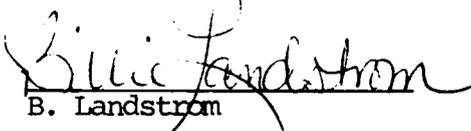
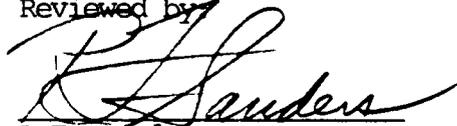


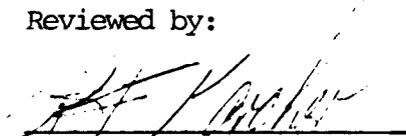
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19. ABSTRACT (Continue on reverse if necessary and identify by block number) Qualification tests were performed to determine whether the MS-27684-2 Metal Drum used for MK 64 MOD 0 Gas Generator meets the Performance Oriented Packaging (POP) requirements specified by the United Nations Recommendations on the Transportation of Dangerous Goods. The container loaded to a gross weight of 50.7 pounds successfully met the requirements and retained its contents throughout the tests.					
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INTRODUCTION

The MS-27684-2 metal drum with appropriate dunnage designed for shipping and storage of one gas generator, see Figure 1, was tested to ascertain whether this packaging 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 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 the MK 64 MOD 0 Gas Generator, as well as to evaluate the drum's ability to protect personnel involved with handling and shipping hazardous materials in the metal drum.

TESTS PERFORMED

1. Stacking Test

This test was performed in accordance with ST/SG/AC.10/1, Chapter 9, Paragraph 9.7.6. Four metal drums were subjected to a stack weight of 650 pounds on each drum. Each drum was measured and examined before and after the test and found to be capable of supporting the simulated load of like metal drums stacked over 16 feet high. There was no deformation or compression of any of the metal drums.

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.

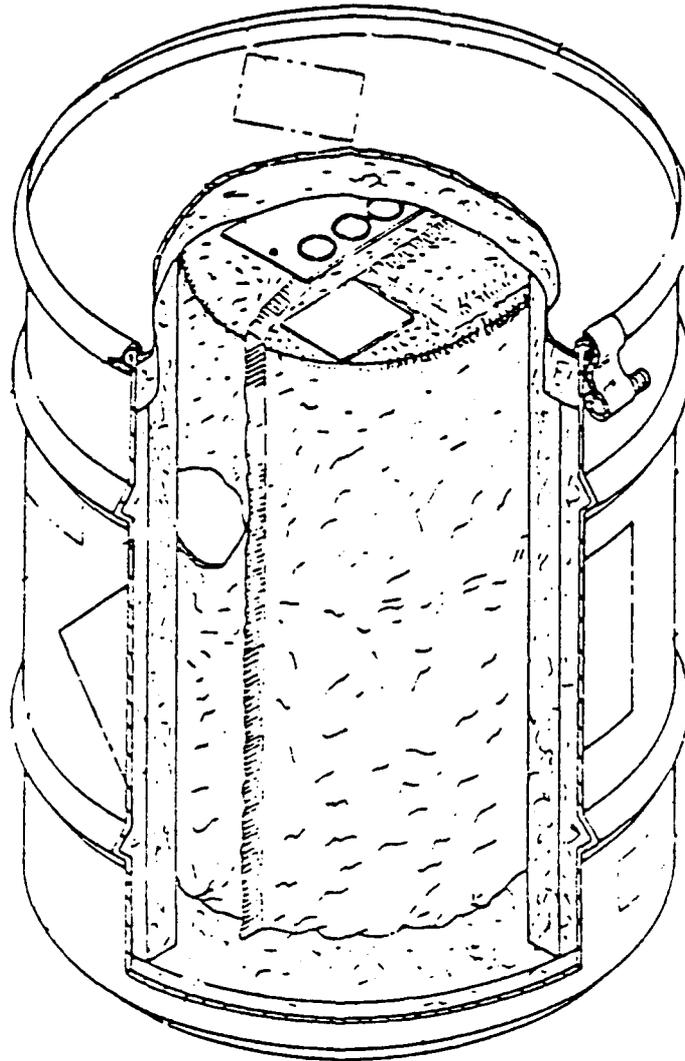


Figure 1 - Metal drum designed for shipping and storage of gas generator.

3. Base Level Vibration Test

This test was performed in accordance with Appendix C of Part 173 of Federal Register/Vol. 55, No. 246/Friday, December 21, 1990/Final Rule. Three sample drums were loaded with inert material and dunnage to a gross weight of 50 pounds and closed for shipment. The three metal drums were placed on a vibrating platform that had a vertical amplitude (peak-to-peak displacement) of one inch. The drums were not restrained during vibration except by a fence attached to the test surface to prevent them from falling off the table. The metal drums were tested for 60 minutes in their normal shipping position. The vibratory input to the drum was at a frequency that caused the drum 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 drum 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.

3. Base Level Vibration Test

Satisfactory with no leakage.

DISCUSSION

1. Stacking Test

Four different metal drums were used, and subjected to a stack weight of 650 pounds on each metal drum. To ensure that the drum, rather than the gas generator would sustain the load, empty metal drums were used for the test. The test was conducted over a period of 24 hours. The drum was measured and examined before and after the test and found to be capable of supporting a simulated 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.

2. Drop Test

The first 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 a 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. Five additional drums were subjected to the same tests without incident. There was some 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 six 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.

REFERENCE MATERIAL

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

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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DATA SHEET

Container: Metal Drum MS-27684-2	
Type: 1A2	UN Code: 1.3C
Specification Number: MIL-D-6054 Material: Steel	
Capacity: 23 kg (50.7 pounds)	Dimensions: .35 m (L) x .26 m Diameter (14.12" L x 10.26" Diameter)
Closure (Method/type): Locking Ring and Bolt	Tare Weight: 3.86 kg (8.5 pounds)
Additional Description: SHIPPING AND STORAGE CONTAINER, For MK 64 MOD 0 Gas Generator Drawing 53711-6556827	

PRODUCTS: MK 64 MOD 0 Gas Generator NSN 5845-01-027-7137 DODIC JW63	
Proper Shipping Name: Cartridges, Power Device	
United Nations Number: UN 0275	
United Nations Packing Group: II	
Physical State: Solid	
Amount Per Container: One (1)	
Net Weight (Gas Generator): 15 kg (33.0 pounds)	

TEST PRODUCT: Name: Simulated Gas Generator	
Physical State: Solid	
Size : .25 m L x .13 m Dia (9.84" L x 5.12" Dia)	
Quantity : One (1)	
Dunnage: Cellulose cushioning material PPP-C-843 and Polyethylene foam PPP-C-1752	
Gross Weight: 23 kg (50.7 pounds)	