

AD-A259 693

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DODPOPHM/USA/DOD/NADTR92029 REVISION A

Superseding
DODPOPHM/USA/DOD/NADTR92029
November 1992

PERFORMANCE ORIENTED PACKAGING TESTING
OF
CONTAINERS, SHIPPING AND STORAGE,
MK 684 MOD 0, MK 460 MODS 0, 2, 3, 4,
MK 510 MOD 0, AND MK 683 MOD 0
FOR PACKING GROUP II SOLID HAZARDOUS MATERIALS

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Performing Activity:
Naval Weapons Station Earle
Colts Neck, New Jersey 07722-5023

December 1992

FINAL

DISTRIBUTION UNLIMITED

Sponsoring Organization:
Naval Sea Systems Command
(Code PMS-422)
Washington, DC 20362-5101

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| REPORT DOCUMENTATION PAGE | | Form Approved OMB No 0704-0188 | |
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| Public reporting burden of this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. | | | |
| 1. AGENCY USE ONLY (Leave blank) | 2. REPORT DATE 12/92 | 3. REPORT TYPE AND DATES COVERED POP Test (10/92) | |
| 4. TITLE AND SUBTITLE Performance Oriented Packaging Testing of Container, Shipping and Storage, Mk 684 Mod 0, Mk 460 Mods 0, 2, 3, 4, Mk 510 Mod 0, and Mk 683 Mod 0 for Packing Group II Solid Hazardous Materials | | 5. FUNDING NUMBERS | |
| 6. AUTHOR(S) Eric Wu | | 8. PERFORMING ORGANIZATION REPORT NUMBER DODPOPHM/USA/DOD/NADTR92029 Revision A | |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Weapons Station Earle Test and Evaluation Branch (Code 5023) Colts Neck, NJ 07722-5023 | | 10. SPONSORING/MONITORING AGENCY REPORT NUMBER Same as above | |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Commander, Naval Sea Systems Command (Code PMS-422) Department of the Navy Washington, DC 20362-5101 | | 11. SUPPLEMENTARY NOTES N/A | |
| 12a. DISTRIBUTION/AVAILABILITY STATEMENT | | 12b. DISTRIBUTION CODE | |
| 13. ABSTRACT (Maximum 200 words) This Performance Oriented Packaging (POP) test was conducted to ascertain whether the Mk 684 Mod 0 Shipping and Storage Container meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 107 through 178, dated 31 December 1991. The packaged commodity used for the test was one inert Mk 45 Mod 9 Mass Mock Up weighing 49 kg (107 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in commodity and/or packaging, 6 kg (13 pounds) were added. Gross weight of the loaded container was 67 kg (147 pounds). The test results indicate that the container has conformed to the POP requirements. In addition, due to their similarities in design, size, and weight, this test is considered representative of qualification testing for the Mk 460 Mods 0, 2, 3, 4, Mk 510 Mod 0, and Mk 683 Mod 0 Shipping and Storage Containers as per the variation in Title 49 CFR 107, Sec. 178.601h. | | | |
| 14. SUBJECT TERMS POP Test of Mk 684 Mod 0, Mk 460 Mods 0, 2, 3, 4, Mk 510 Mod 0, and Mk 683 Mod 0 Shipping and Storage Containers | | 15. NUMBER OF PAGES 8 | |
| 17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED | | 16. PRICE CODE | |
| 18. SECURITY CLASSIFICATION OF THIS PAGE UL | 19. SECURITY CLASSIFICATION OF ABSTRACT UL | 20. LIMITATION OF ABSTRACT UL | |

INTRODUCTION

This Performance Oriented Packaging (POP) test was performed to ascertain whether the Mk 684 Mod 0 Shipping and Storage Container meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 107 through 178, dated 31 December 1991. The packaged commodity used for the test was one inert mock up of a Mk 45 Mod 9 Target Detecting Device (TDD) weighing 49 kg (107 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in commodity and/or packaging, 6 kg (13 pounds) were added. Gross weight of the loaded container was 67 kg (147 pounds).

Due to unavailability only one container was used for testing. This is less than the number required by the regulations. Approval for this deviation has been granted by the Under Secretary of Defense, Memorandum for the Joint Logistics Commanders dated 22 February 1990.

In addition, due to their similarities in design, size and weight, this test is considered representative of qualification testing for the Mk 460 Mods 0, 2, 3, 4, Mk 510 Mod 0, and Mk 683 Mod 0 Shipping and Storage Containers as per the variation in Title 49 CFR 107, Sec. 178.601h.

TESTS PERFORMED

1. Base Level Vibration Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.608. The container was placed on a repetitive shock platform which has a vertical linear motion of 1-inch double amplitude. Movement of the container was restricted during vibration in all but the vertical direction. The frequency of the platform was increased until the container left the platform 1/16 of an inch at some instant during each cycle. Test time was 1 hour.

2. Stacking Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.606. The container was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked to a minimum height of 3 meters (including the test container). A weight of 333 kg (735 pounds) was stacked on the test container. The test was performed for 24 hours. The weight was then removed and the container examined.

3. Drop Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.603. Five drops were performed from a height of 1.2 meters (4 feet), impacting the following surfaces:

- a. Flat bottom.
- b. Flat top.
- c. Flat on long side.
- d. Flat on short side.
- e. One corner.

PASS/FAIL

1. Base Level Vibration Test

The criteria for passing the base level vibration test is outlined in Title 49 CFR, Sec. 178.608(c): No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength.

2. Stacking Test

The criteria for passing the stacking test is outlined in Title 49 CFR, Sec. 178.606(d): No test sample may show any deterioration which could adversely affect transportation safety or any distortion likely to reduce its strength, cause instability in stacks of packages, or cause damage to inner packagings likely to reduce safety in transportation.

3. Drop Test

The criteria for passing the drop test is outlined in Title 49 CFR, Sec. 178.603(f): A package is considered to successfully pass the drop tests if for each sample tested, no rupture occurs which would permit spillage of loose explosive substances or articles from the outer packaging.

TEST RESULTS

1. Base Level Vibration Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Drop Test

Satisfactory.

DISCUSSION

1. Base Level Vibration Test

The input vibration frequency was 3.5 Hz. Immediately after the vibration test was completed, the container was removed from the platform, turned on its side and inspected. No unfavorable distortion or deterioration was observed.

2. Stacking Test

The container was inspected after the 24-hour period was over. No unfavorable distortion or deterioration was observed.

3. Drop Test

After each drop, the container was inspected. The inert Mk 45 Mod 9 Mass Mock Up was completely retained by the container.

REFERENCE MATERIAL

A. Code of Federal Regulations, Title 49 CFR, Parts 107-178.

B. Bureau of Explosives Tariff No. BOE 6000K Hazardous Materials Regulations of the Department of Transportation by Air, Rail, Highway, Water including Specifications for Shipping Containers.

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TEST DATA SHEET

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|--|---|
| POP MARKING: | |
| UN 4H1/Y67/S/**/USA/DOD/NAD | |
| **YEAR LAST PACKED OR MANUFACTURED | |
| Container: Mk 684 Mod 0 Shipping and Storage Container | |
| Type: 4H1 | Container P/N or NSN: P/N 5167081 |
| Drawing Number: 5167081 | Outer Packaging Material: Polystyrene Foam |
| Dimensions: 41" L x 24" W x 24" H | Gross Weight: 67 kg (147 pounds) |
| Closure (Method/Type): Tape, 1-1/2 inch, Type IV | Tare Weight: 12 kg (27 pounds) |
| Additional Description: | |
| PACKAGED COMMODITY: | |
| Name: See table 1 | NSN(s): See table 1 |
| United Nations Number: See table 1 | |
| 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 1 | Flash Point: N/A |
| Net Weight: See table 1 | |
| PACKAGED COMMODITY USED FOR TEST: | |
| Name: Mk 45 Mod 9 TDD Mock Up | Physical State: Solid |
| Consistency: N/A | Density/Specific Gravity: N/A |
| Test Pressure (Liquids Only): N/A | Net Weight: 55 kg (120 pounds) |
| Additional Description: The net weight includes the current maximum commodity weight plus an additional 6 kg (13 pounds). | |

N/A = Not Applicable

TABLE 1
Commodities Approved for Shipping in the
Mk 684 Mod 0 and Mk 460 Mod 4 Shipping and Storage Containers

| NALC/ DODIC | NSN | Commodity Nomenclature | Packing Drawing Number | Haz Class/Div | UN Number | Units/ Cntr | Total Net Weight (lb) | Total Gross Weight (lb) |
|----------------|---------------------|---------------------------|------------------------------|------------------|--------------|----------------|--------------------------------|----------------------------------|
| 2W96 | 8T 1420-01-242-8797 | SCU(MR) | 2643923 | 1.4S | 0349 | 1 | 66 | 93 |
| DW80 | 8T 1420-01-024-5332 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |
| ZW32 | 8T 1420-00-411-8834 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |
| 1W83 | 8T 1420-01-242-8795 | SCU(MR) | 2643923 | 1.4S | 0349 | 1 | 66 | 93 |
| YW85 | 8T 1420-01-135-6854 | SCU(MR) | 2643923 | 1.4S | 0349 | 1 | 66 | 93 |
| SW41 | 8T 1420-01-056-2677 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |
| 6W45 | 8T 1420-01-144-3389 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |

Mk 510 Mod 0 Shipping and Storage Container

| NALC/ DODIC | NSN | Commodity Nomenclature | Packing Drawing Number | Haz Class/Div | UN Number | Units/ Cntr | Total Net Weight (lb) | Total Gross Weight (lb) |
|----------------|---------------------|---------------------------|------------------------------|------------------|--------------|----------------|--------------------------------|----------------------------------|
| 2W96 | 8T 1420-01-242-8797 | SCU(MR) | 2643923 | 1.4S | 0349 | 1 | 66 | 93 |
| 1W83 | 8T 1420-01-242-8795 | SCU(MR) | 2643923 | 1.4S | 0349 | 1 | 66 | 93 |
| YW85 | 8T 1420-01-135-6854 | SCU(MR) | 2643923 | 1.4S | 0349 | 1 | 66 | 93 |

Mk 683 Mod 0 Shipping and Storage Container

| NALC/ DODIC | NSN | Commodity Nomenclature | Packing Drawing Number | Haz Class/Div | UN Number | Units/ Cntr | Total Net Weight (lb) | Total Gross Weight (lb) |
|----------------|---------------------|---------------------------|------------------------------|------------------|--------------|----------------|--------------------------------|----------------------------------|
| YW84 | 8T 1420-01-135-3605 | APBU | 5167082 | 1.4S | 0349 | 1 | 66 | 93 |
| 7W60 | 8T 1420-01-172-7780 | APBU | 5167082 | 1.4S | 0349 | 1 | 66 | 93 |
| 2W98 | 8T 1420-01-241-9427 | APBU | 5167082 | 1.4S | 0349 | 1 | 66 | 93 |
| ZW25 | 8T 1420-00-406-7645 | APBU | 5167082 | 1.4S | 0349 | 1 | 66 | 93 |
| SW73 | 8T 1420-01-061-5993 | APBU | 5167082 | 1.4S | 0432 | 1 | 66 | 93 |
| WW84 | 8T 1420-01-102-1084 | APBU | 5167082 | 1.4S | 0349 | 1 | 66 | 93 |
| SW25 | 8T 1420-01-316-1819 | APBU | 5167082 | N/A | N/A | 1 | 66 | 93 |

Mk 460 Mod 0 Shipping and Storage Container

| NALC/ DODIC | NSN | Commodity Nomenclature | Packing Drawing Number | Haz Class/Div | UN Number | Units/ Cntr | Total Net Weight (lb) | Total Gross Weight (lb) |
|----------------|---------------------|---------------------------|------------------------------|------------------|--------------|----------------|--------------------------------|----------------------------------|
| DW80 | 8T 1420-01-024-5332 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |
| ZW32 | 8T 1420-00-411-8834 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |
| SW41 | 8T 1420-01-056-2677 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |
| 6W45 | 8T 1420-01-144-3389 | SCU(ER) | 2642909 | 1.4S | 0349 | 1 | 107 | 134 |

Mk 460 Mod 2 Shipping and Storage Container

| NALC/ DODIC | NSN | Commodity Nomenclature | Packing Drawing Number | Haz Class/Div | UN Number | Units/ Cntr | Total Net Weight (lb) | Total Gross Weight (lb) |
|----------------|---------------------|---------------------------|------------------------------|------------------|--------------|----------------|--------------------------------|----------------------------------|
| YW84 | 8T 1420-01-135-3605 | APBU | 2642928 | 1.4S | 0349 | 1 | 66 | 93 |
| 7W60 | 8T 1420-01-172-7780 | APBU | 2642928 | 1.4S | 0349 | 1 | 66 | 93 |
| 2W98 | 8T 1420-01-241-9427 | APBU | 2642928 | 1.4S | 0349 | 1 | 66 | 93 |
| ZW25 | 8T 1420-00-406-7645 | APBU | 2642928 | 1.4S | 0349 | 1 | 66 | 93 |
| SW73 | 8T 1420-01-061-5993 | APBU | 2642928 | 1.4S | 0432 | 1 | 66 | 93 |
| WW84 | 8T 1420-01-102-1084 | APBU | 2642928 | 1.4S | 0349 | 1 | 66 | 93 |
| SW25 | 8T 1420-01-316-1819 | APBU | 2642928 | N/A | N/A | 1 | 66 | 93 |

Mk 460 Mod 3 Shipping and Storage Container

| NALC/ DODIC | NSN | Commodity Nomenclature | Packing Drawing Number | Haz Class/Div | UN Number | Units/ Cntr | Total Net Weight (lb) | Total Gross Weight (lb) |
|----------------|---------------------|---------------------------|------------------------------|------------------|--------------|----------------|--------------------------------|----------------------------------|
| WW89 | 8T 1420-01-104-2897 | APBU | 2642926 | 1.4S | 0349 | 1 | 62 | 89 |
| 2W97 | 8T 1420-01-241-9426 | APBU | 2642926 | 1.4S | 0349 | 1 | 62 | 89 |
| 5W58 | 8T 1420-01-279-9961 | APBU | 2642926 | 1.4S | 0349 | 1 | 62 | 89 |
| SW78 | 8T 1420-00-062-0700 | APBU | 2642926 | 1.4S | 0349 | 1 | 62 | 89 |

NOTE: Mk 460 Mod 4 and Mk 684 Mod 0 only used to ship inerts at this time.

APBU = Autopilot Battery Unit
 N/A = Not Assigned
 SCU(MR) = Section Control Unit (Medium Range)
 SCU(ER) = Section Control Unit (Extended Range)