PERFORMANCE ORIENTED PACKAGING TESTING

OF

MK 663 MOD 0 BLASTING CAP CONTAINER

FOR

PACKING GROUP II

SOLID HAZARDOUS MATERIALS

BY:

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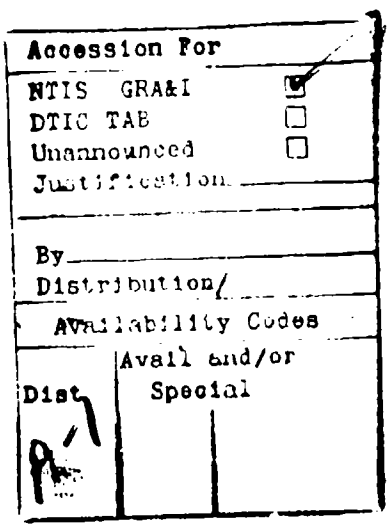

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The MK 663 MOD 0 Blasting Cap Container was tested for conformance to Performance Oriented Packaging criteria established by the United Nations Recommendations on the Transport of Dangerous Goods and Code of Federal Regulations 49 CFR. The container was tested with a gross weight of 15.4 pounds (7 kilograms) and met all requirements.

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INTRODUCTION

The MK663 Mod 0 Blasting Cap Container was tested to ascertain whether the container would meet the requirements of Performance Oriented Packaging (POP) as specified by the United Nations 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 by the Department of Transportation Performance Oriented Packaging Standards, 49 CFR Part 106 et al. Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations. The objectives were to evaluate the adequacy of the container in protecting and retaining the blasting caps when secured with appropriate dunnage.

The MK663 Mod 0 Blasting Cap Container is a cylindrical stainless steel container with a screw-on aluminum cap used for shipment and storage of ten M6 or M7 blasting caps. The container is shown in Figure 1.

TESTS PERFORMED

1. Drop Test

This test was performed in accordance with ST/SG/AC.10/1, Chapter 9, Paragraph 9.7.3. The container was tested first as a box, then as a drum. Five containers were used during the test series for a box, one for each drop. The drop height was 1.2 meters and the drop sequence was as follows:

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

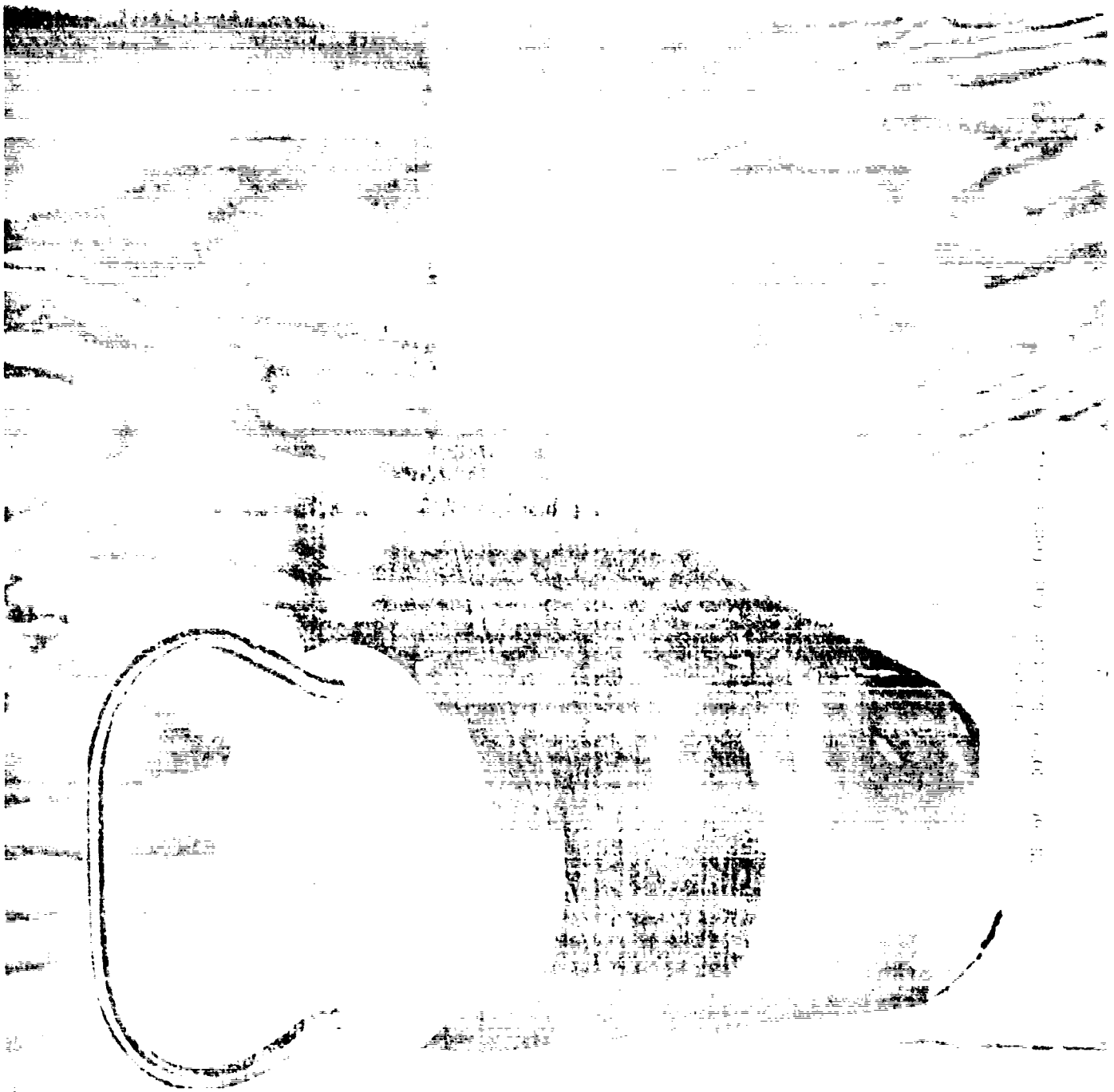
The test series for a drum required six containers, three for each drop. The drop height was 1.2 meters and the drop sequence was as follows:

a. Bottom Chime
b. Edge of Lid

The tests were performed at ambient temperature ($70^0 \pm 20^0$F). The contents of the container should be retained within its packaging and exhibit no damage liable to affect safety during transport.

2. 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, each with a stack weight of 650 pounds. This weight represents the load superimposed on the bottom container of a sixteen-foot stack of MK663 containers weighing 15.4 pounds each.



The test was performed for 24 hours. After the allowed time, the weight was removed and the container examined. Any leakage, deterioration, or distortion which could adversely affect transport or reduce its strength or cause instability in stacks of packages is cause for rejection.

3. Base Level Vibration Test

This test was performed in accordance with the Federal Register/Vol 56, No. 245/Friday, December 20, 1991/Rules and Regulations. Three sample containers were loaded with sand and closed as for shipment. Each container was placed on a vibrating platform that had a vertical double-amplitude (peak-to-peak displacement) of one inch. The packages were constrained horizontally to prevent them from falling off the platform, but were free to move vertically, bounce and rotate. The test was performed for one hour at a frequency that caused each point of the container bottom to be raised from the platform to such a degree that a 1.6mm thick metal strip could be passed between the bottom of any package and the platform.

PASS/FAIL (UN CRITERIA)

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".

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".

PASS/FAIL (FEDERAL REGISTER CRITERIA)

The criteria for passing the Base Level Vibration Test is outlined in the Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations 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. A packaging passes the vibration test if there is no rupture or leakage from any of the packages. No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength."

TEST RESULTS

1. Drop Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Base Level Vibration Test

Satisfactory.

DISCUSSION

1. Drop Test

After each drop the container was inspected for any damage which would be cause for rejection. The only container damaged was the one subjected to the drop on top, which bent the handle, but no drop caused any spillage of contents.

2. Stacking Test

Three containers were individually tested. Each container was visibly inspected after the 24-hour period was over. There was no leakage, distortion, or deterioration to the container as a result of this test.

3. Base Level Vibration Test

Immediately following the vibration test, each container was removed from the platform, turned on its side and observed for any evidence of leakage. The lids of two of the containers were loosened by approximately 1/8 of a turn during the test, but remained fastened. There was no evidence of leakage of contents.

REFERENCE MATERIAL

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

Department of Transportation Performance Oriented Packaging Standards, 49 CFR Part 106 et al. Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations

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DATA SHEET

CONTAINER:
MK663 Blasting Cap
Container

POP MARKING:
(un) 4A1/Y7/S/**
USA/DOD/NAD

Type: 4A1

UN Code: 1.1B

Specification Number:
53711-5206200

Material:
Stainless Steel

Gross Weight:
7.0 kg
(15.4 pounds)

Dimensions:
.30 m L x .11 m DIA
(11.9" L x 4.5" DIA)

Closure (Method/type):
Screw-on cap

Tare Weight:
5.2 kg
(11.5 pounds)

Additional Description: Cylindrical stainless steel body with aluminum cap.

PRODUCTS:
M6 Blasting Cap, M130, 1375-00-756-1865
M7 Blasting Cap, M131, 1375-00-283-9440

Proper Shipping Name: M6- Detonators, Electric
M7- Detonators, Non-electric

United Nations Number: M6- 0030
M7- 0029

United Nations Packing Group: II

Physical State: Solid

Amount Per Container: 10

Net Weight: Varies

TEST PRODUCT:
Name: Sand
Physical State: Solid

Size: N/A

Quantity: N/A

Dunnage: None
Gross Weight: 7.0 kg (15.4 lbs.)