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PERFORMANCE ORIENTED PACKAGING TESTING
OF
MS-27683-4 METAL DRUM
FOR
PACKING GROUP II
SOLID HAZARDOUS MATERIALS

BY:
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Performing Activity:
Naval Weapons Support Center Crane
Crane, Indiana 47522-5000

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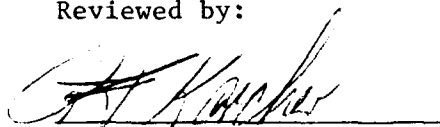
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19 ABSTRACT (Continue on reverse if necessary and identify by block number) QUALIFICATION TESTS WERE PERFORMED TO DETERMINE WHETHER THE MS-27683-4 METAL DRUM USED FOR SHIPPING AND STORAGE MEETS THE PERFORMANCE ORIENTED PACKAGING (POP) REQUIREMENTS SPECIFIED BY THE UNITED NATIONS RECOMMENDATIONS ON THE TRANSPORTATION OF DANGEROUS GOODS. THE CONTAINER LOADED TO A GROSS WEIGHT OF 65 POUNDS SUCCESSFULLY MET THE REQUIREMENTS AND RETAINED IT'S CONTENTS THROUGHOUT THE TESTS.					
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INTRODUCTION

The MS 27683-4-H metal drum with appropriate dunnage designed for shipping and storage of various Flexible Linear Shaped Charges, shown in Figure 1, was tested to ascertain whether this container would meet the requirements of Performance Oriented Packaging (POP) as specified by the United Nations (UN) Recommendations on the Transport 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 rulings specified in the Department of Transportation's (DOT) Performance Oriented Packaging Standards Federal Register/Vol. 55, No.246/ Friday, December 21, 1990. The objectives were to evaluate the adequacy of the metal drum 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 subjected to a stack weight of 1,100 pounds. The test was performed for 24 hours. The containers were measured and examined before and after the test and found capable of supporting the simulated load of like containers stacked 16 feet high. There was no deformation or compression of the containers. Any 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. Each metal drum was subjected to two drops. One on the top edge or chime, and once on the bottom edge near the side seam. The drops were performed from a height of 4 feet in the following sequence:

- a. Top chime
- b. Bottom chime at seam

This test was performed at ambient, $+70 \pm 20^{\circ}$ F temperature. The contents of the metal drum 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 Appendix C to Part 173 of Federal Register/Vol. 55, No. 246/Friday, December 21, 1990/ Final Rule. Three sample drums were filled to a gross weight of 65 pounds and closed for shipment. Each metal drum was placed on a vibrating platform that had a vertical amplitude (peak-to-peak

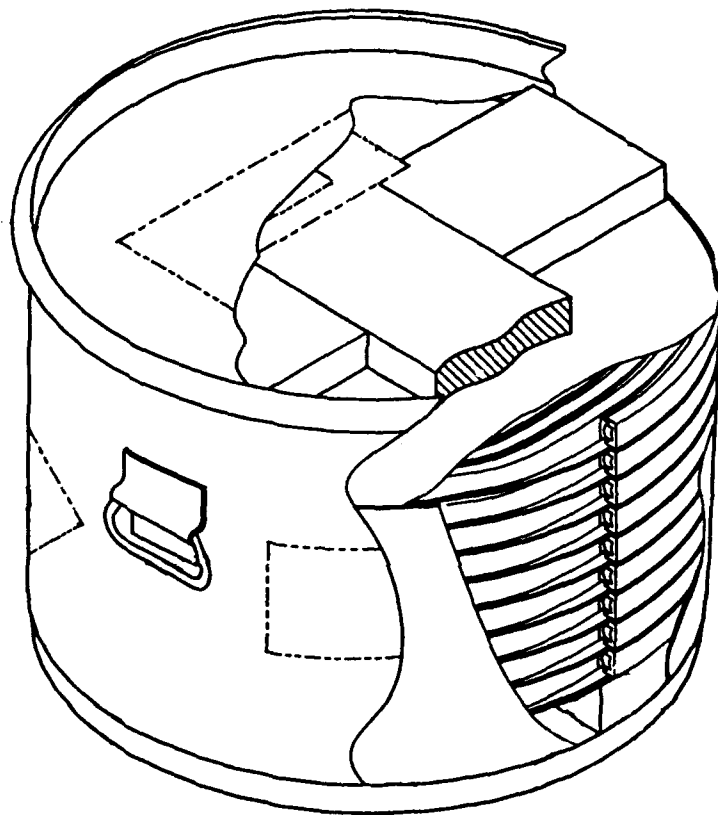


Figure 1. Metal Drum Designed for Shipping and Storage of Flexible, Linear, Shaped, Charges.

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 drums were tested for 1 hour 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 (49 CFR CRITERIA)

The criteria for passing the Base Level Vibration Test is outlined in Appendix C of Part 173 Performance Oriented Packaging Standards, Federal Register/Vol. 55, No. 246/Friday, December 21, 1990/Final Rule 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".

TEST RESULTS

1. Stacking Test

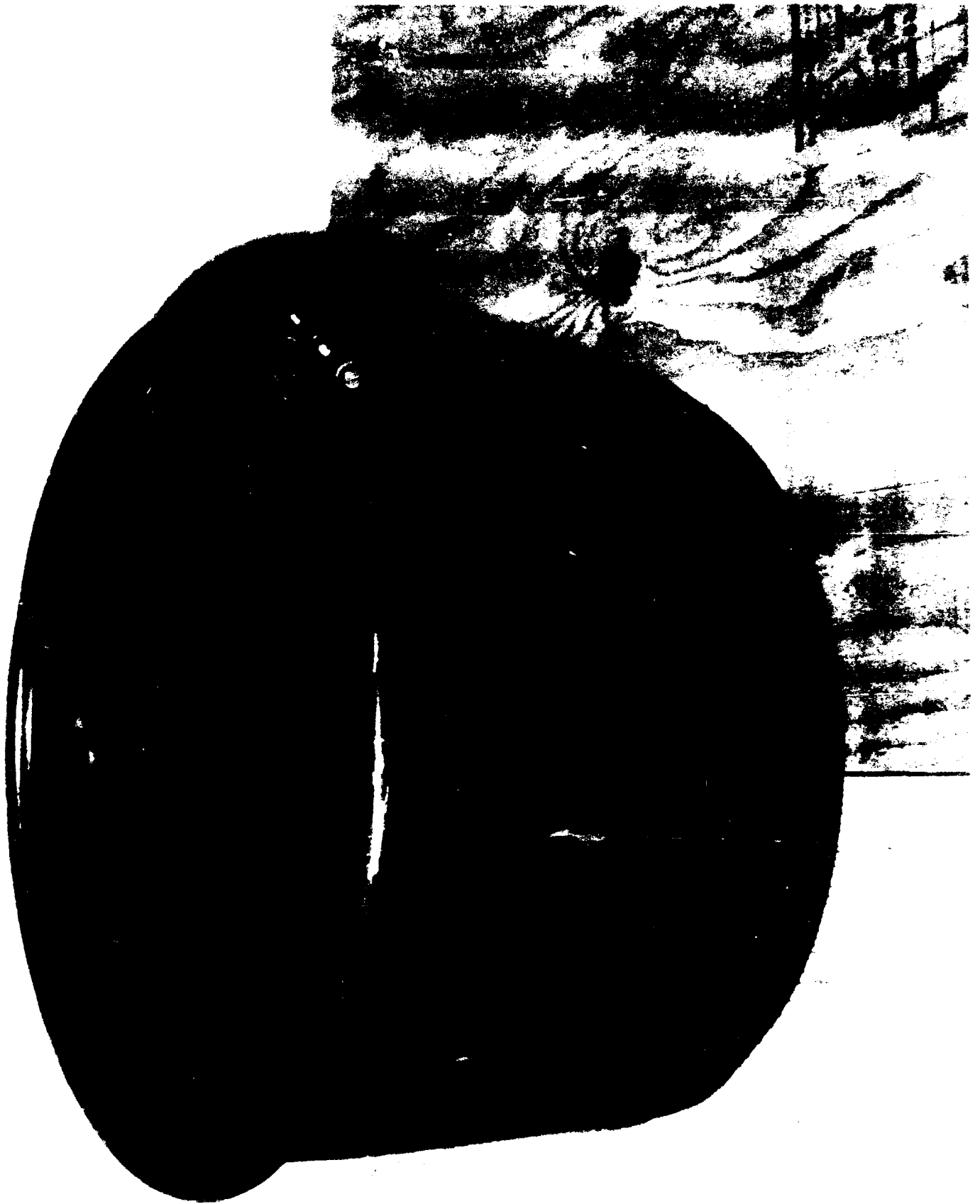
Satisfactory.

2. Drop Test

Satisfactory, See Figure 2.

3. Base Level Vibration Test

Satisfactory with no leakage.



DISCUSSION

1. Stacking Test

The stacking test was performed with a load of 1100 pounds over a period of 24 hours. Each drum was measured and examined before and after the test and found to be capable of supporting a stimulated load of like drums stacked 16 feet high. There was no leakage, distortion, crushing, or deterioration to any of the metal drums as a result of this test on any of the three drums tested.

2. Drop Test

The metal drum was subjected to a chime drop on the lid from a height of four feet and inspected for any damage which would be cause for rejection. Since there was no evidence of damage, the same drum was subjected to an additional drop on the bottom chime near the side seam without spillage of the contents. Two additional drums were subjected to the same two chime drop tests without incident. There was evidence of very minor denting on the impacted chime or edge, but there was no cracking, loss of contents or failure of any of the metal drums.

3. Vibration Test

Immediately after the vibration test was completed, each of the three metal drums was removed from the platform, turned on its side and observed for any evidence of leakage. The top ring was still in place and there was no evidence of leakage or damage to the contents or any of the metal drums.



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REFERENCE MATERIAL

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

Department of Transportation 49 CFR Part 107, et al. Performance Oriented Packaging Standards, Federal Register/Vol. 55, No. 246/Friday, December 21, 1990, Final Rule

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TEST DATA SHEET

CONTAINER: Metal Drum MS-27683-4-H

Type: 1A2

UN Code: 1.2D

Specification Number:
MS 27683

Material:
Steel

Gross Weight:
29.51 kg
(65.0 pounds)

Dimensions:
.37 m (L) x .62 m diameter
(14.625" L x 24.25" diameter)

Closure (Method/type):
Locking Ring and Bolt

Tare Weight:
14.07 kg
(31.0 pounds)

Additional Description: SHIPPING AND STORAGE CONTAINER,
Metal Drum, MS 27683-4-H

PRODUCTS: See Table

Proper Shipping Name: Charges, Explosive, Commercial
(without detonator)

United Nations Number: 0443

United Nations Packing Group: II

Physical State: Solid

Amount Per Container: See Table

Net Weight:

MK 142 MOD 0	- 11.2 kg	(24.66 pounds)
MK 143 MOD 0	- 9.81 kg	(21.60 pounds)
MK 144 MOD 0	- 8.99 kg	(19.80 pounds)
MK 145 MOD 0	- 9.51 kg	(20.94 pounds)
MK 149 MOD 0	- 11.34 kg	(24.98 pounds)

TEST PRODUCT

Name: Sand

Size: N/A

Physical State: Solid

Quantity: N/A

Dunnage: None

Gross Weight: 29.5 kg (65.0 pounds)

TABLE I

DODIC	NSN	MODEL	TYPE	PKG DWG.	QTY	GROSS WGT. (kg)
MM24	1375-01-328-4732	MK 142 MOD 0	300 GR/FT	53711-6736478	18	25.95
MM51	1375-01-328-5796	MK 143 MOD 0	600 GR/FT	53711-6736479	9	24.56
MM52	1375-01-328-5797	MK 144 MOD 0	1200 GR/FT	53711-6736480	4	23.80
MM53	1375-01-328-8048	MK 145 MOD 0	2400 GR/FT	53711-6736481	2	23.81
MM54	1375-01-328-8049	MK 149 MOD 0	5400 GR/FT	53711-6736482	1	25.76