



## Pelican™ - Hardigg Roto Molded Container Test Performance

Subject: Testing Program considerations for Shipping Container qualification by Testing, Analysis and/or Similarity

Reference: General conditions and statements of technical position.

By: HARDIGG INDUSTRIES, INC. / HARDIGG CASES  
Norman Barstow, Jr. - Chief Packaging Engineer

### Abstract:

Performance tests may be either actually conducted or submitted by engineering analysis. Many tests are done by Similarity to other tests which Hardigg or Hardigg customers have had done in the past on other container programs. Hardigg Cases have been used on many government programs with in excess of 450,000 containers in service today. As a prime contractor to US and foreign governments our container systems have been qualified by actual program testing and by over twenty (25) years of operational field use. As a repair depot on several government container programs we receive up to fifteen year old containers for minor repairs or updates and re-issue them back into service.

Hardigg Industries, Inc. can provide as either tests or similar test reports for qualification of Environmental Conditions by similarity:

Before any environmental testing can be conducted, Hardigg may need to construct test dummy loads to simulate the basic shape and weight of the equipment. As each of the containers has a different shaped primary item, each to be tested, will need a dummy load. If a customer selects only certain containers to be tested and allows qualification by similarity for the other container sizes in the system, then a limited number of dummy loads will need to be built.

### 1 - SUNSHINE

Ref: MIL-STD-810E, Method 505.3, Procedure II

Comment: Hardigg has not had this test actually conducted. We can provide data from our resin suppliers and hardware suppliers that should substantiate the acceptance of the container to Sunshine exposure. Years of field use has progressively verified acceptability.

Ref: Hardigg File Analysis Report No. TS-1055



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### 2 - WATER-VAPOR TRANSMISSION RATE (WVTR)

Ref: ASTM E96

Comment: From data provided by our material suppliers and industry journals, for wall thickness of 0.180 inches of MDPE medium density polyethylene the WVTR is 0.0038 grams/100 sq in/24 hr @100 deg. F.

The limit established in MIL-C-4150 for Type II case shells shall not exceed 0.050 grams/100 sq in/24 hrs.

Actual tests IAW MIL-C-4150J and ASTM D 1008-64 "Water Vapor Permeability of Shipping Containers", were conducted by NTS/ Northeast, Boxborough which confirm the suitability of these Rotationally molded reusable containers as primary environmental barriers.

Ref: Hardigg Test File TS- 1061

### 3 - TENSILE / ELONGATION / COMPRESSIVE / FLEXURAL (physical properties)

Comment: Attached to this document is a "Physical Properties" sheet listing typical rotationally molded container material properties for polyethylene per FED SPECIFICATION L-P-390c, Type M.

Ref: Hardigg Test Series File, TS-1043 and resin supplier data.

### 4 - LEAK TEST Pneumatic pressure technique.

Ref: IAW FTMS 101, Method 5009

Comments: When required, each container assembly or a sampling of container assemblies is Leak Tested, after manufacturing, to verify airtightness. Record logs are kept on the results of all Leak Tests.

### 5 - CONCENTRATED LOAD TEST

Ref: IAW FTMS 101, Method 5016

Comment: Hardigg has conducted stacked loading tests on a container size 58" x 34"x 29" high at 4,153 lbs. (265 lbs/sq ft) for 24 hours. The test was conducted and the container passed IAW DOT 49CFR 178.350 for Hazardous materials shipping and transport. We believe this test to be equal to or greater than that required by FTMS 101.

Ref: File Test Report TS- 1019, A and B.



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### 6 - HANDLING TEST (Suspend case by one handle)

Ref: IAW FTMS 101, Method 5011

Comment: Hardigg container for the Advance Cruise Missile engine was tested at Wright Patterson AFB. Container size was 43" x 31" x 24" high @ 313 pounds gross weight. Both metal type hand lift and hoisting rings were tested and passed.

Ref: File Test Report no. TS-943

### 7 - VIBRATION

Ref: MIL-STD-810E, Method 514.4 (composite inputs)

This test covers inputs from Ground, Air and Sea transport (procedures as specified). (random on random)

Comment: This test is generally run on typical container designs/styles in a program system. In this plan, certain container assemblies would qualify other similar containers in the system. Before containers are submitted to final test qualification, Hardigg does preliminary development vibration tests, (sine sweep only) to verify dynamic performance and adjust cushioning system as required.

Ref: File Report TS-1040

### 8 - SHOCK (TRANSIT DROP)

Ref: MIL-STD-810E, Method 516.4 procedure IV.

Comment: This test is generally conducted on typical container designs/styles in a program system. Before containers are submitted to final test qualification, Hardigg does preliminary development drop testing to verify shock performance and adjust cushioning system as required.

Hardigg has hundreds of drop tests on file and can select from data most appropriately similar to the size container being considered.

Ref: File Report TS-1005



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### 9 - TEMPERATURE (Storage)

Ref: MIL-STD-810E, Method 501.3, proceed. I (Tailored, High temperature)  
Method 502.3, procedure I (Tailored, Low temperature)

Comment: Hardigg conducted a High Temp. Storage test for containers used on the MFX Portable X-Ray equipment system for DEPMEDS (Deployable Medical Systems). Most all of the containers tested were large and heavy.

Ref: File Report No. TS-976A, Temperature range cycling 97°F(38°C) to 165°F(73°C) for 7 days (168 hrs).

Regarding Low Temperature Storage tests, Hardigg has no recent test on file but we have done many Low Temperature drop tests [-40°F(-40°C) to -20° F(-28°C)] which require overnight stabilization. As these containers must be completely functional in the Low Temperature environment we believe this would demonstrate compliance.

Ref: File Report No. TS-989

### 10 - RELATIVE HUMIDITY

Ref: MIL-STD-810E, Method 507.3, Proceed. I

Comment: Hardigg had NTS Acton conduct a Humidity test. The test item was a "trunk" style, Single Lid container and should qualify like styled containers by similarity.

Ref: File Report No. TS-1030

### 11 - ALTITUDE (LOW PRESSURE)

Ref: MIL-STD-810E, Method 500.3

Comment: Hardigg has had two (2) altitude tests conducted in addition to thousand of flying hours in commercial and military aircraft to verify compliance pressure differential environments.

Ref: File Report No. TS-919



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### 12 - SAND AND DUST

Ref: MIL-STD-210C

Comment: Hardigg had a Rain, Sand & Dust test conducted on a "trunk" style single lid container. Tests were done by NTS Acton in accordance with MIL-STD-810D, Method 510.2, Procedure I. We submit that this should qualify by similarity, containers which are made of the same materials and construction.

Ref: File Report No. TS-971

### 13 - SALT FOG

Ref: MIL-STD-810E, Method 509.3, Proceed. I @ 5%

Comment: Hardigg had a series of Salt Fog tests conducted on steel hardware, in different finishes, as used on the shipping containers. As the polyethylene container shell is inert to Salt Fog exposure, the main issue is the exterior hardware, i.e. handles and closure catches. These tests demonstrate compliance.

Ref: File Report No. TS-1038

### 14 - FUNGUS

Ref: MIL-STD-810D, Method 508.4

Comment: Hardigg had tests conducted by NTS Acton for Fungus on 52 items that are used to manufacture our containers. This report should verify by similarity compliance with design requirements.

Ref: File Report No. TS-979



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### 15 - RAIN AND IMMERSION

Ref: MIL-STD-810D, Method 506.2, Proceed. I (Rain with Wind)  
MIL-STD-810D, Method 512.2, Proceed. I (Immersion one (1) meter)

Comment: For Rain with Wind, Hardigg had a container tested by Dayton T. Brown. This report should qualify most containers by similarity.

For Immersion, Hardigg had several containers tested by Wyle Laboratories. This report should qualify the containers by similarity.

Ref: File Report No. TS-1023 (Rain)

Ref: File Report No. TS-976 (Immersion)

### 16 - WIND, ICE, HAIL and SNOW

Comment: After twenty-five (25) years of supplying reusable shipping containers on a variety of government programs, no program has ever actually tested containers for Wind, Ice & Hail or Snow. Consequently, Hardigg does not have any qualification reports on file. It is our considered opinion that these tests are frequently proven by other tests such as, Superimposed loads, Stacking tests and Rain with Wind. As these tests are costly to conduct or analyze and container field history has not shown any problems from these environments, we suggest that these tests be waived.

Hardigg Cases  
Div. of Hardigg Industries, Inc.  
Custom Engineered Container Div.

Engineering Dept. Data  
Updated 01APR23



**Pelican™ - Hardigg Roto Molded Container Test Performance**

**Typical Rotationally molded container material properties.  
Material is “Polyethylene” per Ref: Fed. Specification L-P-390c, type M**

**Superseded for new projects by: ASTM D 4976-89, PE 223  
(i.e. PE Group 2, Class 2, Grade 3)**

PROPERTY	NOMINAL VALUE	UNITS	METHOD	MAT'L SAMPLE
Density	0.935 to 0.937	g/cm <sup>3</sup>	ASTM D 1505	Compression molded
Melt Index (190/2.16)	5.0	g/10 minutes	ASTM D 1238	Pellets
ESCR, Cond. A, F <sub>50</sub> , 100% Igepal, CO-630	>1000	hours	ASTM D 1693	Roto-molded *
Flexural Modulus 1% Secant	79,200 to 109,000	psi	ASTM D 790	Roto-molded *
Tensile Strength @ Yield, 2"/minute	2,490	psi	ASTM D 638	Roto-molded *
Heat Distortion Temp. @ 66 psi @ 264 psi	52 36	°C °C	ASTM D 648	Roto-molded *
Low-Temp. Impact 1/8" thk specimen 1/4 " thk specimen	45 200	ft-lbs	ARM, Low Temp. Impact Resistance	Roto-molded *
FDA Compliance	yes	See 21CFR177.1520.3.1 for specific conditions of use requirements.		
UV-Stabilized	yes	--	--	--
* Thickness of specimen is 1/8"		(ARM is Association of Rotational Molders)		



## Pelican™ - Hardigg Roto Molded Container Test

### Performance Container Test Performance

TEST	SPEC	METHOD	PROCEDURE	TEST SERIES NUMBER	TEST SERIES NUMBER	TEST SERIES NUMBER
1	Sunshine	MIL-STD-810E	505.3	II	TS-1055	
2	Water Vapor Transmission Rate	ASTM D 1008-64			TS-1061	
3	Tensile / Elongation / Compression / Flexural	FED Spec L-P-390c	Type M		TS-1043	TS1043A
4	Leak Test - Pneumatic pressure technique	IAW FTMS 101	5009		Logs are kept	
5	Concetrated Load Test	IAW FTMS 101	5016		TS-1019	TS-1019A TS-1019B
6	Handling Test	IAW FTMS 101	5011		TS-943	
7	Vibration	MIL-STD-810E	514.4		TS-1040	
8	Shock (Transit Drop)	MIL-STD-810E	516.4	IV	TS-1005	
9	Temperature Storage (High Temp)	MIL-STD-810E	501.3	I	TS-976A	
	Temperature Storage (Low Temp)	MIL-STD-810E	502.3	I	TS-989	
10	Relative Humidity	MIL-STD-810E	507.3	I	TS-1030	
11	Altitude (Low Pressure)	MIL-STD-810E	500.3		TS-919	
12	Sand and Dust	MIL-STD-810D	510.2	I	TS-971	
13	Salt Fog	MIL-STD-810E	509.3	I @ 5%	TS-1038	TS1038
14	Fungus	MIL-STD-810D	508.4		TS-979	
15	Rain and Immersion (RAIN)	MIL-STD-810D	506.2	I	TS-1023	
	Rain and Immersion (IMMERSION)	MIL-STD-810D	512.2	I	TS-976	
16	Wind, Ice, Hail, and Snow	<p>After twenty-five (25) years of supplying reusable shipping containers on a variety of government programs, no program has ever actually tested containers for Wind, Ice &amp; Hail or Snow. Consequently, Hardigg does not have any qualification reports on file. It is our considered opinion that these tests are frequently proven by other tests such as, Superimposed loads, Stacking tests and Rain with Wind. As these tests are costly to conduct or analyze and container field history has not shown any problems from these environments, we suggest that these tests be waived.</p>				