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PERFORMANCE ORIENTED PACKAGING TESTING
OF
M592 SHIPPING AND STORAGE CONTAINER
FOR
PACKING GROUP II
SOLID HAZARDOUS MATERIALS

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FINAL

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<p>Qualification tests were performed to determine whether the M592 Shipping and Storage Container meets the Performance Oriented Packaging (POP) requirements specified by the United Nations Recommendations on the Transportation of Dangerous Goods. The container loaded to a gross weight of 126 pounds successfully met the requirements and retained its contents throughout the tests.</p>						
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INTRODUCTION

The M592 Shipping and Storage Container with a dummy load of 100 pounds enclosed and an overall weight of 126 pounds was tested to ascertain whether this standard container would meet the requirements of Performance Oriented Packaging (POP) as specified by the United Nations (UN) Recommendation on the Transportation of Dangerous Goods, Document ST/SG/AC.10/1, Revision 6, Chapters 4 and 9. A Base Level Vibration Test was also conducted in accordance with the proposed rulings specified in the Department of Transportation's (DOT) Performance Oriented Packaging Standards HM-181, and Requirements for Explosives HM-181A. The objectives were to evaluate the adequacy of the container in protecting explosive materials which are secured with appropriate dunnage.

TESTS PERFORMED

1. Stacking Test

This test was performed in accordance with ST/SG/AC.10/1, Chapter 9, Paragraph 9.7.6. Three different containers were used, and subjected to a stack weight of 1,200 pounds. The test was performed for 24 hours. After the allowed time, the weight was removed and the containers examined. Any leakage, deterioration, or distortion which could adversely affect transport, reduce strength or cause instability in stacks of packages was considered cause for rejection.

2. Drop Test

This test was performed in accordance with ST/SG/AC.10/1 Chapter 9, Paragraph 9.7.3. One container was used for the four flat drops and one corner drop instead of the required five containers (one for each drop). The drops were performed from a height of 4 feet in the following sequence:

- a. Flat Bottom
- b. Flat Top
- c. Flat on Long Side
- d. Flat on Short Side
- e. One Corner

This test was performed at ambient, $+70 \pm 20^{\circ}$ F temperature. The contents of the container should be retained within its packaging and exhibit no damage liable to affect safety during transport.

3. Base Level Vibration Test

This test was performed in accordance with Part 173, Appendix C of Federal Register / Vol 52, No 215 / Friday, November 6, 1987 / Proposed Rules. Three sample containers were filled to a gross weight of 126 pounds and closed for shipment using nonhazardous materials. One container was loaded with the simulated brass weights used during the drop test. One container was loaded with 1 pound steel bars and the other container was loaded with the required weight of sand which would be the worst case scenario. The three containers were placed on a vibrating platform that had a vertical amplitude (peak-to-peak displacement) of one inch. The containers were not restrained during vibration except by a fence attached to the test surface to prevent them from falling off the table. The containers were tested for 50 minutes in their normal shipping position. The vibratory input to the container was at a frequency that caused the container to be raised from the vibrating platform to such a degree that a piece of material of approximately 1/16" (1.6mm) thickness could be passed between the bottom of the container and the platform.

PASS/FAIL (UN CRITERIA)

The criteria for passing the stacking test is outlined in Paragraph 9.7.6.3 of ST/SG/AC.10/1 and states the following: "No test sample should show any deterioration which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages".

The criteria for passing the drop test is outlined in Paragraph 9.7.3.5 of ST/SG/AC.10/1 and states the following: "Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle (e.g., a plastic bag), even if the closure is no longer sift-proof".

PASS/FAIL (HM-181 CRITERIA)

The criteria for passing the Base Level Vibration Test is outlined in Part 173, Appendix C Paragraphs 4 and 5 of Docket No. HM-181, Notice No. 87-4, Federal Register / Vol 52, No 215 / Friday, November 6, 1987 / Proposed Rules and states the following: "Immediately following the period of vibration, each package shall be removed from the platform, turned on its side and observed for any evidence of leakage. Rupture or leakage from any of the packages constitutes failure of the test".

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TEST RESULTS

1. Stacking Test

Satisfactory.

2. Drop Test

Satisfactory, see Figure 1.

3. Base Level Vibration Test

Satisfactory with no leakage.

DISCUSSION

1. Stacking Test

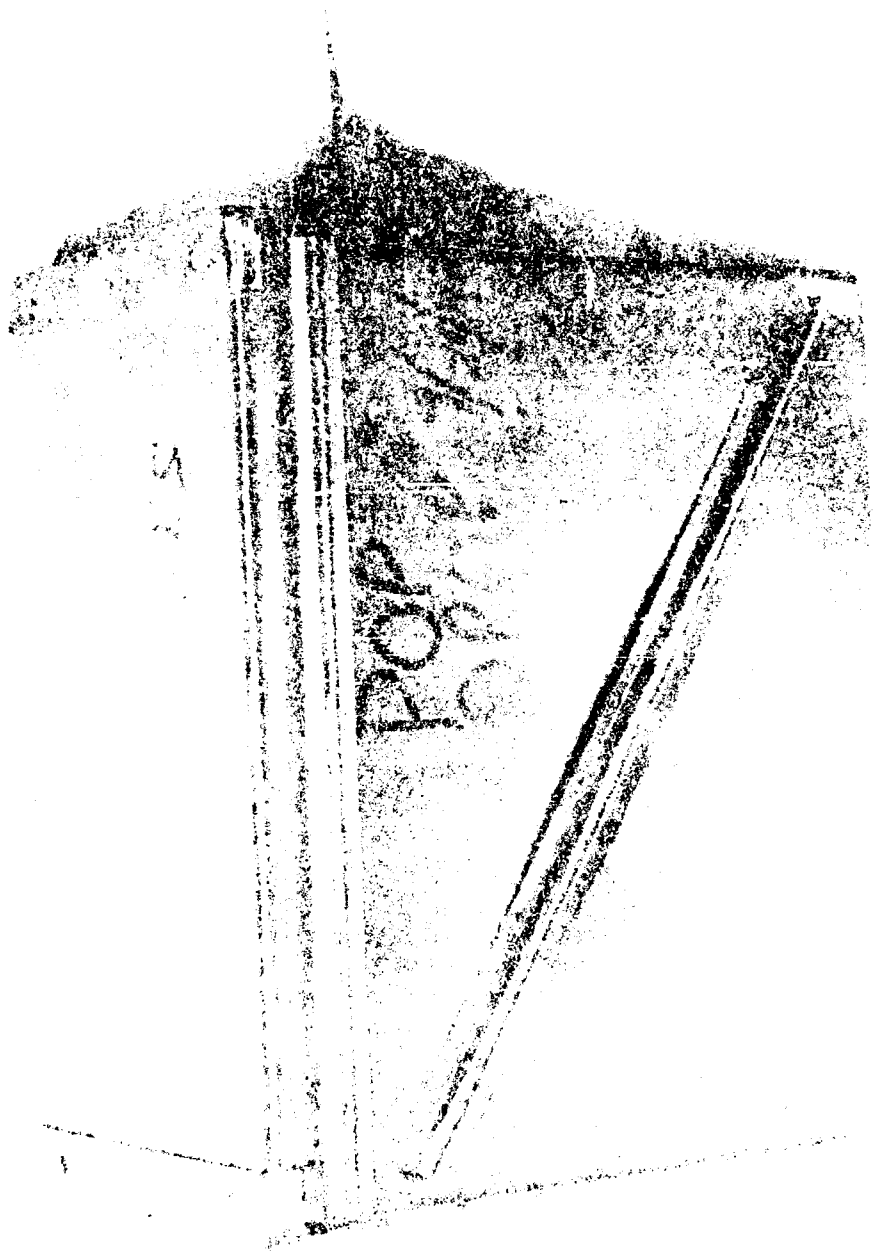
The stacking test was performed with a load of 1200 pounds for 24 hours. Each container was visibly checked after the 24 hour period was over. There was no leakage, distortion, or deterioration to any of the containers as a result of this test.

2. Drop Test

After each drop, the container was inspected for any damage which would be a cause for rejection. Final inspection indicated damage was minimal with only minor denting noted, particularly after the final corner drop. The container remained intact and serviceable on completion of the tests. The standard wire seal (Drawing 19200-8794342) used to secure each end of the container also remained intact during the entire test. An internal pressure test at the end of the series of drops was conducted and the container still maintained an internal pressure of 3.00 PSIG for 30 minutes.

3. Base Level Vibration Test

Immediately after the vibration test was completed, each container was removed from the platform, turned on its side and observed for any evidence of leakage. The latches remained intact, the seals were not broken, and there was no evidence of leakage of the solid weights, steel bars, or the sand.



REFERENCE MATERIAL

United Nations "Recommendation on the Transportation of Dangerous Goods", ST/SG/AC.10/1, Revision 6

Docket No. HM-181, Notice No. 87-4, Federal Register / Vol 52, No 215 / Friday, November 6, 1987 / Performance-Oriented Packaging Standards; Proposed Rulemaking.

Docket No HM-181A; Notice No 90-5, Federal Register/ Vol. 55, No 85 / Wednesday May 2, 1990 / Requirements for Explosives : Proposed Rulemaking

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TEST DATA SHEET

Container: M592 SHIPPING AND STORAGE CONTAINER	
Type: 4A1	UN Code: See Table
Specification Number: MIL-S-50312	Material: Steel
Capacity: 57 kg (128 pounds)	Dimensions: .47 m (L) x .24 m (W) x .37m(H) (18.59" L x 9.50" W x 14.59" H)
Closure (Method/type): Removable lid	Tare Weight: 10.17 kg (22.45 pounds)
Additional Description: SHIPPING AND STORAGE CONTAINER, 30MM CARTRIDGE M592 DRAWING 19200-10542565	

PRODUCTS: See Table	
Name: See Table	
United Nations Number: See Table	
United Nations Packing Group: II	
Physical State (Solid, Liquid or Gas): Solid	
Vapor Pressure (Liquids Only): N/A At 50° C: N/A At 55° C: N/A	
Consistency/Viscosity: N/A Density/Specific Gravity: N/A	
Amount Per Container: See Table	
Net Weight: See Table	

TEST PRODUCT:	
Name: Simulated Weights or Sand	Physical State: Solid
Size : 9.88" x 7.75" x 1.25" or .88" Diameter x 6.0" or granulated sand	Quantity : Four (4) Weights, or 100 rods, or 100 lbs.
Density/Specific Gravity: N/A	
Dunnage: PPP-C-1752 FOAM POLYETHYLENE	
Gross Weight: 57 KG (126 LBS.)	

TABLE I

DODIC OR	NSN	HM ITEM	TYPE	PACKING DWG	HAZARD CLASS	UN NO.	PER CNTR	WGT KG
B124	1305-01-081-1636	30MM	HEI			0321		
F770	1325-01-217-8822	FZ	FMU140			0410		