DODPOPHM/USA/DOD/NADTR-91103

PERFORMANCE ORIENTED PACKAGING TESTING

OF

WOOD BOX

FOR

MK 3 MOD 2 NAE BEACON

BY:

KERRY J. LIBBERT
MECHANICAL ENGINEER

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

APRIL 1991
FINAL

Sponsoring Organization:
Naval Weapons Station Earle
Program Management Office - C11
Colts Neck, New Jersey 07722-5000

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION / AVAILABILITY OF REPORT
2b DECLASSIFICATION / DOWNGRADING SCHEDULE	Unlimited Distribution
4. PERFORMING ORGANIZATION REPORT NUMBER(S) DODPOPHM/USA/DOD/NADTR-91103	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION NAVAL WEAPONS SUPPORT CENTER 6b. OFFICE SYMBOL (If applicable) 5053	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) CRANE, INDIANA 47522	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION NAVAL WEAPONS SUPPORT CENTER 8b. OFFICE SYMBOL (If applicable) 705	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code) CRANE, INDIANA 47522	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO

11. TITLE (Include Security Classification)

(U) Performance Oriented Packaging Testing of Wood Box for Mk 3 Mod 2 NAE Beacon

12. PERSONAL AUTHOR(S)
Kerry J. Libbert

13a. TYPE OF REPORT	13b TIME COVERED FROM ____ TO ____	14. DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
		91-04-24	8

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Performance Oriented Packaging, Hazardous Materials, Mk 3 Mod 2 NAE Beacon, Lithium Hydride

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This report discusses the testing of the wood box used for packaging Mk 3 Mod 2 NAE Beacons for conformance to Performance Oriented Packaging regulations. The beacons contain the hazardous material lithium hydride. Stack tests, drop tests and vibration tests were performed, and results were satisfactory.

20 DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☑ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a NAME OF RESPONSIBLE INDIVIDUAL Kerry J. Libbert	22b TELEPHONE (Include Area Code) (812)854-1025 22c OFFICE SYMBOL 5053

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE U

☆U.S. Government Printing Office: 1988—507-047

INTRODUCTION

The current packaging configuration for the Mk 3 Mod 2 NAE Beacon consists of six beacons, each in a fiberboard inner pack, in a wood box. This pack was tested to ascertain whether it would meet the requirements of Performance Oriented Packaging (POP) as specified by the United Nations Recommendations on the Transport of Dangerous Goods, 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 Federal Register/ Vol. 55, No. 246 / Friday, December 21, 1990 / Final Rule. The objectives were to evaluate the adequacy of the container in protecting the hazardous materials.

TESTS PERFORMED

1. Drop Test

This test was performed in accordance with ST/SG/AC.10/1, chapter 9, paragraph 9.7.3. Both the outer container and the inner pack were tested. Three outer containers and one inner pack were used to complete the tests. The drop height was 1.8 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. One corner

The test was performed at ambient temperature (70° ± 20°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 outer containers were used, each with a stack weight of 2200 pounds. Three inner packs were also tested, each with a stack weight of 800 pounds. 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, 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 Federal Register/ Vol 55, No. 246 / Friday, December 21, 1990 / Final Rule. Three outer containers were loaded with inert beacons and closed 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 1/16-inch. A 1/16-inch thick metal strip was passed between the bottom of the container and the platform.

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. During both the end drop and the corner drop, the end of the outer container was forced open, exposing the ends of the inner packs, but the beacons were contained within the inner packs. The outer containers damaged in the end and corner drops are shown in Figure 1. Since the inner packs were exposed, the inner pack was tested to the same requirements. After five drops of one inner pack, the pack remained intact, with no exposure of the beacon. The inner pack is shown in Figure 2 after the drop tests were completed.

It should be noted that the container tested is a combination package. The outer container passed the drop tests

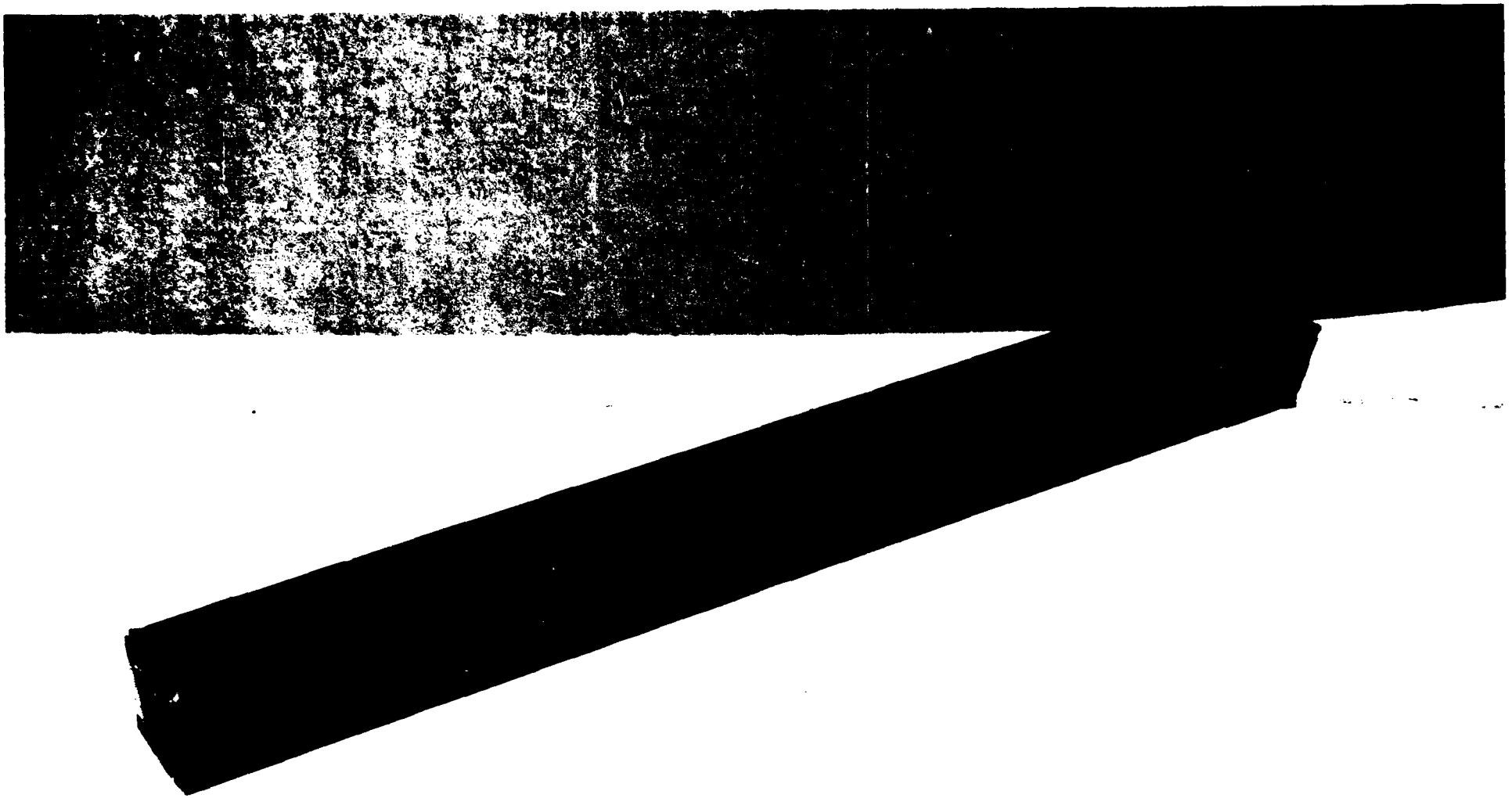

FIGURE 2.

Inner pack after drop tests. Pack contains an inert MK 3 Mod 2 Beacon

in conjunction with the inner pack, and passed only because of the inner pack. Containers such as these should be evaluated with each item and inner pack transported in it, since its performance is based heavily on the inner pack.

2. **Stacking Test**

Three outer containers and three inner packs were individually tested. Each container and inner pack was visually inspected after the 24-hour period was over. There was no leakage, distortion, or deterioration to any of the containers or packs as a result of this test.

3. **Base Level Vibration Test**

Immediately following the vibration test, each outer container was removed from the platform, turned on its side and observed for any evidence of leakage. All latches remained fastened and there was no evidence of leakage of contents.

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. 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.

CONCLUSION

The United Nations pass/fail criteria allows an outer container to pass the drop test if the inner pack retains the hazardous material. In cases such as the Mk 3 Mod 2 beacons, the MIL-B-2427 wood box passed the test only because the inner pack retained the beacons. Boxes of this type should not be used for transporting hazardous materials without a POP approved inner pack. Approval of this box for shipping the beacons should not be construed as an approval to ship any other items without approved inner packs.

REFERENCE MATERIAL

United Nations "Recommendations on the Transport 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

DISTRIBUTION LIST

Commanding Officer
Naval Weapons Support Center
Code 5053 and Code 705
Crane, IN 47522-5000

Commanding Officer
Naval Weapons Station Earle
Code 403 and Code C11
Colts Neck, NJ 07722-5000

Defense Technical Information Center
ATTN: DTIC/FDAC (Virginia Guidi)
Bldg. 5, Cameron Station
Alexandria, VA 22304-6145
(2 copies)

Headquarters, Military Traffic Management Command
ATTN: MTMC/MT-SS, James Gibson
5611 Columbia Pike
Falls Church, VA 22041-5050
(2 copies)

DATA SHEET

CONTAINER: Wood Box for the Mk 3 Mod 2 NAE Beacon

Type: 4C1	UN Code: 4.3
Specification Number: MIL-B-2427	Material: Natural Wood
Capacity: 96.88 kg (213 pounds)	Dimensions: 1.10 m (L) x .31 m (W) x .25 m (H) (43.38" L x 12.25" W x 9.87" H)
Closure (Method/type): Hasp	Tare Weight: 10.44 kg (23.00 pounds)

Additional Description: Beacons packed in MIL-B-117 bag and fiberboard box in accordance with drawing 53711-6204325.

PRODUCTS:
Beacon, NAE, Mk 3 Mod 2
NSN 5845-00-574-3442
DODIC 1W17

Proper Shipping Name:
Lithium Hydride

United Nations Number:
1414

United Nations Packing Group: I

Physical State: Solid

Amount Per Container: Six (6)

Net Weight: 12.94 kg (28.5 pounds)

TEST PRODUCT:
Name: Inert Mk 3 Mod 2 Beacons
Physical State: Solid

Size : .08 m Dia x .99 m L (3.00" Dia x 39.00" L)
Quantity : Six (6)

Dunnage: None
Gross Weight: 96.88 kg (213 pounds)