5/25/95	QA		QA: ME Riste <i>(Signature)</i>	5/26/95	Safety		Safety: DW McNally <i>(Signature)</i>	5/26/95	Design		Environ.: NA		Environ.		Other: NA		Other										DEPARTMENT OF ENERGY				Signature or a Control Number that tracks the Approval Signature								ADDITIONAL																							
Signature	Date	Signature	Date																																																																														
OPERATIONS AND ENGINEERING																																																																																	
Cog. Eng.: DA Moody <i>(Signature)</i>	5/25/95	PE																																																																															
Cog. Mgr.: JG Field <i>(Signature)</i>	5/25/95	QA																																																																															
QA: ME Riste <i>(Signature)</i>	5/26/95	Safety																																																																															
Safety: DW McNally <i>(Signature)</i>	5/26/95	Design																																																																															
Environ.: NA		Environ.																																																																															
Other: NA		Other																																																																															
DEPARTMENT OF ENERGY																																																																																	
Signature or a Control Number that tracks the Approval Signature																																																																																	
ADDITIONAL																																																																																	

All units of measure in this document have been converted to metric units with the U.S. standard units in parentheses

ADDED: Figure 1 - Test Article
 Figure 2 - Bottom drop configuration
 Figure 3 - Edge drop configuration
 Figure 4 - Drop test sill
 Figure 5 - Accelerometer Placement

2.1 PURPOSE

WAS...

The Transit Drop Procedure consists of five drops from an (18") height,

NOW READS...

The Transit Drop Procedure consists of three drops from an 47 cm (18") height one bottom face drop, and two edgewise drops on adjacent sides of Subsystem 145...

3.1.1 System 120 Model

WAS...

1. Have a center of gravity (c.g.) equal to the c.g. of System 120, with impact limiter, loaded with a GPHS or MOD-3 RTG.
2. Have a weight equivalent to System 120, with impact limiter, loaded with a GPHS or MOD-3 RTG.

NOW READS...

1. Have a center of gravity (c.g.) which simulates the c.g. of System 120, with impact limiter, loaded with a RTG.
2. Have a weight which simulates System 120, with impact limiter, loaded with a RTG.

3.2 TEST OBJECTIVE

WAS...

The objective of this test is to impose forces on Subsystem 145 simulating an accidental drop of 18 inches during onloading or offloading. This will be accomplished by dropping the Test Article five times in the configurations described in Table 1

NOW READS...

The objective of this test is to impose forces on Subsystem 145 simulating an accidental drop of 47 cm (18") during onloading or offloading. This will be accomplished by dropping the Test Article three times in the configurations described in Table 1. Figures 2 and 3 are graphical representations of the drops.

Table 1. Required Drop Configurations.

WAS...

REQUIRED DROP CONFIGURATIONS	
Drop #1	Bottom Face Drop
The RTG package assembly and package mounting shall be raised 47 cm (18") above the floor. The RTG Package and package mounting should be oriented so that the line of impact through the c.g. is perpendicular to the floor when released.	
Drop #2	Edgewise Drop 1
The side marked 3 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 1, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	
Drop #3	Edgewise Drop 2
The side marked 4 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 2, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	
Drop #4	Edgewise Drop 3
The side marked 1 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 3, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	
Drop #5	Edgewise Drop 4
The side marked 2 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 4, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	

NOW READS...

REQUIRED DROP CONFIGURATIONS	
Drop #1	Edgewise Drop 1
The side marked 3 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 1, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	
Drop #2	Edgewise Drop 2
The side marked 4 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 2, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	
Drop #3	Bottom Face Drop
The RTG package assembly and package mounting shall be raised 47 cm (18") above the floor. The RTG Package and package mounting should be oriented so that the line of impact through the c.g. is perpendicular to the floor when released.	

3.5 INSTRUMENTATION

WAS...

The thermal qualification vessel or equivalent model shall be instrumented electronic tri-axial accelerometers and passive shock indicators.

NOW READS...

The Test Article shall be instrumented with electronic tri-axial accelerometers and passive shock indicators. Figure 5 shows the positions for the passive shock indicators and the accelerometers. The passive shock indicators are to be used for information only.

The Test Engineer shall have the accelerometers to be used in the drop test calibrated by an independent organization prior to testing.

3.6 PHOTOGRAPHY

WAS...

Still and video camera equipment and operators may be supplied through Boeing Computer Service, Richland.

NOW READS...

Still and video camera equipment and operators will be supplied through Boeing Computer Service, Richland.

3.8 WEATHER

WAS...

... Table 3 are acceptable for testing:

NOW READS...

... Table 2 are acceptable for testing:

Table 2. Standard Ambient Conditions.

ADDED: Wind speed ≤ 8.9 m/s (20 mph)

4.1 TEST FACILITY

REMOVED...

A suitable Test Pad is located in the 300 Area of the Hanford Site and is depicted on Drawing H-3-48996, titled "Structural Plans, Section, Details and Specification." The Test Pad is faced with a steel target plate 125 inches long, 70 inches wide and 8.5 inches thick, reportedly of 4340 steel. The overall base dimensions of the ASTM C 150, Type II cemented aggregate foundation is 13 feet 6 inches by 18 feet 6 inches with an overall height including target plate, of 78 inches. The 1359 Ft³ concrete foundation monolith is encased with #6 steel.

4.2 REQUIRED TEST EQUIPMENT

Table 3. Required Equipment

WAS...

Accelerometers -- Tri-axial model #339A15
Data acquisition system -- Instrumented sensor Technology, model MSR-1
Meter stick
Portable quartz iodine lights, if needed
Safety gasses and hard hats for spectators

NOW READS...

Accelerometers -- Tri-axial model #339A15* or other
Data acquisition system -- Instrumented sensor Technology, model MSR-1 or other
Meter stick (yard stick or tape measure)
Portable lights, if needed
Safety glasses and hard hats for spectators

ENGINEERING CHANGE NOTICE CONTINUATION SHEET

Page 6 of 11

ECN 168987

Date 05/25/95

4.4 SPARE PARTS

WAS...

Table 5. Required Spare Parts.

ITEM 1	QNTY 2	Package Mounting cable assembly
ITEM 2	QNTY 2	CB2000-12-20 Aeroflex Isolator
ITEM 5	QNTY 4	3/4" X 6" HG-4037 JAW END FITTING

NOW READS...

ITEM 1	QNTY 2	1.58 CM (5/8") WIRE ROPE 153 cm long
ITEM 2	QNTY 8	CB2000-12-20 Aeroflex Isolator
ITEM 5	QNTY 4	.91 cm X 15 cm (3/4" X 6") HG-4037 JAW END FITTING

ADDED...

ITEM 7	QNTY 8	Wire Rope Thimble (for 1.58 cm wire rope)
ITEM 8	QNTY 8	S-505 Coldtuff standard steel sleeve

4.5 REQUIRED TEST PERSONNEL

WAS...

Table 6. Required Test Personnel.

	Signature	Initial	Date
Test Manager F.W. Moore			
Alternate			
Test Engineer			
Alternate			
Cognizant Engineer K. E. Ard			
Alternate			
Technician T.J. Ward			
Alternate			
QA Rep. M.E. Riste			
Alternate			

NOW READS...

Table 6. Required Test Personnel.

	Signature	Initial	Date
Test Manager J.G. Field			
Alternate			
Project Lead Engineer B. L. Becker			
Alternate			
Test Engineer D.A. Moody			
Alternate			
Cognizant Engineer D.A. Moody			
Alternate			
Technician T.J. Ward			
Alternate			
QA Rep. M.E. Riste			
Alternate			
Safety D.W. McNally			
Alternate			

4.6 PROCEDURAL CHANGES

WAS...

The Test Engineer is permitted to make red ink changes to the test procedure with the concurrence of the Cognizant Engineer.

NOW READS...

The Test Engineer is permitted to make red ink changes to the test procedure with the concurrence of the Project Lead Engineer and representatives of the RTG community present at testing. Each change in the procedure must be signed by the Test Engineer, the Cognizant Engineer and the Project Lead Engineer.

5.5 HOISTING AND RIGGING EQUIPMENT

WAS...

All hoisting and rigging equipment shall have current load test tags and shall be operated by WHC rigging personnel.

NOW READS...

All hoisting and rigging equipment shall have current load test tags.

Site Preparation Checklist

WAS...

3. Have required 5- to 6-inch sill fabricated, if necessary.
4. Verify any modifications to the Test Article necessary for the instrumentation installation and to accommodate lifting fixtures have been completed. Record a summary of all modification on Data Sheet A.
5. Record all prior tests Test Article components have been subjected to on Data Sheet A.
9. Assign a number 1 through 4 to each side of Subsystem 145
11. Perform general inspection of Test Article and record observations on Data Sheet A.

NOW READS...

3. Have required 12-15 cm (5- 6") sill fabricated, if necessary.
4. Verify any modifications to the Test Article necessary for the instrumentation installation and to accommodate lifting fixtures have been completed. Photograph and record a summary of all modifications on Data Sheet A.
5. Record all prior tests Test Article components have been subjected to on Data Sheet A. Photograph all components of Test Article prior to and during pre-test assembly.
9. Assign a number 1 through 4 to each side of Subsystem 145, start with #1 and count clockwise around the Package Mounting, label each side with a permanent marking pen.
11. Perform general inspection of Test Article (the inspection shall be documented with photographs of the RTG model, the Package, the Package Mounting, and the Tie-downs before the model is secured in the test configuration) and record observations on Data Sheet A.

6.2.1.2 Pre test checklist for starting Test Article Drop Tests.

ADDED...

13. Measure the height of the Package Mounting and record measurements on Data Sheet A.

6.2.2.3

WAS...

Authorize the rigging crew to lift side #1 of the Test Article to elevation of 18"...

NOW READS...

Authorize the rigging crew to lift the Test Article to elevation of 47 cm (18")+ 2 cm (1")/- 0 cm (1 in)...

6.2.2.4

WAS...

Verify Test Article elevation. Elevation=_____

NOW READS...

Verify Test Article elevation, measure at midpoint of each side of Package Mounting bottom plate. Elevation=_____

Post-Drop Checklist for Drop #1

WAS...

1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Record observation on Data Sheet B.

NOW READS...

1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Measure package mounting height at all four corners, compare measurements to previous measurements and assess implications of differential, if heights vary from previous measurements. Record observation on Data Sheet B.

6.2.3.3

WAS...

Authorize the rigging crew to lift side #1 of the Test Article to an elevation of 18"...

NOW READS...

Authorize the rigging crew to lift side #1 of the Test Article to an elevation of 47 cm (18") + 2 cm (1")/- 0 cm (0 in)...

6.2.3.4

WAS...

Verify elevation of side #1.
Elevation=_____

NOW READS...

Verify elevation of side #1, measured at each corner of side #1.
Elevation=_____

Post-Drop Checklist for Drop #2

WAS...

1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Record observation on Data Sheet C.

NOW READS...

1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Measure isolator heights. Record observation on Data Sheet C.

6.2.4.3

WAS...

Authorize the rigging crew to lift side #3 of the Test Article to an elevation of 18".

NOW READS...

Authorize the rigging crew to lift side #3 of the Test Article to an elevation of 47 cm (18") + 2 cm (1")/- 0 cm (0 in)...

6.2.4.4

WAS...

Verify elevation of side #2. Elevation=_____

NOW READS...

Verify elevation of side #2, measure at each corner of side #2.
Elevation=_____

Post-Drop Checklist for Drop #3

WAS...

1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Record observation on Data Sheet D.

NOW READS...

1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Measure isolator heights. Record observation on Data Sheet D.

ADDED...

7. Photographs of the package mounting, the package, the ties downs, and the RTG model, shall be taken at disassembly of the test article.

6.2.2 through 6.2.2.9 has changed numbering

Drop #1 has been changed to be drop #3

6.2.3 through 6.2.3.9 has changed numbering

Drop #2 has been changed to be drop #1

6.2.4 through 6.2.4.9 has changed numbering

Drop #3 has been changed to be drop #2

The following sections have been deleted:

- 6.2.4.9
- 6.2.5
- 6.2.5.1
- Pre-Drop Checklist for Drop #4
- 6.2.5.2
- 6.2.5.3
- 6.2.5.4
- 6.2.5.5
- 6.2.5.6
- 6.2.5.7

ENGINEERING CHANGE NOTICE CONTINUATION SHEET

Page 11 of 11

ECN 168987

Date 05/25/95

- 6.2.5.8
- Post-Drop Checklist for Drop #4
- DATA SHEET E FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR PACKAGE MOUNTING SUBSYSTEM 145 for Drop # 4
- 6.2.5.9
- 6.2.6 Drop #5
- 6.2.6.1
- Pre-Drop Checklist for Drop #5
- 6.2.6.2
- 6.2.6.3
- 6.2.6.4
- 6.2.6.5
- 6.2.6.6
- 6.2.6.7
- 6.2.6.8
- Post-Drop Checklist for Drop #5
- DATA SHEET F FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR PACKAGE MOUNTING SUBSYSTEM 145 for Drop #5

RELEASE AUTHORIZATION	
Document Number:	WHC-SD-RTG-TC-006, Rev. 0
Document Title:	TEST PLAN/PROCEDURE FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR PACKAGE MOUNTING SUBSYSTEM 145
Release Date:	5/31/95
Limited-Use Category:	EXPORT CONTROLLED INFORMATION
<p align="center">This document was reviewed following the procedures described in WHC-CM-3-4. It contains limited-use information and is:</p> <p align="center">APPROVED FOR LIMITED DISTRIBUTION ONLY</p> <p align="center">(Not For Public Release)</p>	
<p>WHC Information Release Administration Specialist:</p> <p align="center"><i>Chris Willingham</i></p> <p align="center">C. Willingham</p> <p align="right">5/31/95</p>	

LEGAL DISCLAIMER. This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PATENT STATUS. This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contract with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

PURPOSE & USE OF DOCUMENT. This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

This report has been reproduced from the best available copy. Available in paper copy and microfiche. Printed in the United States of America. Available to the U.S. Department of Energy and its contractors from:

U.S. Department of Energy
Office of Scientific and Technical Information (OSTI)
P.O. Box 62
Oak Ridge, TN 37831
Telephone: (615) 576-8401

EXPORT CONTROLLED INFORMATION. This product contains technical data, the export of which is restricted by the Nuclear Nonproliferation Act, the Arms Export Control Act (22 U.S.C. 2751, et seq.); the Atomic Energy Act of 1954, as amended (42 U.S.C. 2077); or the Export Administration Act of 1979, as amended (50 U.S.C. 2401, et seq.). Violation of these laws may result in severe administrative, civil, or criminal penalties.

SUPPORTING DOCUMENT		1. Total Pages 33
2. Title Test Plan/Procedure for the Shock Limiting Device of the Radioisotope Thermoelectric Generator Package Mounting Subsystem 145	3. Number WHC-SD-RTG-TC-006	4. Rev No. 1
5. Key Words RTG Transportation System, Package Mounting, Drop Test Procedure	6. Author Name: J. A. Satoh Signature Organization/Charge Code 2C120/XJ10A	
7. Abstract This document defines the procedure to be used in the 18 inch drop test to be used for design verification of the RTG Transportation System Package Mounting. EXPORT CONTROLLED INFORMATION: This document contains technical data, the export which is restricted by the Arms Export Control Act (22 USC 2751 et seq.), the Atomic Energy Act of 1954, as amended (42 USC 2077), or the Export Administration Act of 1979, as amended (50 USC 2401 et seq.). Violations of these laws may result in administrative, civil, or criminal penalties.
MASTER DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED		8. RELEASE STAMP

[illegible]

TEST PLAN/PROCEDURE FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR PACKAGE MOUNTING SUBSYSTEM 145

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	PURPOSE/SCOPE	1
2.1	PURPOSE	1
2.2	SCOPE	1
3.0	GENERAL REQUIREMENTS	1
3.1	TEST ARTICLE	1
3.2	TEST OBJECTIVE	3
3.3	ACCEPTANCE CRITERIA	7
3.4	HOLD POINT REQUIREMENTS	7
3.5	INSTRUMENTATION	7
3.6	PHOTOGRAPHY	9
3.7	SAFETY	9
3.8	WEATHER	9
4.0	TEST REQUIREMENTS	9
4.1	TEST FACILITY	9
4.2	REQUIRED TEST EQUIPMENT	10
4.3	TOOLS	11
4.4	SPARE PARTS	11
4.5	TEST PERSONNEL	12
4.6	PROCEDURAL CHANGES	12
5.0	PRE-TEST REQUIREMENTS	13
5.1	SAFETY	13
5.2	TEST PERSONNEL	13
5.3	FACILITIES, EQUIPMENT AND MATERIALS	13
5.4	TEST CHECKLISTS	13
5.5	HOISTING AND RIGGING EQUIPMENT	14
6.0	TEST PROCEDURE	14
6.1	PRE-TEST OPERATIONS	14
6.2	TRANSIT DROP PROCEDURE	18
7.0	POST-TEST ACTIVITIES	28
8.0	QUALITY ASSURANCE	28
9.0	REPORTS	28
10.0	SCHEDULE	28
11.0	REFERENCES	28
	DATA CONTINUATION SHEET FOR THE TEST FOR THE SHOCK LIMITING DEVICE OF THE RTG PACKAGE MOUNTING	A-1

LIST OF TABLES

Table 1.	Required Drop Configurations	3
Table 2.	Standard Ambient Conditions	9
Table 3.	Required Equipment	10
Table 4.	Required Tools	11
Table 5.	Required Spare Parts	11
Table 6.	Required Test Personnel	12

LIST OF FIGURES

Figure 1.	Test Article.	2
Figure 2.	Edge Drop Configuration.	4
Figure 3.	Flat Bottom Drop Configuration.	5
Figure 4.	12-15 cm Drop Test Sill.	6
Figure 5.	Accelerometer Placement.	8

CHECKLISTS

Site Preparation Checklist	14
Data Sheet A	16
Pre-Test Checklist for Starting Test Article Drop Tests	18
Pre-Drop Checklist for Drop #1	19
Post-Drop Checklist for Drop #1	20
Data Sheet B	21
Pre-Drop Checklist for Drop #2	22
Post-Drop Checklist for Drop #2	23
Data Sheet C	24
Pre-Drop Checklist for Drop #3	25
Post-Drop Checklist for Drop #3	26
Data Sheet D	27

TEST PLAN/PROCEDURE FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR PACKAGE MOUNTING SUBSYSTEM 145

1.0 INTRODUCTION

Subsystem 145 is a component of the Radioisotope Thermoelectric Generator (RTG) Transportation System Semitrailer (System 140). It will secure the Packaging (System 120) to the Semitrailer (System 140) during transport. Subsystem 145 will also protect the RTG from excessive vibration during transport, provide shock protection during on/off loading of the RTG package, and provide a mechanism for moving the RTG package with a forklift.

2.0 PURPOSE/SCOPE

2.1 PURPOSE

The MIL-STD-810E, Transit Drop Procedure, will be used to verify that Subsystem 145 will provide adequate shock protection to the RTG package during on-loading and off-loading. The Transit Drop Procedure consists of three drops from an 47 cm (18") height, one bottom face drop, and two edgewise drops on adjacent sides of Subsystem 145. The impact force on the RTG Package resulting from the drop must be less than the limits specified in WHC-SD-RTG-FRD-001, Functions and Requirements for the RTG Transportation System, Rev. 0, Section 4.1.5.2.

The primary purpose of this procedure is to verify that the Subsystem 145 design will provide adequate shock protection to the RTG Package (System 120) during on-loading and off-loading of the RTG Package.

2.2 SCOPE

This test plan/procedure provides planning, pretest, setup, testing, and post testing guidelines and procedures for conducting the "Transit Drop" procedure for Subsystem 145. The written report will be issued under a separate document.

3.0 GENERAL REQUIREMENTS

3.1 TEST ARTICLE

The Test Article will consist of the System 120 model, with the impact limiter, secured to the Subsystem 145 with the Subsystem 145 tie-downs. The Test Article is shown in figure 1.

Figure 1. Test Article.

3.1.1 System 120 Model

The System 120 model to be used in the drop test shall be the thermal qualification test vessel, or an equivalent model. The model must:

1. Have a center of gravity (c.g.) which simulates the c.g. of System 120, with impact limiter, loaded with a RTG.
2. Have a weight which simulates System 120, with impact limiter, loaded with a RTG.
3. Have the approximate height and width of System 120 with impact limiter.
4. Be able to be secured to Subsystem 145 using Subsystem 145 tie-downs.
5. Be able to be lifted by a crane fitted with a quick-release hook.

3.1.2 Subsystem 145

The Subsystem 145 model shall be the prototype model built by ICF Kaiser Hanford Company Support Services according to WHC Drawing H-4-302080.

3.2 TEST OBJECTIVE

The objective of this test is to impose forces on Subsystem 145 simulating an accidental drop of 47 cm (18") during onloading or offloading. This will be accomplished by dropping the Test Article three times in the configurations described in Table 1. Figures 2 and 3 are graphical representations of the drops.

Table 1. Required Drop Configurations.

REQUIRED DROP CONFIGURATIONS	
Drop #1	Edgewise Drop 1
The side marked 3 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 1, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	
Drop #2	Edgewise Drop 2
The side marked 4 of the bottom plate of the package mounting shall be supported on a sill (12-15 cm (5-6 inches) in height). The opposite side, marked 2, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.	
Drop #3	Bottom Face Drop
The RTG package assembly and package mounting shall be raised 47 cm (18") above the floor. The RTG Package and package mounting should be oriented so that the line of impact through the c.g. is perpendicular to the floor when released.	

Figure 2. Edge Drop Configuration.

Figure 3. Flat Bottom Drop Configuration.

Figure 4. 12-15 cm Drop Test Sill.

3.3 ACCEPTANCE CRITERIA

The acceptance criteria for the allowable shock input to the RTG is defined in WHC-SD-RTG-FRD-001, Functions and Requirements for the RTG Transportation System, Rev. 0, Section 4.1.5.2 as follows:

"... Subsystem 145 shall limit shock input to the RTG to 15 g or less when the package and Subsystem 145 is subject to a drop on any bottom edge from a height of 18 in."

3.4 HOLD POINT REQUIREMENTS

Procedure steps after a **Hold Point** shall not be performed until the **Hold Point** is signed by the Test Engineer (or his designee) and the Quality Assurance (QA) Representative (or his designee).

Rescission from a **Hold Point** may be made by a mutual agreement of the Test Engineer (or his designee) and the QA Representative (or his designee).

3.5 INSTRUMENTATION

The Test Article shall be instrumented with electronic tri-axial accelerometers and passive shock indicators. Figure 5 shows the positions for the passive shock indicators and the accelerometers. The passive shock indicators are to be used for information only.

The instrumentation shall be connected to, or interface with, data acquisition equipment, as required. Instrumentation shall be installed and checked to verify operation prior to beginning drop tests. Spare components shall be located at the test site as required.

The Test Engineer shall have the accelerometers to be used in the drop test calibrated by an independent organization prior to testing.

3.5.1 Precision and Accuracy

Tolerances used for this test are specified in MIL-STD-810E.

- Acceleration -- Acceleration (g's) shall be measured to within $\pm 10\%$
- Time -- Elapsed time shall be measured with an accuracy of $\pm 1\%$

The instruments must have an accuracy of at least one-third the tolerance for the variable to be measured.

3.5.2 Calibration Requirements

The instruments used in this test shall be calibrated to laboratory standards with a calibration traceable to the National Standards via primary standards.

Figure 5. Accelerometer Placement.

3.6 PHOTOGRAPHY

Each drop is to be recorded by video camera; video and still photographs shall be taken of any damage to the Test Article after each drop. Additional photographs will be taken during testing at the discretion of the Test Engineer or a QA Representative.

Still and video camera equipment and operators will be supplied through BCS Richland, Inc.

3.7 SAFETY

The Test Engineer shall coordinate with the WHC Safety Engineer to review and establish safety requirements for the tests. Safety barricades, as required, shall be installed at the start of each test day, under the direction of the Test Engineer and Safety Engineer. Routes shall be identified for vehicle travel. The Test Engineer shall assure that all lifting equipment is operational and certified for use.

3.8 WEATHER

The Test Engineer shall have the responsibility for determining if test activities proceed during periods of inclement weather. The standard ambient conditions shown in Table 2 are acceptable for testing:

Table 2. Standard Ambient Conditions.

Temperature	25°C ± 10°C
Relative Humidity	Uncontrolled ambient
Atmospheric pressure	Site pressure
Wind speed	≤ 8.9 m/s (20 mph)
Lighting	Ambient daylight or artificial lighting

4.0 TEST REQUIREMENTS

4.1 TEST FACILITY

The test facility must have a concrete floor, be well lit, and be able to accommodate a 66.7 kN (15,000-lb) capacity forklift. The facility must have a Test Pad capable of withstanding the impact of the Test Article without visible damage to the Test Pad. The Test Pad must have a removable 12-15 cm (5"-6") sill for use in the edgewise drop, or a sill must be brought to the facility and secured to the Test Pad.

4.2 REQUIRED TEST EQUIPMENT

Following is a partial list of equipment required for the 47 cm (18") drop test. Equipment may be added or deleted from this list by the Test Engineer as required.

Table 3. Required Equipment.

Item	Responsibility
Passive shock indicators*	
Accelerometers -- Tri-axial model #339A15* or other	
Data acquisition system -- Instrumented sensor Technology, model MSR-1 or other	
A 12-15 cm (5-6 inch) sill to be securely attached to the Test Pad	
Bolts to secure sill (if necessary)	
Meter stick (yard stick or tape measure)	
Crane with a quick-release hook and a 66.7 kN (15,000 lb) lifting capacity	
Lifting fixture for use with crane and quick-release hook and any special rigging required	
Forklift with a 66.7 kN (15,000 lb) lifting capacity	
Subsystem 145 tie-downs	
Black marking pen	
Still Camera	
Video Camera	
Spare film and tapes for cameras	
Portable lights, if needed	
Portable generator, if needed	
Safety barricades and rope-off tape	
Seating for spectators	
Portable heater, if required	
Temporary shelter for spectators and test personnel	
Safety glasses and hard hats for spectators	

*Must meet requirements of section 3.5

4.3 TOOLS

Following is a partial list of the tools needed at the test facility to conduct the transit drop procedure. Other items may be added to this list by the Test Engineer as required.

Table 4. Required Tools.

2 30.5 cm (12") adjustable open-end wrenches
Phillips screw driver
Standard Screwdriver
1.9 cm (3/4") rachet and 1.9 cm (3/4") socket
.95 cm (3/8") rachet and .64 cm (1/4") socket
.64 cm (1/4") open-end wrench
Digital level

4.4 SPARE PARTS

The following is a partial list of spare parts for the 47 cm (18") drop test. Items may be added or deleted by the Test Engineer as required.

Table 5. Required Spare Parts.

	Qty.	Description
1	2	1.58 cm (5/8") SST WIRE ROPE 143 cm long
2	8	CB2000-12-20 Aeroflex Isolator
3	16	Screw, HEX SCH CAP 3/4-10 UNC-2Ax 2 3/4" long
4	2	Subsystem 145 Package tie-down straps
5	4	.91 cm X 15 cm (3/4" X 6") HG-4037 JAW END FITTING
6	2	accelerometer -- Tri-axial-339A15
7	8	Wire Rope Thimble (for 1.58 cm wire rope)
8	8	S-505 Coldtuff standard steel sleeve

4.5 TEST PERSONNEL

The following personnel will be required for this test. Personnel involved in the testing are required to print their names, then initial and date next to their printed names.

Table 6. Required Test Personnel.

	Signature	Initial	Date
Test Manager J.G. Field			
Alternate			
Project Lead Engineer D.L. Becker			
Alternate			
Test Engineer D.A. Moody			
Alternate			
Cognizant Engineer D.A. Moody			
Alternate			
Technician T.J. Ward			
Alternate			
QA Rep. M.E. Riste			
Alternate			
Safety D.W. McNally			
Alternate			

The Test Engineer is required to witness all testing described in this procedure.

4.6 PROCEDURAL CHANGES

Prior to initiating the test, an approved and released copy of this test procedure shall be stamped "TEST CONTROL COPY" in red ink on each page and initialed and dated by the Test Engineer on each page. Additional pages added to this procedure shall be stamped "TEST CONTROL COPY" and initialed and dated by the Test Engineer. Additional copies of the test procedure on location during the test shall be marked "REFERENCE ONLY."

Adjustments or changes to the test procedure or the acceptable range of some variables may be necessary in the field as the test is conducted. The Test Engineer shall ensure such changes remain within the intent of this test procedure. The Test Engineer is permitted to make red ink changes to the test procedure with the concurrence of the Project Lead Engineer and representatives of the RTG community present at testing. Each change in the procedure must be signed by the Test Engineer, the Cognizant Engineer and the Project Lead Engineer.

The Data Continuation Sheet shall be used if additional pages are used when completing any of the drop test data sheets or check lists. Additional copies of the Data Continuation Sheet should be made at the start of the test.

5.0 PRE-TEST REQUIREMENTS

5.1 SAFETY

All test operations shall be conducted in a safe manner. The Test Engineer shall be responsible for the safety of personnel and equipment at the test site, for ensuring all witness and test support personnel are at assigned safe locations before lifting or dropping the Test Article, and ensuring all personnel have required safety equipment (hard hats, eye protection, etc.). The Test Engineer shall review safety procedures with all test personnel at the start of each day of drop tests.

The Test Engineer shall be responsible for the placement of markers identifying the routes for trucks, cars and cranes, at the start of each day of the drop test. Parking areas shall be designated by the Test Engineer.

5.2 TEST PERSONNEL

All test support personnel shall have received any required training prior to participating in the tests. All test operations shall be conducted by authorized personnel.

5.3 FACILITIES, EQUIPMENT AND MATERIALS

Landlord concurrence for the use of the test facility shall be obtained by the Test Engineer prior to any test activities.

The Test Engineer shall schedule and arrange for the arrival of all crane equipment, the Test Article, spare parts, electrical power supply, portable generators, additional lighting equipment, portable shelters, and other items as needed.

The Test Engineer shall schedule the use of all photographic personnel and equipment through BCS Richland, Inc.

The Test Engineer shall verify that all key personnel are cognizant of their responsibilities and commitments for a timely and successful test.

5.4 TEST CHECKLISTS

All checklists shall be witnessed and signed off for each drop test by the Test Engineer and the responsible QA Representative after the completion of each test.

5.5 HOISTING AND RIGGING EQUIPMENT

All hoisting and rigging equipment shall have current load test tags.

The selection and set-up of the cranes and lifting equipment used to handle the Test Article shall be made by crane and rigging services. The test operations shall be supported by the appropriate number of rigging personnel. The Test Engineer shall verify that rigging personnel are cognizant of their responsibilities and commitment for a timely completion and successful test.

The set-up of the crane shall allow for the rebound of the boom and rigging as the Test Article is released.

Special rigging necessary to hold the Test Article in the predetermined orientation for the drop is the responsibility of the Test Engineer.

6.0 TEST PROCEDURE

6.1 PRE-TEST OPERATIONS

Site preparation will be the responsibility of the Test Engineer. Following is a list of actions to be completed prior to the Test Articles arrival at the test facility.

Site Preparation Checklist		Completion Date	Initial
1.	Arrange a schedule with WHC Transportation for a flatbed trailer and a rigging crew to transfer the Test Article from storage area to test facility.		
2.	Arrange a schedule with BCS Richland, Inc. for video and still photographers during testing.		
3.	Have required 12-15 cm (5- 6") sill fabricated, if necessary.		
4.	Verify any modifications to the Test Article necessary for the instrumentation installation and to accommodate lifting fixtures have been completed. Photograph and record a summary of all modifications on Data Sheet A.		
5.	Record all prior tests Test Article components have been subjected to on Data Sheet A. Photograph all components of Test Article prior to and during pre-test assembly.		
6.	Verify all instrumentation has been installed.		

Site Preparation Checklist	Completion Date	Initial
7. Verify that the System 120 model has been properly assembled.		
8. Verify that the System 120 model has been properly installed in Subsystem 145. System 120 and Subsystem 145 shall be assembled in a manner simulating service usage. <ul style="list-style-type: none"> a) All plugs, covers, and inspection plates not used in operation, but used in servicing, shall remain in place. b) Electrical connections normally used in service, but not in this test, shall be provided with electrical connectors having dummy cables with protective terminations. Such mechanical connections shall also be protected. 		
9. Assign a number 1 through 4 to each side of Subsystem 145, start with #1 and count clockwise around the Package Mounting, label each side with a permanent marking pen.		
10. Verify that all instrumentation is calibrated and operational. Record model identification, serial numbers and calibration date of all instrumentation on Data Sheet A.		
11. Perform general inspection of Test Article (the inspection shall be documented with photographs of the RTG model, the Package, the Package Mounting and the tie-downs before the model is secured in the test configuration) and record observations on Data Sheet A.		
12. Verify weather conditions are conducive to testing.		
13. Verify that shelters are erected, as necessary.		
14. Establish safety zones for test personnel and observers.		
15. Verify all required equipment is at the test site and operational. Verify that access to facilities and power supply will be uninterrupted for the duration of the test.		
16. Verify the required sill has been secured to the Test Pad.		
17. Place markers to identify routes for trucks, cars, and cranes. Identify parking area.		

DATA SHEET A FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR
PACKAGE MOUNTING SUBSYSTEM 145

DATE: _____
Sheet 1 of 2

Summary of modifications to Test Article.

Prior tests, resulting damage and dates of tests Test Article components have been subjected to:

Test	Description of Damage incurred:	Date

DATA SHEET A FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR
PACKAGE MOUNTING SUBSYSTEM 145

DATE: _____
Sheet 2 of 2

Test Instrumentation:

[illegible]

OBSERVATIONS FROM GENERAL INSPECTION:

Test Engineer	Date
---------------	------

QA Representative	Date
-------------------	------

6.2 TRANSIT DROP PROCEDURE

6.2.1 Transit Drop pre-test activities

6.2.1.1 Transport Test Article to test facility.

6.2.1.2 The Test Engineer shall complete Pre-Test checklist. The Drop Test is scheduled to be completed in one day, if the tests carry over to a second day, a second Pre-Test Checklist shall be completed at the beginning of the subsequent day. Items that are not required to be checked off on the second day should be marked N/A.

Pre-Test Checklist for Starting Test Article Drop Tests	Date
<ol style="list-style-type: none"> 1. Hold a pretest meeting with all personnel involved with this test. The Test Engineer shall review the test procedures and discuss potential hazards involved with this test. 2. Identify safety zones to test personnel and observers. 3. Remove dirt and debris from Test Pad. 4. Set up photographic equipment and verify operation. 5. Mark drop target on Test Pad. 6. Label Test Pad backdrops. 7. Inspect and verify all lifting equipment is currently certified. 8. Authorize rigging crew to offload Test Article from flatbed trailer and place on or near Test Pad. 9. Verify installation of accelerometers is still correct. 10. Verify passive shock indicators are set. 11. Verify that any additional instrumentation or instruments, not checked at the storage facility, are calibrated and operational. 12. Verify cameras are loaded with film and operational. 13. Measure the height of the Package Mounting and record measurements on Data sheet A. 	
Test Engineer _____ Date: _____	
QA Representative _____ Date: _____	

6.2.2 Drop #1

Drop #1 is Edgewise Drop # 1. The side marked #3 of the bottom plate of the package mounting shall be supported on the sill, 12-15 cm (5-6") in height. The opposite side, marked 1, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.

6.2.2.1 Perform pre-drop procedure and complete checklist for Drop #1 as follows:

Pre-Drop Checklist for Drop #1	
1.	Move Test Article onto Test Pad.
2.	Install rigging setup as specified for drop, as specified in Table 1.
3.	Connect electronic cables, if any, to Test Article instrumentation. Verify cables are properly connected and instrument systems are checked out.
4.	Mark the Test Article with the test number. Mark backdrops with direction.
5.	Attach crane hook to rigging and carefully lift the Test Article until it is just clear of the Test Pad.
6.	Verify all test preparations for the drop are complete.
7.	Call PNL Weather station for wind speed (373-2716)
Pre-Drop Checklist for Drop #1 has been completed.	
Test Engineer: _____ Date: _____	
QA Representative: _____ Date: _____	

6.2.2.2 Direct all personnel to go to their assigned WHC safety approved observation and test locations.

6.2.2.3 Authorize the rigging crew to lift side #1 of the Test Article to an elevation of 47 cm (18")+ 2 cm (1")/ - 0 cm (0"), and verify that the Test Article is in the required orientation and is stable.

6.2.2.4 Verify elevation of side #1, measured at each corner of side #1.
Elevation= _____

6.2.2.5 Direct that the video cameras be started and verify cameras are operating.

6.2.2.6 Authorize the rigging crew to drop the Test Article.

6.2.2.7 Verify the Test Article is in a stable position on the Test Pad before proceeding to the next step.

6.2.2.8 The Test Engineer shall complete the Post-Drop Checklist for Drop #1.

Post-Drop Checklist for Drop #1	
1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Measure package mounting height at each corner. Record observation on Data Sheet B.	
2. Inspect the passive shock indicators and record which accelerometers were tripped on Data Sheet B.	
3. Have the video and still cameras record the damaged area, the instrumentation, and the passive shock indicator as required.	
4. Replace any damaged equipment and instrumentation, reset accelerometers and passive shock indicators. Record on Data Sheet B what was replaced and serial numbers of new parts.	
5. Take dimensional measurements of damaged areas; record dimensions on Data Sheet B. Record a sketch of damaged area on Data Sheet B.	
6. Clean Test Pad of dirt and debris. Inspect Test Pad for damage and verify it is usable for the next test.	
<p>Post-Drop Checklist for Drop #1 has been completed.</p> <p>Test Engineer: _____ Date: _____</p> <p>QA Representative: _____ Date: _____</p>	

DATA SHEET B FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC
GENERATOR PACKAGE MOUNTING SUBSYSTEM 145 for Drop # 1

Passive Shock Indicators: (Indicate Tripped or OK)

Remarks from visual inspection of Test Article:

Wind Speed:			
Package Mounting height 1:	2:	3:	4:

Sketch and measurements of damaged area:

--	--	--	--

Record serial numbers of equipment or instruments replacing damaged equipment/instruments:

Equipment/Instruments	Serial Number

Test Engineer

Date

QA Representative

Date

- 6.2.2.9 The Test Engineer shall make the determination to proceed with the subsequent tests after conferring with the on-site representatives.

HOLD POINT

The next drop shall____, shall not____, be performed

Test Engineer

Date

QA Representative Date

6.2.3 Drop #2

Drop #2 is Edgewise Drop #2. In Drop #2, the bottom plate of the Package Mounting side marked #4 shall be supported on the sill, which is 12-15 cm (5"-6") in height. The opposite side, marked 2, shall be raised to 47 cm (18") above the floor, then allowed to drop freely.

- 6.2.3.1 Perform pre-drop procedure and complete checklist for Drop #2 as follows:

Pre-Drop Checklist for Drop #2	
1. Move Test Article onto Test Pad.	
2. Install rigging setup as specified for drop, as specified in Table 1.	
3. Connect electronic cables, if any, to Test Article instrumentation. Verify cables are properly connected and instrument systems are checked out.	
4. Mark the Test Article with test number. Mark backdrops with direction.	
5. Attach crane hook to rigging and carefully lift the Test Article until it is just clear of the Test Pad.	
6. Verify all test preparations for the drop are complete.	
7. Call PNL for wind speed (373-2716)	
Pre-Drop Checklist for Drop #2 has been completed.	
Test Engineer:_____ Date:_____	
QA Representative:_____ Date:_____	

- 6.2.3.2 Direct all personnel to go to their assigned, WHC safety approved, observation and test locations.

- 6.2.3.3 Authorize the rigging crew to lift side #2 of the Test Article to an elevation of 47 cm (18") +2 cm (1")/-0 cm (0"), and verify that the Test article is in the required orientation and is stable.

6.2.3.4 Verify elevation of side #2, measure at each corner of side #2.
Elevation=_____

6.2.3.5 Direct that the video cameras be started and verify cameras are operating.

6.2.3.6 Authorize the rigging crew to drop the Test Article.

6.2.3.7 Verify the Test Article is in a stable position on the Test Pad before proceeding to the next step.

6.2.3.8 The Test Engineer shall complete the Post-Drop Checklist for Drop #2.

Post-Drop Checklist for Drop #2	
1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Measure package mounting height at each corner. Record observation on Data Sheet C.	
2. Inspect the passive shock indicators and record which accelerometers were tripped on Data Sheet C.	
3. Have the video and still cameras record the damaged area, the instrumentation, and the passive shock indicator as required.	
4. Replace any damaged equipment and instrumentation; reset accelerometers and passive shock indicators. Record on Data Sheet C what was replaced and serial numbers of new parts.	
5. Take dimensional measurements of damaged areas; record dimensions on Data Sheet C. Record a sketch of damaged area on Data Sheet C.	
6. Clean Test Pad of dirt and debris. Inspect Test Pad for damage and verify it is usable for the next test.	
<p>Post-Drop Checklist for Drop #2 has been completed.</p> <p>Test Engineer:_____ Date:_____</p> <p>QA Representative:_____ Date:_____</p>	

DATA SHEET C FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC
GENERATOR PACKAGE MOUNTING SUBSYSTEM 145 for Drop # 2

Passive Shock Indicators: (Indicate Tripped or OK)

Remarks from visual inspection of Test Article:

Wind speed:			
Package Mounting Height 1:	2:	3:	4:

Sketch and measurements of damaged area:

--

Record serial numbers of equipment or instruments replacing damaged equipment/instruments:

Equipment/Instruments	Serial Number

Test Engineer _____ Date _____

QA Representative _____ Date _____

6.2.3.9 The Test Engineer shall make the determination to proceed with the subsequent tests after conferring with the on-site representatives.

HOLD POINT

The next drop shall _____, shall not _____ be performed.

Test Engineer Date

QA Representative Date

6.2.4 Drop #3

Drop #3 is the Bottom face drop. The RTG package assembly and package mounting shall be raised 18" above the floor. The RTG Package and package mounting should be oriented so that the line of impact through the c.g. is perpendicular to the floor when released.

6.2.4.1 Perform pre-drop procedure and complete checklist for Drop #3 as follows:

Pre-Drop Checklist for Drop #3	
1. Move Test Article onto Test Pad.	
2. Install rigging setup as specified for drop, as specified in Table 1.	
3. Connect electronic cables, if any, to Test Article instrumentation. Verify cables are properly connected and instrument systems are checked out.	
4. Mark the Test Article with test number. Mark backdrops with direction.	
5. Attach crane hook to rigging and carefully lift the Test Article until it is just clear of the Test Pad.	
6. Verify all test preparations for the drop are complete.	
7. Call PNL weather station obtain wind speed (373-2716)	
Pre-Drop Checklist for Drop #3 has been completed.	
Test Engineer: _____ Date: _____	
QA Representative: _____ Date: _____	

6.2.4.2 Direct all personnel to go to their assigned, WHC safety approved, observation and test locations.

6.2.4.3 Authorize the rigging crew to lift the Test Article to elevation of 47 cm (18") +2 cm (1")/-0 cm (0"), and verify that the Test Article is in the required orientation and is stable.

6.2.4.4 Verify Test Article elevation, measure at mid point of each side of Package Mounting bottom plate. Elevation=_____

6.2.4.5 Direct that the video cameras be started and verify cameras are operating.

6.2.4.6 Authorize the rigging crew to drop the Test Article.

6.2.4.7 Verify the Test Article is in a stable position on the Test Pad before proceeding to the next step.

6.2.4.8 The Test Engineer shall complete the post-drop checklist.

Post-Drop Checklist for Drop #3	
1. Perform visual inspection of Test Article. Using a metal marking pen, outline the damaged area, if any, and mark it with the drop test number. Measure package mounting height at all four corners, compare measurements to previous measurements and assess implications of differential, if heights vary from previous measurements. Record observation on Data Sheet D.	
2. Inspect the passive shock indicators and record which accelerometers were tripped on Data Sheet D.	
3. Have the video and still cameras record the damaged area, the instrumentation, and the passive shock indicator as required.	
4. Replace any damaged equipment and instrumentation; reset accelerometers and passive shock indicators. Record on Data Sheet D what was replaced and serial numbers of new parts.	
5. Take dimensional measurements of damaged areas; record dimensions on Data Sheet D. Record a sketch of damaged area on Data Sheet D.	
6. Clean Test Pad of dirt and debris. Inspect test pad for damage and verify it is usable for the next test.	
Post-Drop Checklist for Drop #3 has been completed.	
Test Engineer:_____ Date:_____	
QA Representative:_____ Date:_____	

DATA SHEET D FOR THE SHOCK LIMITING DEVICE OF THE RADIOISOTOPE THERMOELECTRIC
GENERATOR PACKAGE MOUNTING SUBSYSTEM 145 for Drop # 3

Passive Shock Indicators: (Indicate Tripped or OK)

Remarks from visual inspection of Test Article:

Wind speed:				
Package Mounting height	1:	2:	3:	4:

Sketch and measurements of damaged area:

--

Record serial numbers of equipment or instruments replacing damaged equipment/instruments:

Equipment/Instruments	Serial Number

Test Engineer

Date

QA Representative

Date

7.0 POST-TEST ACTIVITIES

The Test Engineer shall have the Test Article transferred to a flatbed truck and moved to the 300 Area after the testing has been completed. The Test Engineer shall be responsible for test area clean up, and have any damage to the Test Pad repaired in a timely manner.

8.0 QUALITY ASSURANCE

Quality assurance documentation associated with this test will be prepared and released in accordance with WHC-CM-6-1, E.P. 2.4.

9.0 REPORTS

A written test report shall be prepared in accordance with WHC, Engineering Guidelines, WHC-IP-1026, Appendix K.

10.0 SCHEDULE

Refer to the RTG Transportation System Schedule for scheduling guidance.

11.0 REFERENCES

MIL-STD-810E, "Environmental Test Methods and Engineering Guidelines."

WHC-SD-RTG-FRD-001, "Functions and Requirements for the RTG Transportation System."

WHC-S-4025, "Specification for RTG Packaging Transportation System."

WHC-SD-RTG-PMP-002, "RTG Transportation System Test Program Management Plan."

DATA CONTINUATION SHEET FOR THE TEST FOR THE SHOCK LIMITING DEVICE OF THE RTG
PACKAGE MOUNTING

DROP # _____
CONTINUATION OF DATA SHEET A B C D E F
DATE _____

Test Engineer

Date _____

QA Representative

Date

* ATTACH CONTINUATION SHEET TO THE BACK OF CORRESPONDING DATA SHEET