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AIR FORCE PACKAGING EVALUATION AGENCY WRIGHT-PATTERSON--ETC F/G 13/4  
TEST AND EVALUATION OF HOUSEHOLD GOODS CONTAINER, (U)  
JAN 78 E J KOWALSKI

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APPEA PROJECT NO. 77-P7-45

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TEST AND EVALUATION OF HOUSEHOLD GOODS CONTAINERS

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) <b>DEMOUNTABLE CONTAINER EXTERIOR CONTAINER</b>		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A demountable reusable household goods shipping/storage container designed by WR-ALC/DSPC was tested by the Air Force Packaging Evaluation Agency, Wright-Patterson AFB OH. The container was tested in accordance with methods of Federal Test Method Standard 101B and MIL-STD-1489. The container did not pass all of the requirements as specified for this project. However, the design is a major improvement over the Type II demountable PPP-B-00580C (Navy-SA) container. Water infiltration was noted on the floor after completion of the watertightness		

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20. ABSTRACT (Cont'd)

test, however, it was not standing water and it should be noted that the watertightness test was conducted after all other testing was completed. Since this is a large container with approximately 66 lineal feet of gasketed seams, it may be very difficult or impossible from an economic standpoint to expect no dampness in the container.

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**ABSTRACT**

A demountable reusable household goods shipping/storage container designed by WR-ALC/DSPC was tested by the Air Force Packaging Evaluation Agency (AFPEA), Wright-Patterson AFB OH. The container was tested in accordance with methods of Federal Test Method Standard (FTMS) 101B and MIL-STD-1489. The container did not pass all of the requirements as specified for this project. However, the design is a major improvement over the Type II demountable PPP-B-00580C (Navy-SA) container. Water infiltration was noted on the floor after completion of the watertightness test, however, it was not standing water and it should be noted that the watertightness test was conducted after all other testing was completed. Since this is a large container with approximately 66 lineal feet of gasketed seams, it may be very difficult or impossible from an economic standpoint to expect no dampness in the container.

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**PUBLICATION DATE:**

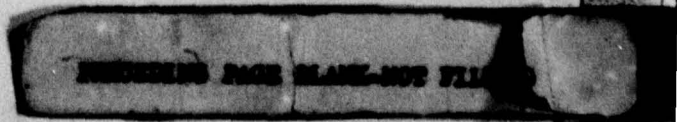
31 January 1978

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## INTRODUCTION

The Air Force Packaging Evaluation Agency (AFPEA) conducted testing on a demountable reusable household goods shipping/storage container (see Figures 1, 2, and 3) for WR-ALC/DSPC, Robins AFB GA 31098. The container was fabricated by Jacksonville Box and Woodwork Co., Inc., Jacksonville FL 32206 in accordance with drawings developed by WR-ALC/DSPC.

The AFPEA acted as an independent and unbiased agency for the testing. Department of Defense (DOD) personnel present for the testing were as follows:

Mr. E. J. Kowalski	AFALD/PTPD, WPAFB OH
Mr. J. P. Neubauer	Na Sup Sys Com, Wash DC
Mr. J. C. Peace	2750 LS/DMTTH, WPAFB OH
Mr. E. E. Reynolds	AFALD/PTPT, WPAFB OH
Mr. T. Rogers	GSA/FMFP, Wash DC
Mr. J. H. Schenck	WR-ALC/DSPC, Robins AFB GA
Mr. G. F. Vacca	AFLC/LOTPP, WPAFB OH

### Container configuration characteristics:

1. Exterior Dimensions.....87" x 47" x 87"
2. Exterior Volume.....205.9 cu ft
3. Interior Dimensions.....84.75" x 44.75" x 81.50"
4. Interior Volume.....178.9 cu ft
5. Ratio Interior to Exterior Volume...0.87:1
6. Tare Weight.....560 pounds
7. Tare Density.....2.72 pcf

## TEST OUTLINE AND TEST EQUIPMENT

Tests were conducted in accordance with Federal Test Method Standard (FTMS) 101B and Military Standard 1489A. Figure 11 is an outline of the container test plan. The pendulum-impact tester fabricated in accordance with Figure 1 of FTMS 101B, Method 5012, was used for the impact test. A high capacity compression tester, Testing Machines Inc. (TMI) Model No. 17-24-2, was used for the super-imposed load test. A pendulum puncture tester fabricated in accordance with Figure 505-1 of MIL-STD-1489 was used for the puncture test. A L.A.B Corporation vibration machine, Serial No. 56801, Type 5000-96B, which has a frequency servoloop constant displacement cam linked motor drive was used for the vibration test. A 4000 pound capacity forklift was used to conduct the material handling and rough handling tests.

## TEST PROCEDURES AND RESULTS

A 1530 pound test load (see Figure 4) was placed in the container. To represent a test load six polyethylene consolidation containers were filled to the required weight with gravel and strapped to a pallet. The pallet was fabricated to the inside dimensions of the container. The load height was 61 inches.

1. CORNERWISE DROP (ROTATIONAL) TEST: The cornerwise drop (rotational) test was conducted in accordance with FTMS 101B, Method 5005. An 18-inch drop height was used during the tests. Drops were made once to each of two diagonally opposite corners of the base.

RESULTS: Visual inspection revealed no damage to the container.

2. EDGEWISE DROP (ROTATIONAL) TEST: The edgewise drop (rotational) test was conducted in accordance with FTMS 101B, Method 5008. An 18-inch drop height was used during the test. Drops were made once to each end of the container.

RESULTS: Visual inspection revealed no damage to the container.

3. PENDULUM-IMPACT TEST: The pendulum-impact test was conducted in accordance with FTMS 101B, Method 5012. Impact was at seven feet per second. Both ends and both sides were impacted.

RESULTS: Visual inspection revealed no damage on the first end impact. On the second end impact two splits were noted at the screw centerline of the header cleat (see Figure 5). Two additional splits were noted at the screw centerline of the header cleat and an end clip became loose (see Figure 6) on the first side impact. On the second side impact one split was noted at the screw centerline of the header cleat. Width of splits in header cleats measured less than 3/64-inch maximum.

4. MECHANICAL HANDLING TESTS: The mechanical handling tests were conducted in accordance with FTMS 101B, Method 5011, Procedures 6.2, 6.3.1, 6.5 and 6.6.

RESULTS: Visual inspection revealed no damage to the container.

5. SUPERIMPOSED-LOAD TEST: The superimposed-load test was conducted in accordance with FTMS 101B, Method 5016. A preload of 100 pounds was applied and the initial measurements for compression set and deflection were recorded. Measurements were made at the four corners of the container for compression set and mid-center of the ends and sides for deflection. A load of 7130 pounds was then applied on the container and kept constant at that loading for one hour.

**RESULTS:** At the end of the test a maximum of 1/4-inch compression was noted at two diagonally opposite corners and a maximum deflection of 3/32-inch on both sides of the container. No compression or deflection set was noted when the 7130 pound load was removed from the container.

6. **PENDULUM-PUNCTURE TEST:** The pendulum-puncture test was conducted in accordance with MIL-STD-1489, Method 505.

**RESULTS:** Visual inspection indicates a horizontal rupture in the vertical cleat of the side panel (see Figures 7 and 8) at point of pendulum impact.

7. **VIBRATION TEST:** The vibration test was conducted in accordance with FTMS 101B, Method 5019. The container was vibrated for two hours at a one inch double amplitude and 4.5 Hz.

**RESULTS:** Visual inspection revealed no damage to the wood or hardware of the container.

8. **WATERTIGHTNESS TEST:** The watertightness test was conducted in accordance with MIL-STD-1489, Method 504.

**RESULTS:** Visual inspection revealed dampening on the interior corners, average approximately six square inches (see Figure 9) and at both hinge seams, average approximately 10 square inches (see Figure 10) on the floor of the container. No standing water was noted on the floor of the container at the end of the test.

## DISCUSSION

The household goods container did not pass all of the test requirements as specified in this project, however, the design by WR-ALC/DSPC is a major improvement over the Type II demountable PPP-B-00580 (Navy-SA) container.

After completion of all testing no additional splitting was noted from the initial 3/64-inch maximum splits, on the ends of the header cleats. Water infiltration at each of the four corners and at both sides of the hinge fold seam was noted at the end of the watertightness test. It is possible that with this size of container and the number of gasketed seams (approximately 66 lineal feet) it may be difficult to economically seal out all moisture from the inside of this type container.

## RECOMMENDATIONS

1. The test methods of MIL-STD-1489 used for this type of container evaluation are too severe and should be reevaluated.

2. The specified test load density (pounds per cubic foot) for this container test and evaluation program should be reevaluated. It was pointed out that the maximum household goods actual loads in transit are generally from 800 to 900 pounds per container instead of the test load of 1530 pounds used during the test.

3. A redesign of the seal area should be accomplished and additional watertightness tests conducted.

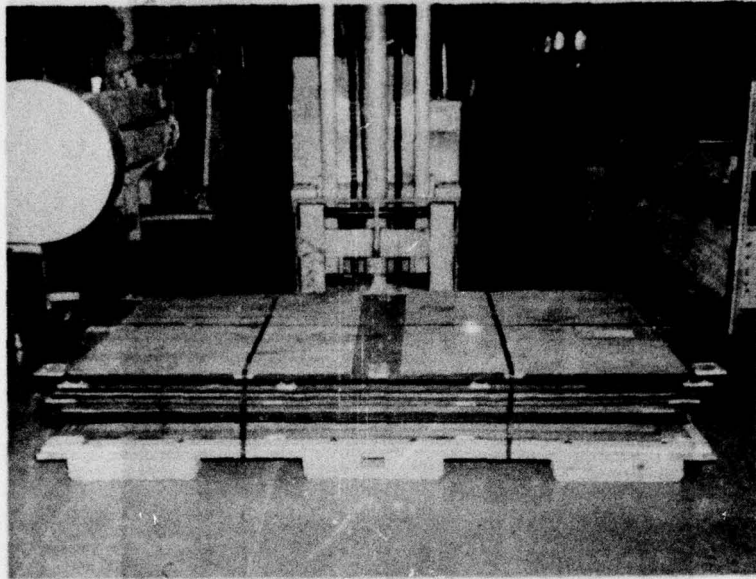


FIGURE 1. WR-ALC CONTAINER, DISASSEMBLED

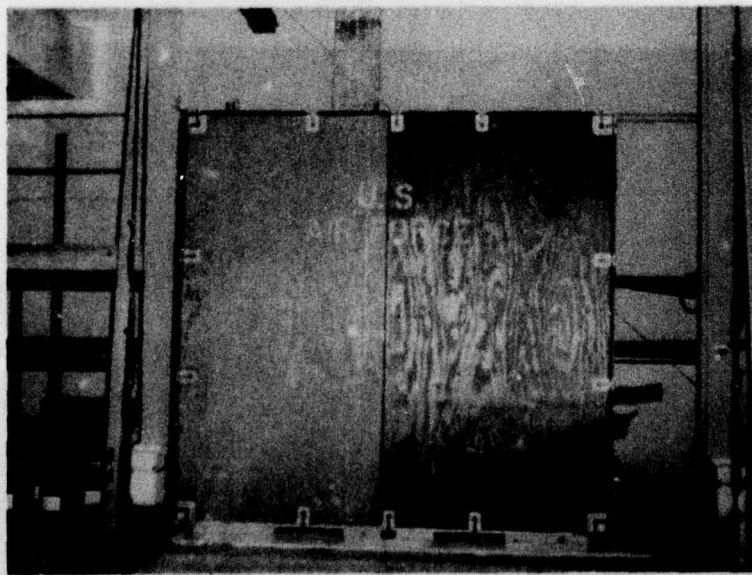


FIGURE 2. WR-ALC CONTAINER, ASSEMBLED, SIDE VIEW

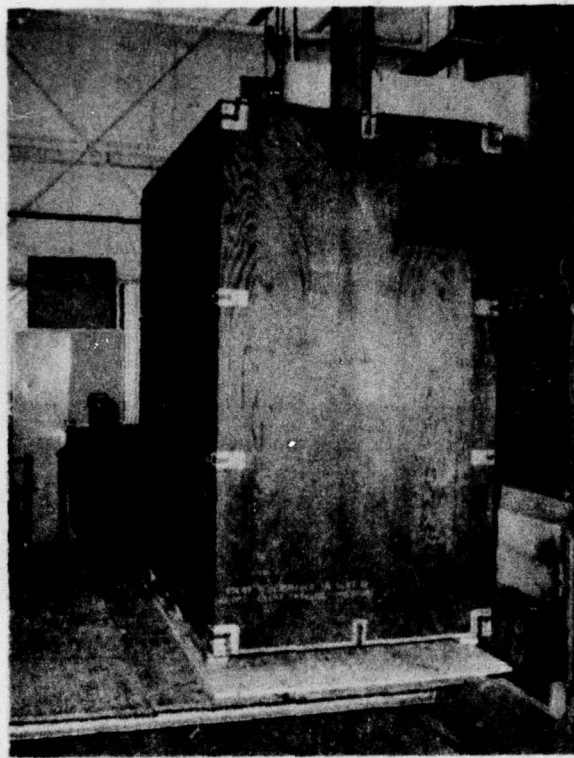


FIGURE 3. WR-ALC CONTAINER, ASSEMBLED, END VIEW

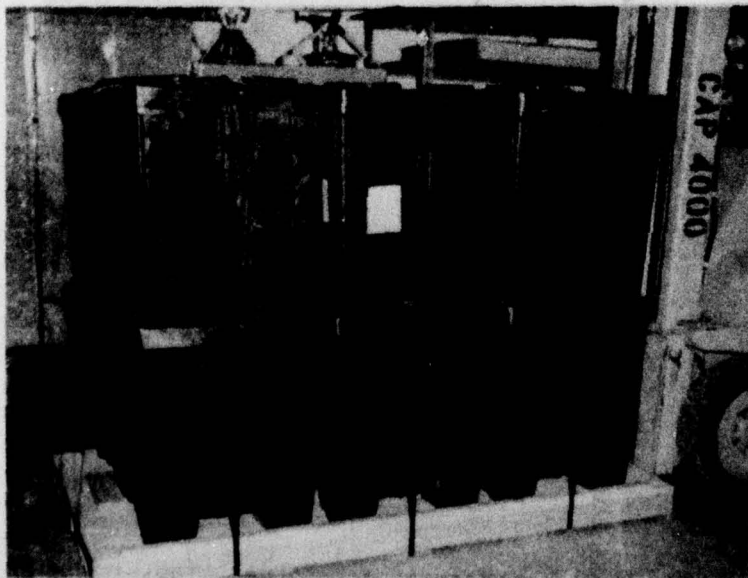


FIGURE 4. 1530 POUND TEST LOAD

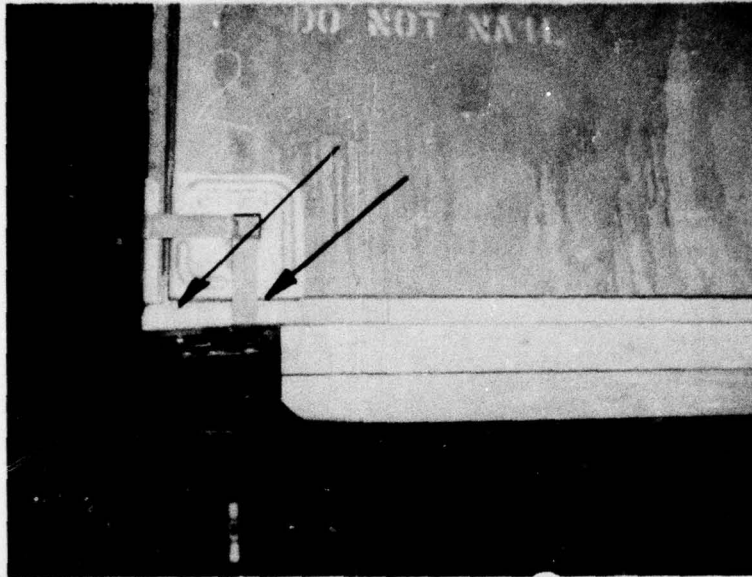


FIGURE 5. SPLITS AT SCREW CENTERLINE  
AFTER SECOND END PENDULUM-IMPACT TEST

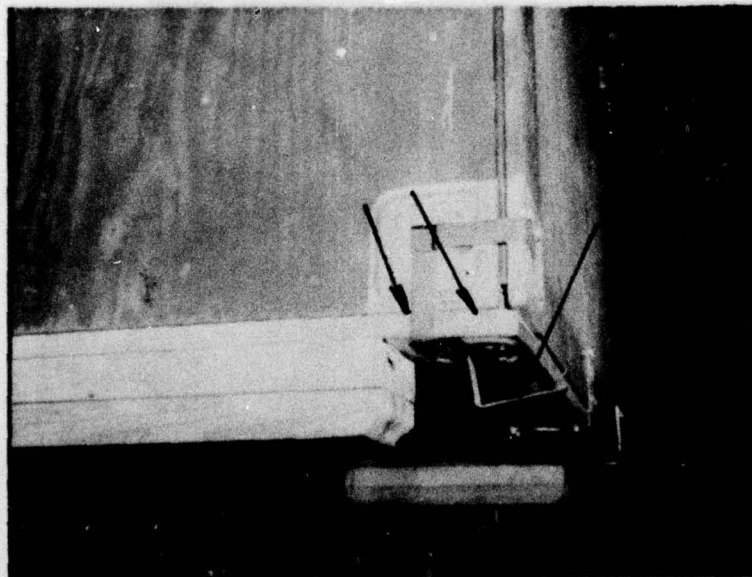


FIGURE 6. LOOSE CLIP AND SPLITS AT SCREW CENTERLINE  
AFTER FIRST SIDE PENDULUM-IMPACT TEST



FIGURE 7. SIDE PANEL AFTER PENDULUM-PUNCTURE TEST, EXTERIOR VIEW

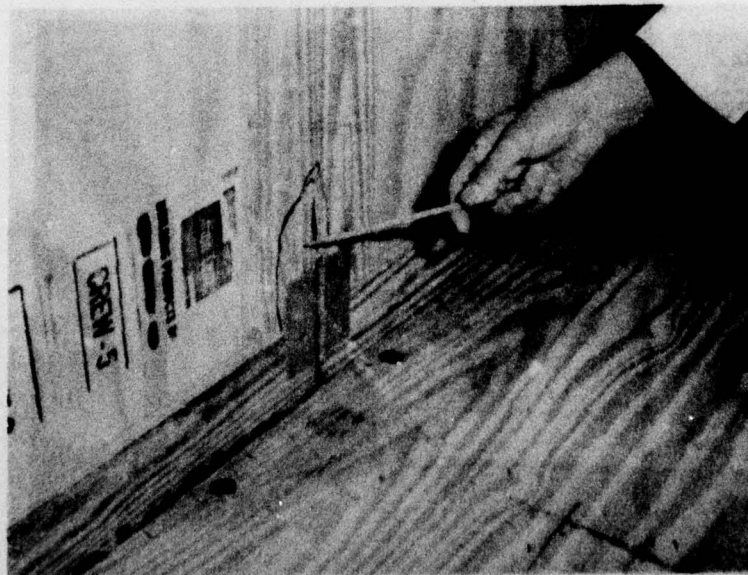


FIGURE 8. SIDE PANEL VERTICAL CLEAT DAMAGE AFTER PENDULUM-PUNCTURE TEST, INTERIOR VIEW

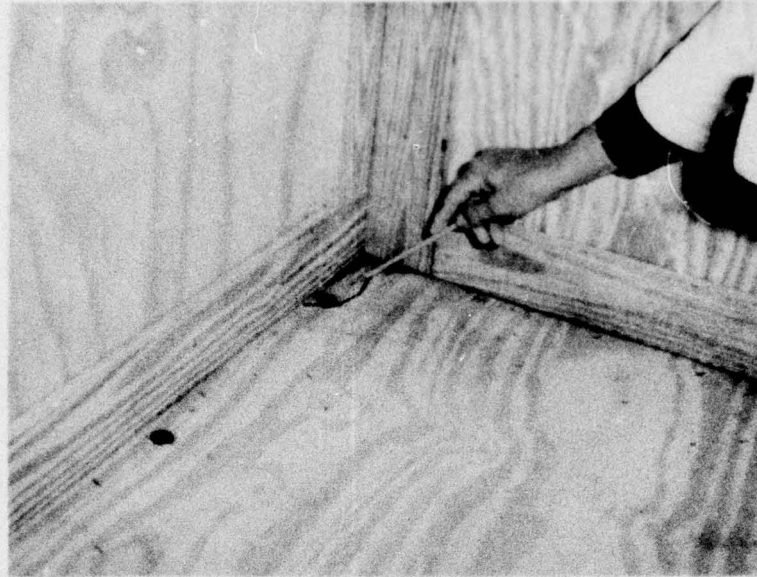


FIGURE 9. CORNER DAMPNESS (APPROX 6 SQ IN)  
AFTER WATERTIGHTNESS TEST

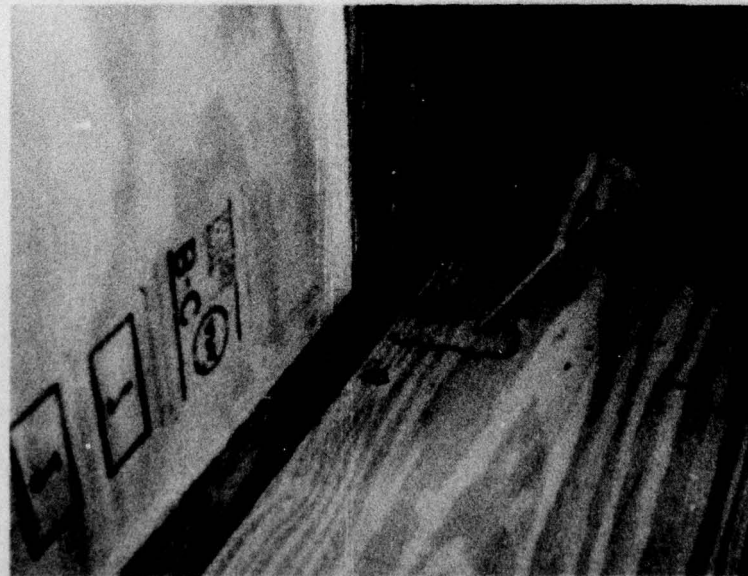


FIGURE 10. DAMPNESS AT HINGE SEAM  
(APPROX 10 SQ IN) AFTER WATERTIGHTNESS TEST

**AIR FORCE PACKAGING EVALUATION AGENCY**  
(Container Test Plan)

AFPEA PROJECT NUMBER  
77-P7-45

CONTAINER SIZE		(GROSS) WT	(ITEM) CUBE	QUANTITY	DATE
87" x 47" x 87"		2090	1530	205.9"	1 1 December 1977
ITEM NAME			MANUFACTURER		
			WR-ALC/DSPC		
CONTAINER NAME			CONTAINER COST		
HOUSEHOLD GOODS CONTAINER			APPROX \$160.00		
PACK DESCRIPTION					
PLYWOOD					
CONDITIONING					
AMBIENT					
TEST NO.	IAW	PARAMETERS		ORIENTATION	INSTRUMENTED
<u>ROUGH HANDLING TESTS</u>					
1	FTMS 101 Method 5005	18 inch drop height		Once to each of two diagonally opposite corners of base	N/A
2	FTMS 101 Method 5008	18 inch drop height		Once to each end of container	N/A
3	FTMS 101 Method 5012	7 FPS impact		Both ends-both sides	N/A
<u>MECHANICAL HANDLING TESTS</u>					
4	FTMS 101 Method 5011 Proc. 6.2, 6.3.1, 6.5 and 6.6	Lifting and transporting by forklift Undersling handling Pushing by forklift Towing		100 feet Suspend 2 minutes 35 feet in 85 seconds 100 feet in 23 seconds	N/A
<u>SUPERIMPOSED LOAD TEST</u>					
5	FTMS 101 Method 5016	7130 pound load		One hour, superimposed	N/A
COMMENTS					
PREPARED BY <i>[Signature]</i>			APPROVED BY <i>[Signature]</i>		

**AIR FORCE PACKAGING EVALUATION AGENCY**  
(Container Test Plan)

APPEA PROJECT NUMBER  
77-P7-45

CONTAINER SIZE		(GROSS) WT	(ITEM) CUBE	QUANTITY	DATE	
87" x 47" x 87"		2090	1530	205.9"	1	1 December 1977
ITEM NAME			MANUFACTURER			
			WR-ALC/DSPC			
CONTAINER NAME			CONTAINER COST			
HOUSEHOLD GOODS CONTAINER			APPROX \$160.00			
PACK DESCRIPTION						
PLYWOOD						
CONDITIONING						
AMBIENT						
TEST NO.	IAW	PARAMETERS		ORIENTATION	INSTRUMENTED	
<u>PENDULUM-PUNCTURE TEST</u>						
6	MIL-STD-1489 Method 505	70 pound load, 20 inch above its equilibrium height		Once to each end and side of container	N/A	
<u>VIBRATION TEST</u>						
7	FTMS 101 Method 5019	1 inch double AMP, 4.5 Hz, 2 hours		As required by test	N/A	
<u>WATERTIGHTNESS TEST</u>						
8	MIL-STD-1489 Method 504	Water pressure 15 to 20 psi, 1.5 feet from con- tainer		Cover all joints and seams of container	N/A	
COMMENTS						
<b>COORDINATION</b>						
SYMBOL		NAME		DATE		
PLP		John C. Johnson		2 Dec 77		
WR-ALC		John C. Johnson		2 Dec 77		
PTPT		John C. Johnson		2 Dec 77		
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