DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Packaging Programs & Testing	Date 01/23/95
Project Title/Work Order		EDT No. 608456
DOT-7A Packaging Test Procedure		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
Westinghouse Hanford Company					
J. G. Field	G2-02	X			
D. L. Kelly	G2-02	X			
D. L. McCall	G2-02	X			
J. H. O'Brien	G2-02	X			
DOT-7A File	G2-02	X			
Central Files (orig. +2)	L8-04	X			
OSTI (2)	L8-07	X			

A-6000-135 (01/93) WEF067

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JAN 3 0 1995 58 Stg. 21

ENGINEERING DATA TRANSMITTAL

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1. EDT 608456

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Packaging Programs & Testing	Packaging Programs & Testing	N/A
5. Proj./Prog./Dept./Div.:	6. Cog. Engr.:	7. Purchase Order No.:
84400/YHXAA	D. L. Kelly	N/A
8. Originator Remarks:		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: N/A
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: 01/30/95

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-TP-RPT-018		0	DOT-7A Packaging Test Procedure	N/A	2	1,2	1,2

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.
2	1,2	Cog.Eng./D. L. Kelly/ D.L. Kelly 1-23-95 G2-02			
2	1,2	Cog. Mgr./D. M. McCall/ G2-02			
		QA -- N/A			
		Safety -- N/A			
		Env. -- N/A			
2	1,2	J. H. O'Brien/ 23JAN95 G2-02			

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
D. L. Kelly/ D.L. Kelly 1-23-95 Signature of EDT Originator Date	D. L. Kelly/ D.L. Kelly 1-23-95 Authorized Representative for Receiving Organization Date	D. L. McCall/ 1-23-95 Cognizant Manager Date	[ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

BD-7400-172-1 (07/91)

RELEASE AUTHORIZATION

Document Number:	WHC-SD-TP-RPT-018, REV. 0
Document Title:	DOT-7A PACKAGING TEST PROCEDURE
Release Date:	1/24/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Chris Willingham

C. Willingham 1/24/95

SUPPORTING DOCUMENT

1. Total Pages 55

2. Title	3. Number	4. Rev No.
DOT-7A PACKAGING TEST PROCEDURE	WHC-SD-TP-RPT-018	0

5. Key Words	6. Author
Test Procedure, DOT-7A, Type A, Package, Packaging, Radioactive Material	Name: D. L. Kelly D. L. Kelly Signature Organization/Charge Code 84400/E37183

7. Abstract

This report outlines the DOT-7A Type A Packaging Test Procedure that was drafted by J. M. Cruse in July 1991. Please note that this report is not in WHC format. This report is being submitted through the Engineering Documentation System so that it may be used for reference and information purposes.

DISCLAIMER

8. RELEASE STAMP

CONTENTS

DOT-7A PACKAGING TEST PROCEDURE

1.0 INTRODUCTION

This test procedure documents the steps involved with performance testing of Department of Transportation Specification 7A (DOT-7A) Type A packages. It includes descriptions of the performance tests, the personnel involved, appropriate safety considerations, and the procedures to be followed while performing the tests. Sections referenced from Title 49 of the Code of Federal Regulations (49 CFR) which address performance requirements applicable to DOT-7A packagings are reproduced in Appendix A. This test procedure will be revised to reflect any regulation changes which occur.

Westinghouse Hanford Company (WHC) is conducting the evaluation and testing discussed herein for the Department of Energy-Headquarters, Division of Quality Verification and Transportation Safety (EH-321).

1.1 Definitions

Impact Angle - The impact angle is used in drop testing to indicate the angle of the package with respect to the target at impact. The value will be the angle formed by the centerline axis of the package in its normal upright position as measured with respect to the horizontal plane of the impact target (See Figure 1.0-1).

Orientation - The orientation on a package is used to define points of impact in drop or penetration testing. It may be a specific feature or an angle measured from the "W" reference axis as described in Section 6.3 herein (See Figure 1.0-1).

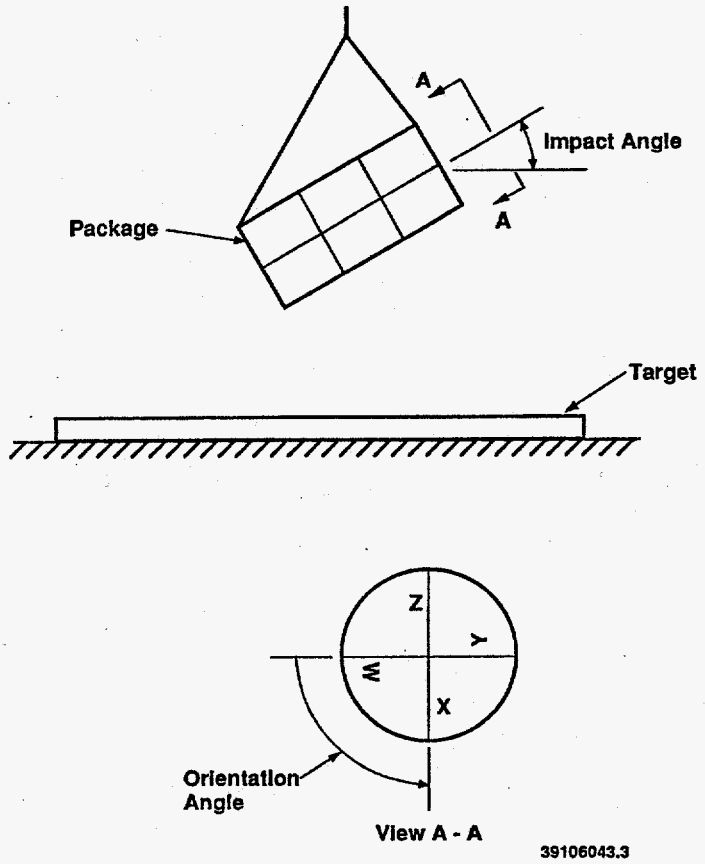

Figure 1.0-1
Typical Package Test Orientation Parameters

2.0 GENERAL TEST DESCRIPTION

The objective of the procedures is to verify that the proposed packaging meets DOT-7A Type A packaging requirements as given in 49 CFR 178.350. The procedure involves pre-test design evaluations, inspections and loading of a simulated payload. Based on a predetermined plan, the test unit packages (test units) are then subjected to a series of performance tests followed by post-test inspections. The following sections provide a general description of each of these activities.

2.1 Pre-Test Activities

2.1.1 Design Verification Review

The first step in qualification of a packaging is to review the data package provided by the applicant which consists of the completed Packaging Qualification Checklist (Reference 1), drawings, specifications, an analysis report and operating instructions. The Test Engineer will review this material and resolve any concerns with the applicant.

2.1.2 Test Plan Development

Upon completion of the Design Verification Review, the Test Engineer then prepares a test plan which details all subsequent steps of Pre-Loading Inspections through testing and Post-Test Activities. The test plan will detail the test sequence, the parameters to be used for each test, including initial conditions, and other critical elements such as the allowable time period between tests. The determination of test sequence and parameters is based on the type of package, materials of construction and the contents.

The test plan will detail the sequence for each test unit and will be reviewed independently and by Safety.

2.1.3 Pre-Loading Inspections

Each test unit will be inspected before testing to ensure compliance with the design and to record certain as-built features. This will, as a minimum involve a general visual inspection, measurement of component weights, and the measurement of the containment boundary wall thickness at several locations. These inspections will be detailed in the test plan.

2.1.4 Assembly, Loading & Closure

Assembly, loading and closure of the test units will be performed in a prototypic manner and in accordance with the operating instructions provided by the applicant.

2.2 Performance Tests

2.2.1 Reduced Pressure Test (173.412(i))

The reduced pressure test is intended to simulate the reduction of ambient (external) pressure to the package to 3.5 psia. This may be achieved by pressurizing the internal cavity of the packaging to 11.2 psig or by placing a closed packaging into a chamber which can be evacuated to 3.5 psia. In both cases, leak detection by visual, soap bubble, pressure change or other method is used. The method is determined by the Test Engineer and reflected in the Test Plan for a given packaging.

2.2.2 Water Spray Test (173.465(b))

The water spray test simulates exposure to rainfall of approximately two inches per hour for at least one hour. This test must precede each of the other tests or test sequences described in 173.465. The time interval between the end of the water spray test and the beginning of the next test shall be such that the water has soaked-in to the maximum extent without appreciable drying of the exterior of the package. The time interval is two hours if the spray is applied from four different directions simultaneously. Other tests will follow immediately if the spray is applied from each of the four directions consecutively.

2.2.3 Compression Test (173.465(d))

The compression test lasts for a period of at least 24 hours. The compressive load is equivalent to either five times the weight of the actual package or 1300 kilograms per square meter (265 pounds per square foot) multiplied by the vertically projected area of the package, whichever is greater. The load is applied uniformly to two opposite sides of the package, one of which must be the base on which the package would normally stand.

2.2.4 Penetration Test (173.465(e) and 173.466(a)(2))

The package is placed on a rigid, flat, horizontal surface. A bar (penetration bar) 3.2 centimeters (1.25 inches) in diameter with a hemispherical end, weighing 6 kilograms (13.2 pounds), with its longitudinal axis vertical, is dropped onto the center of the weakest part of the package, so that, if it penetrates far enough, it will hit the containment system. The bar must not be deformed by the test.

The distance of the fall of the bar is measured from its lower end to the upper surface of the package. The determination of this distance depends on the basic physical form of the contents for which the packaging is designed. The penetration drop height for packagings designed to contain only solids is 1 M (3.3 ft.). This distance is 1.7 M (5.5 ft.) for packagings designed to contain liquids and/or gasses.

2.2.5 Free Drop Test (173.465(c) and 173.466(a)(1))

The free drop test consists of a fall onto a flat, horizontal, rigid surface. The orientation of the test package is such that the fall will cause maximum damage to the package and its safety features. The distance of the fall will be measured from the lowest part of the packaging to the upper surface of the target.

2.3 Post-Test Activities

Following completion of each individual performance test, the test units will be inspected for damage and assessed for adequacy. Upon completion of all of the tests, the Test Engineer will prepare a test report for submittal to DOE/EH-321.

2.4 Pass/Fail Criteria

The package(s) must perform adequately when subjected to the applicable performance tests which are described in Section 2.2 of this procedure. There should be evidence that the integrity of the packaging would remain with no significant release of the hazardous materials to the environment (49 CFR 173.24), no loss or dispersal of radioactive contents, and no significant increase in the radiation levels recorded or calculated at the external surfaces for the condition before the test (49 CFR 173.412(m)).

2.5 Test Exceptions

This test procedure or its sequence may be altered by approval of the Project Engineer or Test Engineer. The Safety Engineer will approve safety related changes as determined by the Project Engineer. Significant changes will be approved by the Packaging Certification Staff as determined by the Project Engineer.

2.6 Test Data

Data collected during evaluation and testing shall consist of a completed PQCL and the Test Data Sheets as invoked by Sections 6.0, 7.0 and 8.0 of this procedure, still-photos and/or video tape records, drawings, and reports from non-destructive testing (NDT) as needed. Analysis of data shall be presented in a final test report upon completion of testing. All original data and documentation shall be referenced and maintained.

3.0 FACILITIES AND EQUIPMENT

3.1 Facilities Required

Facilities required for testing include an unyielding drop pad, an area with adequate water supply for the spray test, and non-destructive testing (NDT) equipment of the type and accuracy needed to satisfy the various inspections.

3.2 Instruments and Calibration

Verification of all instrument and weight calibration shall be performed prior to use in testing.

3.3 Equipment Required

a) Calibrated weighing device

b) Water spray apparatus, including spray system

c) Weights for compression test

d) Penetration bar

e) Rigging equipment for free drops (including quick release)

f) Overhead or mobile crane

g) Necessary safety equipment (as given in Section 5.2)

h) Camera/Video Equipment

i) Dimensional and leakage rate measuring equipment, as-needed

3.4 Hanford Packaging Test Facilities

Packaging test facilities at Hanford include the 305 Building which contains a small drop pad, penetration, water spray, leakage rate and other test equipment.

Two outdoor drop pads are used for drop testing larger packages. A complete discussion of the facilities and equipment is included with this procedure as Appendix B.

4.0 PERSONNEL REQUIREMENTS

4.1 Project Engineer

The Project Engineer has overall responsibility for the cost, schedule and testing activities performed by Westinghouse Hanford Company under the DOT-7A Program.

4.2 Test Engineer

The Test Engineer is the person in charge of the testing activities. It is his responsibility to direct all related activities and to assure the quality, safety, and validity of the test sequences. In addition, it is his responsibility to present the documented results in a final test report.

4.3 Safety Engineer

The Safety Engineer is an independent Industrial Health and Safety representative responsible for verifying compliance of the testing with all appropriate Hanford safety manuals.

4.4 Riggers and Operators

Qualified lifting equipment operators shall perform the drop tests of the packages in accordance with the Hanford Hoisting and Rigging Manual. The manager responsible for hoisting and rigging operations shall designate a person in charge of the hoisting and rigging activities.

4.5 Photographer

A photographer (still and/or video) shall be present during testing as needed to provide recorded visual documentation of the test results.

4.6 Non-Destructive Test Personnel

When NDT is required, certified non-destructive testing personnel shall be used. Evidence of certification shall be required.

5.0 ENVIRONMENT & SAFETY

5.1 Safety Briefing

All personnel involved with testing shall attend a safety briefing given by the Test Engineer and/or the Safety Engineer to ensure that all personnel understand the testing, their responsibilities, and the hazards involved with the testing.

During drop or other impact testing, personnel shall be excluded from the impact area to the extent to be clear of any fragments which could result from the impact. As a minimum this distance shall be 50 ft. in a 30 ft. drop test, 30 ft. in a 4 ft. drop test and 20 ft. in a penetration test.

5.2 Safety Equipment

All personnel shall wear appropriate personal safety equipment as dictated by the particular test being performed and suggested by the Safety Engineer. For safety and testing integrity reasons, barricades shall be erected around the test area(s) to restrict interference from personnel not involved with the test being conducted.

5.3 Rigging Safety

All rigging shall be verified for current inspection, tagging and compliance with the Hanford Hoisting and Rigging Manual WHC-CM-6-4. Preventative maintenance on the crane shall be current. Prior to each lift, the integrity of the hoisting and rigging equipment must be verified to provide a high degree of safety for personnel and equipment.

5.4 Environmental Factors

Testing shall not be conducted in weather conditions that could affect the safety of the test personnel and/or test quality. In the case of inclement weather, the decision to postpone the testing shall be made by the Test Engineer and the Safety Engineer.

6.0 PRE-TEST ACTIVITIES

6.1 Design Verification Review

The process for qualification of a new packaging in the DOT-7A Program will involve the applicant completing the Packaging Qualification Checklist (PQCL) per the guidance of Reference 2 and submitting a document package to WHC for review. The first step for WHC in the evaluation and testing sequence will be a thorough review of the PQCL and the accompanying data. This review is accomplished by performing the following:

6.1.1 Review the PQCL provided by the applicant and the accompanying documents for compliance to the applicable regulatory requirements and resolve any concerns or comments with the applicant.

6.1.2 Upon completion of the review per Item 6.1.1 and incorporation of the resolutions to any comments, sign-off on the completion block on the PQCL and obtain the required independent review.

6.1.3 Retain the completed PQCL for inclusion in the Test Report.

6.2 Test Plan Development

The test plan shall be developed following the Design Verification Review. The test plan will detail the Pre-Loading Inspections to be performed, the simulated payload to be used, the processes for preparing the test units for testing, the test sequence and post-test inspections. The sequences will be based on the packaging type, its intended contents, the applicable regulatory requirements and other items. Prepare the test plan in accordance with the following steps:

6.2.1 A generic test plan form is included with this procedure as Appendix C. Use it as a model to develop the test plan.

6.2.2 Determine and state the Pre-Loading Inspections to be performed on each test unit along with the acceptance criteria. As a minimum, this shall include a general visual inspection, measurement of component weights, and the measurement of the containment boundary wall thickness at several locations. These inspections shall also include any pre-loading inspections specified in the Operating Instructions provided by the applicant.

6.2.3 Determine and state the simulated payload to be used for each test unit and for which tests it must be used.

6.2.4 Determine and state any special steps to be performed involving assembly, loading and closure of the package for each test unit prior to testing. Normally, the Test Plan will merely refer to those steps included in the Operating Instructions provided by the applicant.

6.2.5 Determine and state the sequence and key parameters of the performance tests to be performed referencing the applicable section of this Test Procedure for the details of each test.

6.2.6 Determine and state any Post-Test Inspections to be performed after completion of all of the performance tests.

6.2.7 Review and sign the completed Test Plan. Obtain the required independent review.

6.3 Test Unit Marking

Each test unit shall be marked in accordance with the following steps. The markings shall be visible but shall not interfere with the packaging performance nor affect the visibility of key packaging features which may distort during impact testing.

6.3.1 Mark the exterior, assembled surface with four axis lines, 90° apart. The axis lines shall be labelled **"W", "X", "Y" and "Z"**. See Figure 6.0-1 for an example. Orientation angles for drop test or penetration test impact locations will be measured from the **"W"** axis.

6.3.2 Mark the exterior surface of each major component with a marking which consists of the sequential integer portion of the Docket number followed by a test unit designation (i.e. the first test unit of Docket 91-24-7A, would be marked "24-TU-1"; the second unit would be marked "24-TU-2". All tests shall be identified with a number consisting of the test unit designation followed by a sequential integer indicating the test as shown on the test plan (i.e. the first test on test unit 24-TU-1 would be numbered "24-TU-1-1"; the second test "24-TU-1-2", and so on).

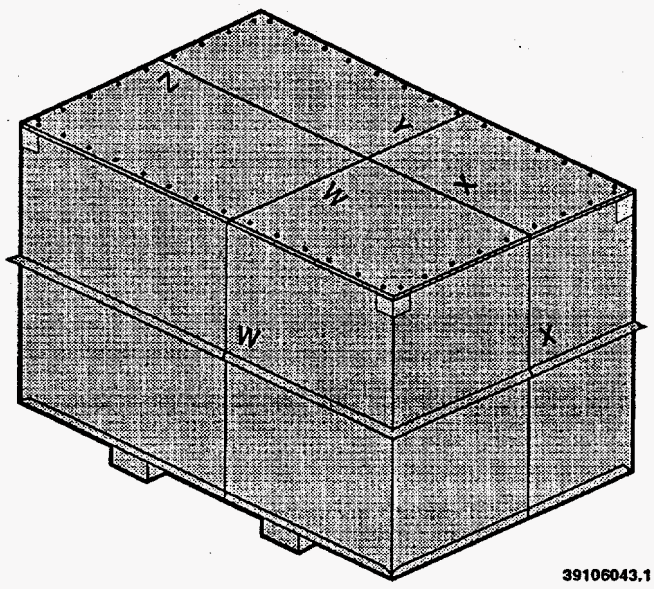

Figure 6.0-1
Typical Package Test Unit Marking

6.4 Pre-Loading Inspections

Pre-Loading Inspections shall be performed on each test unit as invoked by the test plan. These will include the minimum inspections discussed in Section 6.2 and the inspections stated in the Operating Instructions provided by the applicant. The following Subsections provide details on some of the inspections to be performed. Any inspections to be performed for which details are not included herein must be detailed in the Test Plan for a given packaging.

6.4.1 Visual Inspection

6.4.1.1 Visually inspect all packaging components to ensure that they are in good condition. Note specifically any of the following conditions:

(1) Divergence from the specifications or drawings

(2) Defects in construction

(3) Corrosion or other deterioration

(4) Distortion of features

6.4.1.2 Note any discrepant conditions and their disposition on Test Data Sheet [6.4.1].

6.4.2 Component Weights

6.4.2.1 Measure the weight of all major packaging components (i.e. lid, body, etc.).

6.4.2.2 Measure the weight (net) of the assembled and closed packaging without contents.

6.4.2.3 Measure the weight (gross) of the package loaded with simulated contents.

6.4.2.4 Record the weight data on Test Data Sheet [6.4.2].

6.4.3 Wall Thicknesses

6.4.3.1 Measure the wall thickness of the materials forming the containment boundary at several places as stated in the test plan.

6.4.3.2 Record the locations and measurement results on Test Data Sheet [6.4.3].

6.5 Assembly, Loading & Closure

The following steps shall be performed to complete the package preparation for testing:

6.5.1 Assemble the packaging components of each test unit per the Operating Instructions and any special steps indicated in the Test Plan.

6.5.2 Load the simulated payload (if applicable) per the Operating Instructions and any special steps indicated in the Test Plan.

6.5.3 Close the packaging per the Operating Instructions and any special steps indicated in the Test Plan.

7.0 PERFORMANCE TEST PROCEDURES

The following Sections provide the step-by-step details for conducting each of the performance tests. These procedures will be invoked by the Test Plan for a given test unit on an as-needed basis.

7.1 Reduced Pressure Test

The reduced pressure test simulates the reduction of ambient (external) pressure to the package to 3.5 psia [173.412(i)]. This may be achieved by pressurizing the internal cavity of the packaging to 11.2 psig ("Pressure Elevation Method") or by placing an empty but closed packaging into a chamber which can be evacuated to 3.5 psia ("Pressure Reduction Method"). In both cases, leak detection by the gas pressure drop, gas bubble, soap bubble, gas pressure rise (Reference 3), other method sensitive to 10E-03 std-cc/sec will typically be used. The following Subsections provide details for both methods:

7.1.1 Initial Conditions

The following initial conditions shall be established prior to the test:

7.1.1.1 The packaging has been marked, inspected and assembled per applicable portions of Section 6.0 as invoked by the Test Plan.

7.1.2 Test - Pressure Elevation Method

This procedure simulates the reduced ambient pressure conditions by elevating the pressure of the payload cavity of the packaging. Complete the following steps recording all data, observations, and indicate completion of steps on Test Data Sheet 7.1.2.

7.1.2.1 Install a fitting into the containment boundary shell at a non-critical location to allow for pressurizing the payload cavity.

7.1.2.2 Close the packaging per the Operating Instructions and any special steps indicated in the Test Plan. Special contents or objects may be loaded into the payload cavity in order to displace the volume and limit the potential energy inside the packaging for safety reasons.

7.1.2.3 Attach a pressure line with gage and cut-out valve as shown in Figure 7.1-1.

7.1.2.4 Pressurize the payload cavity to 11.2 +0.5/-0.0 psig, shut the cut-out valve, disconnect the air line and record the initial time, pressure and temperature.

7.1.2.5 Let the assembly stand for 15 minutes minimum while observing for leakage. Leakage indication may be achieved by one of the methods mentioned in Paragraph 7.1 as detailed in the test plan.

7.1.2.6 At the completion of the hold period, record the final time, pressure and temperature.

7.1.2.7 Slowly open the cut-out valve and relieve the payload cavity pressure. Secure the test equipment.

7.1.2.8 Evaluate the time, pressure and temperature data, the observations during the hold period and indicate a leakage rate as zero if below 1.0E-03 std-cc/sec and "pass" if this is the case. If detectable leakage occurs (i.e. above 1.0E-03 std-cc/sec), indicate "fail" and repeat steps 7.1.2.3 through 7.1.2.6 while using soap bubble leak test solution (snoop) or other method to isolate the location of the leak. Record the results of this effort on the data sheet.

7.1.2.9 Remove the package from the test set-up and prepare it for subsequent testing as indicated in the Test Plan.

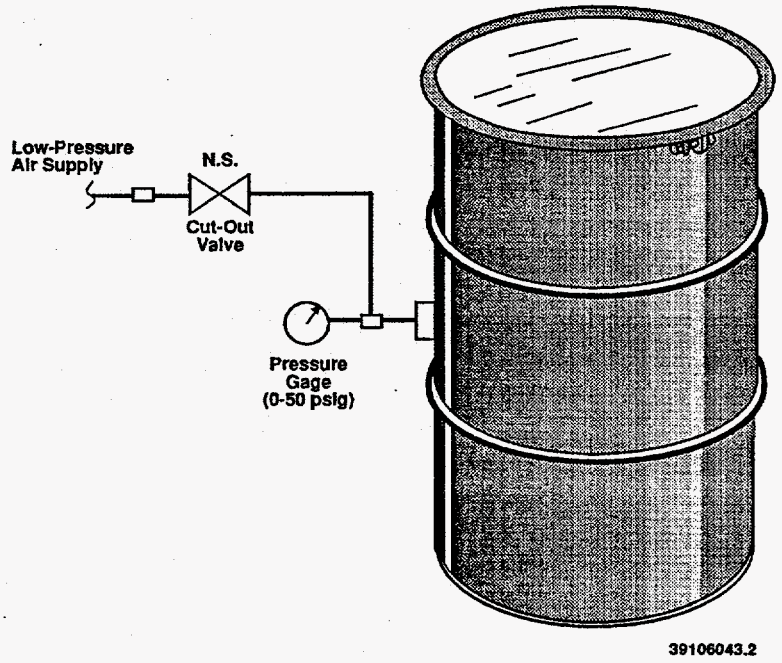

Figure 7.1-1
Reduced External Pressure Test (Elevation Method) Typical Set-up

7.1.3 Test - Pressure Reduction Method

This procedure simulates the reduced ambient pressure conditions by reducing the external pressure to the packaging. Complete the following steps recording all data, observations, and indicate completion of steps on Test Data Sheet 7.1.3.

7.1.3.1 Install a fitting into the containment boundary shell at a non-critical location to allow for sensing pressure in the payload cavity.

7.1.3.2 Close the packaging per the Operating Instructions and any special steps indicated in the Test Plan. Special contents or objects may be loaded into the payload cavity in order to displace the volume and limit the potential energy inside the packaging for safety reasons.

7.1.3.3 Place the closed package in a chamber and reduce the ambient pressure to 3.5 +0.0/-0.5 psia, as shown in Figure 7.1-2. The package may be submerged or coated at selected areas with snoop to allow detection of leakage.

7.1.3.4 Let the assembly stand for 15 minutes minimum while observing for leakage. Leakage indication may be achieved by one of the methods mentioned in Paragraph 7.1 as detailed in the test plan.

7.1.3.5 At the completion of the hold period, record the final time, pressure and temperature.

7.1.3.6 Relieve the vacuum and secure the test equipment.

7.1.3.7 Evaluate the time, pressure and temperature data and indicate a leakage rate as zero if below 1.0E-03 std-cc/sec and "pass" if this is the case. If detectable leakage occurs (i.e. above 1.0E-03 std-cc/sec), indicate "fail" and repeat steps 7.1.2.3 through 7.1.2.6 while using soap bubble leak test solution (snoop) or other method to isolate the location of the leak. Record the results of this effort on the data sheet.

7.1.3.8 Remove the package from the test set-up and prepare it for subsequent testing as indicated in the Test Plan.

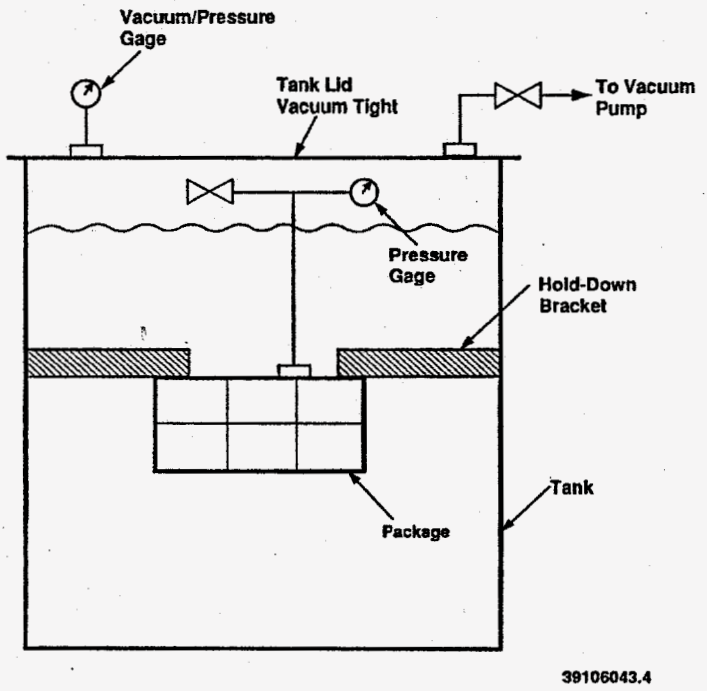

Figure 7.1-2
Reduced External Pressure Test (Reduction Method) Typical Set-up

7.2 Water Spray Test

The water spray test simulates exposure to rainfall of approximately two inches per hour for at least one hour.

Complete the following steps recording all data, observations, and indicate completion of steps on Test Data Sheet 7.2.

7.2.1 Initial Conditions

The following initial conditions shall be established prior to the test:

7.2.1.1 The packaging has been marked, inspected, assembled and closed (no payload) per applicable portions of Section 6.0 as invoked by the Test Plan.

7.2.2 Test Procedure

7.2.2.1 Load the package into the water spray test stand and set-up the necessary water spray equipment.

7.2.2.2 Start the water spray simulating the conditions as required [173.465(b)], record the start time, and maintain the conditions for a minimum of one hour.

7.2.2.3 Observe the package for any degradation of features during the test interval. Photograph the assembly during this time period.

7.2.2.4 At the completion of the minimum time interval, record the stop time and secure the water spray equipment.

7.2.2.5 Note any degradation of features or other affects on the package on the data sheet. If no degradation to the package's effectiveness occurred, indicate "pass"; otherwise indicate "fail" and explain.

7.2.2.6 Remove the package from the test stand and prepare it for subsequent testing as indicated in the Test Plan.

7.3 Compression Test

The compression test lasts for a period of at least 24 hours. The compressive load is equivalent to either five times the weight of the actual package or 1300 kilograms per square meter (265 pounds per square foot) multiplied by the vertically projected area of the package, whichever is greater. The load is applied uniformly to two opposite sides of the package, one of which must be the base on which the package would normally stand.

Complete the following steps recording all data, observations, and indicate completion of steps on Test Data Sheet 7.3.

7.3.1 Initial Conditions

The following initial conditions shall be established prior to the test:

7.3.1.1 The packaging has been marked, inspected, assembled and closed (no payload) per applicable portions of Section 6.0 as invoked by the Test Plan.

7.3.2 Test Procedure

7.3.2.1 The compression load has been determined as part of the Test Plan development. Indicate the load to be applied on the data sheet.

7.3.2.2 Assemble the necessary test weights.

7.3.2.3 Load the package and record the initial time.

7.3.2.4 Hold the test conditions for 24 hrs. (minimum) and photograph the loaded set-up during the hold period.

7.3.2.5 After 24 hrs. (minimum) record the time and remove the package from the test set-up.

7.3.2.6 Note any degradation of features or other affects on the package on the data sheet. If no degradation to the package's effectiveness occurred, indicate "pass"; otherwise indicate "fail" and explain.

7.3.2.7 Remove the package from the test stand and prepare it for subsequent testing as indicated in the Test Plan.

7.4 Penetration Test

The package is placed on a rigid, flat, horizontal surface. The penetration bar is then dropped onto the package impacting at a predetermined location. The drop height is also predetermined, based on the type of packaging.

Complete the following steps recording all data, observations, and indicate completion of steps on Test Data Sheet 7.4.

7.4.1 Initial Conditions

The following initial conditions shall be established prior to the test:

7.4.1.1 The packaging has been marked, inspected, assembled and closed (with payload) per applicable portions of Section 6.0 as invoked by the Test Plan.

7.4.1.2 Mark the impact point to be attacked by the test on the test unit along with the applicable test number.

7.4.2 Test Procedure

7.4.2.1 Place the package on a drop pad or other flat, horizontal, unyielding surface in the orientation stated in the Test Plan. Record the drop height and the impact point of the penetration bar on the Test Data Sheet.

7.4.2.2 Elevate the penetration bar to the correct height above the impact area and photograph the test set-up.

7.4.2.3 Drop the bar freely and without restriction, impacting the package.

7.4.2.4 Examine the impact area and photograph.

7.4.2.5 Evaluate the effect of the test on the package. If no degradation to the package's effectiveness occurred, indicate "pass"; otherwise indicate "fail" and explain. Record these observations on the data sheet.

7.4.2.6 Remove the package from the test set-up and prepare it for subsequent testing as indicated in the Test Plan.

7.5 Free Drop Test

The free drop test consists of a free-fall onto a suitable drop pad. The impact angle and orientation of the test package is predetermined and set in the Test Plan. The distance of the fall will be measured from the lowest part of the packaging to the upper surface of the target and is also stated in the Test Plan.

Complete the following steps recording all data, observations, and indicate completion of steps on Test Data Sheet 7.5.

7.5.1 Initial Conditions

The following initial conditions shall be established prior to the test:

7.5.1.1 The packaging has been marked, inspected, assembled and closed (with payload) per applicable portions of Section 6.0 as invoked by the Test Plan.

7.5.2 Test Procedure

7.5.2.1 The impact angle, orientation and drop height were established in the Test Plan; record these parameters and sketch the rigged set-up on the data sheet.

7.5.2.2 Direct the riggers to establish the rigged set-up as shown on the sketch.

7.5.2.3 Photograph the rigged set-up showing that the drop height is correct (use a tape measure) and start the video coverage.

7.5.2.4 **Drop the package.** Following the impact secure the video coverage.

7.5.2.5 Direct the riggers to clear the crane and rigging to allow for approaching the package.

7.5.2.6 Approach the package, examine, photograph and videotape the damaged areas of the package. If flour and fluorescent powder are used, examine the damaged area and any other suspect package features, using the black light method, for leakage indication. Record the results of this on the data sheet.

7.5.2.7 If no degradation to the package's effectiveness occurred, indicate "pass"; otherwise indicate "fail" and explain. Record these observations on the data sheet.

7.5.2.8 Remove the package from the test set-up and prepare it for subsequent testing as indicated in the Test Plan.

8.0 POST-TEST ACTIVITIES

The following actions shall be performed at the conclusion of all evaluation and testing activities:

8.1 Assemble the PQCL, the Test Plan and all Test Data Sheets into a data package and review with the Project Engineer to establish the conclusions of the evaluation and testing.

8.2 If the package is considered acceptable, prepare a test report which includes the data package assembled per Item 8.1 and the proposed data which would be included in the DOT-7A Packaging Technical Manual (Reference 1). Prepare a cover letter to submit this report to DOE/EH-321 for approval.

8.3 If the evaluation and testing concludes that the package does not meet DOT-7A requirements, prepare a letter which highlights the discrepancies for submittal to DOE/EH-321 and inform the applicant as to what actions may be taken to resolve the problem.

9.0 REFERENCES

1. Cruse, J. M., 1992, *Test and Evaluation Document for DOT Specification 7A Type A Packaging*, WHC-EP-0558, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

2. Kelly, D. L., 1995, *DOT-7A Type A Packaging Design Guide*, Rev. 0, WHC-SD-TP-RPT-017, Westinghouse Hanford Company, Richland, Washington.

3. ANSI, 1987, *American National Standard for Radioactive Materials--Leakage Tests on Packages for Shipment*, ANSI N14.5-1987, American National Standards Institute, New York, New York.

APPENDIX A

TITLE 49 CFR EXCERPTS

A.1 49 CFR 173.412

ADDITIONAL DESIGN REQUIREMENTS FOR TYPE A PACKAGES

(i) The containment system will retain its radioactive contents under the reduction of ambient pressure to .25 kilograms per square centimeter (3.5 pounds per square inch);

(m) When subjected to the tests specified in 173.465 or evaluated against these tests by any of the methods authorized by 173.461(a), the packaging will prevent:

(1) Loss or dispersal of the radioactive contents; and

(2) Any significant increase in the radiation levels recorded or calculated at the external surfaces for the condition before the test;

(n) Each packaging designed for liquids will:

(1) Meet the conditions prescribed in paragraph (m) of this section when subjected to the tests specified in 173.466 or evaluated against these tests by any of the methods authorized by 173.461(a);

(2) For any package with a liquid volume not exceeding 50 cubic centimeters (1.7 fluid ounces), have sufficient suitable absorbent material to absorb twice the volume of the liquid contents. The absorbent material shall be compatible with the package contents and suitably positioned to contact the liquid in the event of leakage; and

(3) For any package with a liquid volume exceeding 50 cubic centimeters (1.7 fluid ounces) either:

(i) Have sufficient absorbent material as prescribed in paragraph (n)(2) of this section; or

(ii) Have a containment system composed of primary inner and secondary outer containment components designed to assure the retention of the liquid contents within the secondary outer components in the event that the primary inner components leak; and

(o) Each package designed for compressed or uncompressed gases other than tritium or argon-37 not exceeding 200 curies will be able to prevent loss of contents when the package is subjected to the tests prescribed in 173.466 or evaluated against these tests by any of the methods authorized by 173.461(a).

A.2 49 CFR 173.461

DEMONSTRATION OF COMPLIANCE WITH TESTS

(a) Compliance with the test requirements in 173.463 through 173.469 shall be shown by any of the methods prescribed in this paragraph, or by a combination of these methods appropriate for the particular feature being evaluated:

(1) By performance of tests with prototypes or samples of the packaging or special form material as normally presented for transportation, in which case the contents of the packaging for the test shall simulate as closely as practicable the expected normal radioactive contents. The use of non-radioactive substitute contents is encouraged provided that the results of the testing take into account the radioactive characteristics of the contents for which it is being tested;

(2) By reference to a previous, satisfactory demonstration of compliance of a sufficiently similar nature;

(3) By performance of tests with models of appropriate scale incorporating those features that are significant with respect to the item under investigation, when engineering experience has shown results of those tests to be suitable for design purposes. When a scale model is used, the need for adjusting certain test parameters, such as the penetrator diameter or the compressive load, must be taken into account; or

(4) By engineering evaluation or comparative data.

(b) With respect to the initial conditions for the tests under 173.463 through 173.469, except for the water immersion tests, compliance shall be based upon the assumption that the package is in equilibrium at an ambient temperature of 38°C (100°F).

A.3 49 CFR 173.462

PREPARATION OF SPECIMENS FOR TESTING

(a) Each specimen (i.e., sample, prototype or scale model) shall be examined before testing to identify and record faults or damage, including:
(1) Divergence from the specifications or drawings;
(2) Defects in construction;
(3) Corrosion or other deterioration; and
(4) Distortion of features.
(b) Any deviation found under paragraph (a) of this section from the specified design shall be corrected or suitably taken into account in the subsequent evaluation.
(c) The containment system of the packaging shall be clearly specified.
(d) The external features of the specimen shall be clearly identified so that reference may be made to any part of it.

A.4 49 CFR 173.463

PACKAGING AND SHIELDING - TESTING FOR INTEGRITY

After each of the applicable tests specified in 173.465 and 173.466, the integrity of the packaging, or of the packaging and its shielding, shall be retained to the extent required by 173.412(m) for the packaging being tested.

A.5 49 CFR 173.465

TYPE A PACKAGING TESTS

(a) The proposed packaging with proposed contents must be capable of withstanding the tests prescribed in this section. One prototype may be used for all tests if the requirements of paragraph (b) of this section are complied with.

(b) Water Spray Test. The water spray test must precede each test or test sequence prescribed in this section. The water spray test shall simulate exposure to rainfall of approximately 5 centimeters (2 inches) per hour for at least one hour. The time interval between the end of the water spray test and the beginning of the next test shall be such that the water has soaked-in to the maximum extent without appreciable drying of the exterior of the package. In the absence of evidence to the contrary, this interval may be assumed to be two hours if the water spray is applied from four different directions simultaneously. However, no time interval may elapse if the water spray is applied from each of the four directions consecutively.

(c) Free Drop Test. The free drop test consists of a fall onto the target in a manner that causes maximum damage to the safety features being tested, and:

(1) For packages weighing 5,000 kilograms (11,000 pounds) or less, the distance of the fall measured from the lowest point of the packaging to the upper surface of the target shall not be less than 1.2 meters (4 feet).

(2) For packages weighing more than 5,000 kilograms (11,000 pounds), the distance of the fall shall not be less than the distance specified in Table 11, for the applicable packaging weight:

TABLE 11 - FREE-FALL DISTANCE FOR PACKAGING WEIGHING MORE THAN 5,000 KILOGRAMS.

Packaging Weight		Free-Fall Distance	
Kilograms	Pounds	Feet	Meters
Up to 5,000	Up to 11,000	4	1.2
>5,000 to 10,000	>11,000 to 22,000	3	0.9
>10,000 to 15,000	>22,000 to 33,000	2	0.6
More than 15,000	More than 33,000	1	0.3

(3) For Fissile Class II packaging, the free drop specified in subparagraph (1) or (2) of this paragraph shall be preceded by a drop from a height of 0.3 meter (1 foot) on each corner. For cylindrical packaging, the 0.3 meter (1 foot) drop shall be onto each of the quarters of each rim.

(4) For fiberboard or wood rectangular packages not exceeding 50 kilograms (110 pounds) in weight, a separate specimen of the proposed packaging shall be subjected to a free drop onto each corner from a height of 0.3 meter (1 foot).

(5) For fiberboard cylindrical packages weighing not more than 100 kilograms (220 pounds) a separate specimen of the proposed packaging shall be subjected to a free drop onto each of the quarters of each rim from a height of 0.3 meter (1 foot).

(6) The target shall have a flat, horizontal surface of such mass and rigidity that any increase in its resistance to displacement or deformation upon impact by the specimen would not significantly increase the damage to the specimen.

(d) Compression Test. The compression test shall last for a period of at least 24 hours and consists of a compressive load equivalent to the greater of the following:

(1) Five times the weight of the actual package; or

(2) 1300 kilograms per square meter (265 pounds per square foot) multiplied by the vertically projected area of the package. The compressive load shall be applied uniformly to two opposite sides of the packaging specimen, one of which must be the base on which the package would normally stand.

(e) Penetration Test. For the penetration test the packaging specimen shall be placed on a rigid, flat, horizontal surface that will not move while the test is being performed. The test shall consist of:

(1) A bar of 3.2 centimeters (1.25 inches) in diameter with a hemispherical end weighing 6 kilograms (13.2 pounds) being dropped with its longitudinal axis vertical, onto the center of the weakest part of the packaging specimen, so that, if it penetrates far enough, it will hit the containment system. The bar must not be deformed by the test; and

(2) The distance of the fall of the bar measured from its lower end to the upper surface of the packaging specimen shall not be less than 1 meter (3.3 feet).

A.6 49 CFR 173.466

ADDITIONAL TESTS FOR TYPE A PACKAGING DESIGNED FOR LIQUIDS AND GASES

(a) In addition to the tests prescribed in 173.465, Type A packaging designed for liquids and gases shall be capable of withstanding the following tests:

(1) **Free Drop Test.** The packaging specimen shall fall onto the target in a manner which will cause it to suffer the maximum damage to its containment. The distance of the fall measured from the lowest part of the packaging specimen shall not be less than 9 meters (30 feet).

(2) **Penetration Test.** The specimen must be subjected to the test specified in 173.465(e) except that the distance of the fall shall be 1.7 meters (5.5 feet).

APPENDIX B

HANFORD PACKAGING TEST FACILITIES

HANFORD PACKAGING TEST FACILITIES

[Information Pending]

APPENDIX C

TEST PLAN FORM

1.0 Docket Information

Date: _____

Docket No. _____

Packaging Name(s): _____

_____

Applicant Name & Address: _____

_____

_____

_____

Applicant Phone(s): **Coml.** _____

FTS _____

2.0 Packaging Data

Packaging Manufacturer: _____

Manufacturer Drawing No.: _____

Weight: **Gross -** _____ **Net -** _____

Contents: **[ ] Solid [ ] Form 1 [ ] Form 2 [ ] Form 3**

[ ] Liquid Specific Gravity: _____

[ ] Gas

3.0 Test Unit Marking

3.1 Mark each test unit in accordance with Section 6.3. List the test units below, by test unit number and note the configuration of each if more than one packaging configuration is being tested.

[xx]-TU-1 _____

[xx]-TU-2 _____

[xx]-TU-x _____

(additional - as needed)

4.0 Pre-Loading Inspections

4.1 Perform preloading inspections on each test unit per Section 6.4 and record the data on Test Data Sheets 6.4.1, 6.4.2 and 6.4.3 of Appendix D (separate set for each test unit).

5.0 Simulated Payload

5.1 Describe the simulated payload to be used for each test unit below:

Test Unit [xx]-TU-1: _____

_____

_____

Test Unit [xx]-TU-2: _____

_____

_____

6.0 Test Sequence - Test Unit [xx]-TU-1

[xx]-TU-1-1 Assemble and close the packaging empty (no payload) in accordance with applicant provided Operating Instructions.

[xx]-TU-1-2 Perform a Reduced Pressure Test per Section 7.1 using the [Pressure Elevation Method/Pressure Reduction Method] per Subsection [7.1.2/7.1.3]. Record the results on the appropriate Test Data Sheet.

[xx]-TU-1-3 Perform a Compression Test per Section 7.3 with the following weight:

Compression Test Weight: _____(lb.)

Record the results on the appropriate Test Data Sheet.

[xx]-TU-1-x [additional tests as needed]

7.0 Test Sequence - Test Unit [xx]-TU-2

[xx]-TU-2-1 Assemble and close the packaging with simulated payload in accordance with applicant provided Operating Instructions.

[xx]-TU-2-2 Perform a Water Spray Test per Section 7.2 and record the results on the appropriate Test Data Sheet.

[xx]-TU-2-3 Perform a Penetration Test per Section 7.4 with the following parameters:

Drop Height: _____ (normally 3.3 ft.)

Impact Point: _____

_____

Record the results on the appropriate Test Data Sheet.

[xx]-TU-2-x [additional penetration tests as needed]

[xx]-TU-2-x Perform a Drop Test per Section 7.5 with the following parameters:

Drop Height: _____ (normally 4 ft.)

Impact Angle: _____ (deg.)

Orientation: _____

_____

_____
(indicate angle and/or feature to be attacked.)

Record the results on the appropriate Test Data Sheet.

[xx]-TU-2-x [additional drop tests as needed]

8.0 Post-Test Actions - Test Unit [xx]-TU-1

8.1 Photograph the test unit in its final condition.

8.x [additional actions as needed]

9.0 Post-Test Actions - Test Unit [xx]-TU-2

9.1 Photograph the test unit in its final condition.

9.x [additional actions as needed]

10.0 Signatures

Prepared: _____
(Test Engineer) Date

Reviewed: _____
(Independent Reviewer) Date

Reviewed: _____
(Safety) Date

Reviewed: _____
(Quality Assurance) Date

APPENDIX D

TEST DATA SHEETS

DOT-7A PROGRAM **DOCKET:** _____
TEST DATA SHEET 6.4.1
PACKAGING VISUAL INSPECTIONS **TEST UNIT NO.:** _____

Perform Inspections Per Procedure Section 6.4.1.

Component: _____

[ ] - Accept [ ] - Reject

Remarks: _____

Component: _____

[ ] - Accept [ ] - Reject

Remarks: _____

Component: _____

[ ] - Accept [ ] - Reject

Remarks: _____

Component: _____

[ ] - Accept [ ] - Reject

Remarks: _____

COMPLETION: _____
Test Engineer Date

[Use additional sheets as needed]

DOT-7A PROGRAM
TEST DATA SHEET 6.4.2-1/2
PACKAGING COMPONENT WEIGHTS

DOCKET: ____________

TEST UNIT NO.: ____________

Measure Major Component Weights and Record Per Procedure Section 6.4.2.

Component: ____________________________

Weight: ________ (lb.) Date Measured: ____________

Equipment Note ________ Test Engineer - Initial/Date ______ / ______

Component: ____________________________

Weight: ________ (lb.) Date Measured: ____________

Equipment Note ________ Test Engineer - Initial/Date ______ / ______

Component: ____________________________

Weight: ________ (lb.) Date Measured: ____________

Equipment Note ________ Test Engineer - Initial/Date ______ / ______

Component: ____________________________

Weight: ________ (lb.) Date Measured: ____________

Equipment Note ________ Test Engineer - Initial/Date ______ / ______

Component: ____________________________

Weight: ________ (lb.) Date Measured: ____________

Equipment Note ________ Test Engineer - Initial/Date ______ / ______

Component: ____________________________

Weight: ________ (lb.) Date Measured: ____________

Equipment Note ________ Test Engineer - Initial/Date ______ / ______

Component: ____________________________

Weight: ________ (lb.) Date Measured: ____________

Equipment Note ________ Test Engineer - Initial/Date ______ / ______

Remarks: ____________________________

____

____

COMPLETION: ____________________________
Test Engineer Date
[Use additional sheets as needed]

DOT-7A PROGRAM **DOCKET:** _____
TEST DATA SHEET 6.4.2-2/2
PACKAGING COMPONENT WEIGHTS **TEST UNIT NO.:** _____

Measure Major Component Weights and Record Per Procedure Section 6.4.2.

Component: _____

Weight: _____ (lb.) Date Measured: _____

Equipment Note _____ Test Engineer - Initial/Date _____ / _____

Component: _____

Weight: _____ (lb.) Date Measured: _____

Equipment Note _____ Test Engineer - Initial/Date _____ / _____

Component: **Complete Packaging - Assembled and Closed (Net)**

Weight: _____ (lb.) Date Measured: _____

Equipment Note _____ Test Engineer - Initial/Date _____ / _____

Component: **Package - Loaded with Simulated Payload (Gross)**

Weight: _____ (lb.) Date Measured: _____

Equipment Note _____ Test Engineer - Initial/Date _____ / _____

Equipment Notes:

1) Description: _____

Serial No. _____ Accuracy: _____

Calibration No. & Expiration: _____ / _____

2) Description: _____

Serial No. _____ Accuracy: _____

Calibration No. & Expiration: _____ / _____

3) Description: _____

Serial No. _____ Accuracy: _____

Calibration No. & Expiration: _____ / _____

Remarks: _____

_____

_____

COMPLETION: _____
Test Engineer Date

[Use additional sheets as needed]

DOT-7A PROGRAM
TEST DATA SHEET 6.4.3-1/2
PACKAGING COMPONENT WALL THICKNESS

DOCKET: ____________

TEST UNIT NO.: ____________

Measure Component Wall Thicknesses Per Test Plan and Record Per Procedure Section 6.4.3.

Component: ______________________________

Feature or Location: ______________________________

Thickness: ____________ (in.)   Date Measured: ____________

Equipment Note ________   Test Engineer - Initial/Date ______ / ______

Component: ______________________________

Feature or Location: ______________________________

Thickness: ____________ (in.)   Date Measured: ____________

Equipment Note ________   Test Engineer - Initial/Date ______ / ______

Component: ______________________________

Feature or Location: ______________________________

Thickness: ____________ (in.)   Date Measured: ____________

Equipment Note ________   Test Engineer - Initial/Date ______ / ______

Component: ______________________________

Feature or Location: ______________________________

Thickness: ____________ (in.)   Date Measured: ____________

Equipment Note ________   Test Engineer - Initial/Date ______ / ______

Component: ______________________________

Feature or Location: ______________________________

Thickness: ____________ (in.)   Date Measured: ____________

Equipment Note ________   Test Engineer - Initial/Date ______ / ______

Remarks: ______________________________

____

____

COMPLETION: ______________________________

Test Engineer   Date

[Use additional sheets as needed]

DOT-7A PROGRAM **DOCKET:** _____
TEST DATA SHEET 6.4.3-2/2
PACKAGING COMPONENT WALL THICKNESS **TEST UNIT NO.:** _____

Measure Component Wall Thicknesses Per Test Plan and Record Per Procedure Section 6.4.3.

Component: _____

Feature or Location: _____

Thickness: _____ (in.) Date Measured: _____

Equipment Note _____ Test Engineer - Initial/Date _____ / _____

Component: _____

Feature or Location: _____

Thickness: _____ (in.) Date Measured: _____

Equipment Note _____ Test Engineer - Initial/Date _____ / _____

Component: _____

Feature or Location: _____

Thickness: _____ (in.) Date Measured: _____

Equipment Note _____ Test Engineer - Initial/Date _____ / _____

Equipment Notes:

1) Description: _____

Serial No. _____ Accuracy: _____

Calibration No. & Expiration: _____ / _____

2) Description: _____

Serial No. _____ Accuracy: _____

Calibration No. & Expiration: _____ / _____

3) Description: _____

Serial No. _____ Accuracy: _____

Calibration No. & Expiration: _____ / _____

Remarks: _____

_____

_____

COMPLETION: _____
Test Engineer Date

[Use additional sheets as needed]

DOT-7A PROGRAM **DOCKET:** _____
TEST DATA SHEET 7.1.2
REDUCED PRESSURE TEST **TEST UNIT NO.:** _____

Perform the Reduced Pressure Test and Record Data per Procedure Section 7.1.2;
Indicate Completion of Steps as Follows:

7.1.1	Initial Conditions Established.	Test Engineer - Initial/Date _____ / _____
7.1.2.1 through 7.1.2.3	Test Assembly Set-up. " "	Test Engineer - Initial/Date _____ / _____
7.1.2.4	Pressurize Payload Cavity	Test Engineer - Initial/Date _____ / _____

Time: _____ (use military notation - 1:30 p.m. = 13:30)

Pressure _____ (psig)

Temperature: _____ (F)

7.1.2.5	Hold (_____ Minutes, Observe, Conduct Leakage Rate Testing	Test Engineer - Initial/Date _____ / _____

7.1.2.6 Record Final Data.

Time: _____ (use military notation - 1:30 p.m. = 13:30)

Pressure _____ (psig)

Temperature: _____ (F)

7.1.2.7	Relieve Pressure.	Test Engineer - Initial/Date _____ / _____
7.1.2.8	Evaluate Leakage Rate.	Test Engineer - Initial/Date _____ / _____

[ ] - Pass [ ] - Fail

Remarks: _____

_____

_____

_____

_____

COMPLETION: _____
Test Engineer Date

DOT-7A PROGRAM **DOCKET:** _____
TEST DATA SHEET 7.1.3
REDUCED PRESSURE TEST **TEST UNIT NO.:** _____

Perform the Reduced Pressure Test and Record Data per Procedure Section 7.1.3;
Indicate Completion of Steps as Follows:

7.1.1	Initial Conditions Established.	Test Engineer - Initial/Date	_____ / _____
7.1.3.1 through 7.1.3.2	Test Assembly Set-up. " "	Test Engineer - Initial/Date	_____ / _____
7.1.3.3	Reduce Ambient Pressure.	Test Engineer - Initial/Date	_____ / _____

Time: _____ (use military notation - 1:30 p.m. = 13:30)

Pressure _____ (psia)

Temperature: _____ (F)

7.1.2.4	Hold (_____ Minutes, Observe, Conduct Leakage Rate Testing.	Test Engineer - Initial/Date	_____ / _____
7.1.2.5	Record Final Data.		

Time: _____ (use military notation - 1:30 p.m. = 13:30)

Pressure _____ (psig)

Temperature: _____ (F)

7.1.2.6	Relieve Vacuum.	Test Engineer - Initial/Date	_____ / _____
7.1.2.7	Evaluate Leakage Rate.	Test Engineer - Initial/Date	_____ / _____

[ ] - Pass [ ] - Fail

Remarks: _____

_____

_____

_____

_____

COMPLETION: _____
Test Engineer Date

DOT-7A PROGRAM
TEST DATA SHEET 7.2
WATER SPRAY TEST

DOCKET: _____

TEST UNIT NO.: _____

Perform the Water Spray Test and Record Data per Procedure Section 7.2;
Indicate Completion of Steps as Follows:

7.2.1	Initial Conditions Established.	Test Engineer - Initial/Date	_____ / _____
7.2.2.1	Test Assembly Set-up.	Test Engineer - Initial/Date	_____ / _____
7.2.2.2	Start Water Spray.	Test Engineer - Initial/Date	_____ / _____
	Time: _____ (use military notation - 1:30 p.m. = 13:30)		
7.2.2.3	Maintain Spray, Observe, Photograph.	Test Engineer - Initial/Date	_____ / _____
7.2.2.4	Stop Water Spray, Secure Equipment.	Test Engineer - Initial/Date	_____ / _____
	Time: _____ (use military notation - 1:30 p.m. = 13:30)		
7.2.2.5	Evaluate Performance.	Test Engineer - Initial/Date	_____ / _____

[ ] - Pass [ ] - Fail

Remarks: _____

_____

_____

_____

_____

COMPLETION: _____
Test Engineer Date

DOT-7A PROGRAM
TEST DATA SHEET 7.3
COMPRESSION TEST

DOCKET: _____

TEST UNIT NO.: _____

Perform the Compression Test and Record Data per Procedure Section 7.3;
Indicate Completion of Steps as Follows:

7.3.1	Initial Conditions Established.	Test Engineer - Initial/Date _____/_____
7.3.2.1 through 7.3.2.2	Test Assembly Set-up.	Test Engineer - Initial/Date _____/_____
	Test Load: _____ (lb.)	
7.3.2.3	Load Package, Record Time.	Test Engineer - Initial/Date _____/_____
	Time: _____ (use military notation - 1:30 p.m. = 13:30)	
7.3.2.4	Hold (24 hrs), Observe, Photograph.	Test Engineer - Initial/Date _____/_____
7.3.2.5	Unload Package, Record Time.	Test Engineer - Initial/Date _____/_____
	Time: _____ (use military notation - 1:30 p.m. = 13:30)	
7.3.2.6	Evaluate Performance.	Test Engineer - Initial/Date _____/_____
	[ ] - Pass [ ] - Fail	

Remarks: _____

_____

_____

_____

_____

_____

COMPLETION: _____
Test Engineer Date

DOT-7A PROGRAM
TEST DATA SHEET 7.4
PENETRATION TEST

DOCKET: _____

TEST UNIT NO.: _____

Perform the Penetration Test and Record Data per Procedure Section 7.4; Indicate Completion of Steps as Follows:

7.4.1	Initial Conditions Established.	Test Engineer - Initial/Date	_____ / _____
7.4.2.1	Test Assembly Set-up.	Test Engineer - Initial/Date	_____ / _____

Drop Height: _____ (in.)

Impact Area: _____

_____

7.4.2.2	Elevate Penetration Bar, Photograph Set-up	Test Engineer - Initial/Date	_____ / _____
7.4.2.3	Drop Penetration Bar.	Test Engineer - Initial/Date	_____ / _____
7.4.2.4	Examine, Photograph Impact Area.	Test Engineer - Initial/Date	_____ / _____
7.4.2.5	Evaluate Performance.	Test Engineer - Initial/Date	_____ / _____

[ ] - Pass [ ] - Fail

Remarks: _____

_____

_____

_____

_____

_____

COMPLETION: _____
Test Engineer Date

DOT-7A PROGRAM
TEST DATA SHEET 7.5-1/2
FREE DROP TEST

DOCKET: _____

TEST UNIT NO.: _____

Perform the Free Drop Test and Record Data per Procedure Section 7.5;
Indicate Completion of Steps as Follows:

7.5.1 Initial Conditions Established. Test Engineer - Initial/Date _____ / _____

7.5.2.1 Test Assembly Set-up. Test Engineer - Initial/Date _____ / _____

Drop Height: _____ (in.)

Impact Angle: _____ (deg.)

Orientation: _____

_____

_____

Sketch - Drop Orientation

COMPLETION: _____
Test Engineer Date

DOT-7A PROGRAM
TEST DATA SHEET 7.5-2/2
FREE DROP TEST

DOCKET: _____

TEST UNIT NO.: _____

7.5.2.2	Rig Package Per 7.5.2.1.	Test Engineer - Initial/Date	_____ /
7.5.2.3	Photograph Set-up, Start Video Coverage.	Test Engineer - Initial/Date	_____ /
7.5.2.4	Drop Package, Secure Video.	Test Engineer - Initial/Date	_____ /
7.5.2.5	Clear Drop Area for Approach.	Test Engineer - Initial/Date	_____ /
7.5.2.6	Examine, Photograph, Videotape Package Damage.	Test Engineer - Initial/Date	_____ /
7.5.2.7	Evaluate Performance.	Test Engineer - Initial/Date	_____ /

[ ] - Pass [ ] - Fail

Remarks: _____

_____

_____

_____

_____

_____

COMPLETION: _____
Test Engineer Date