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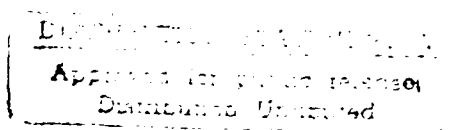
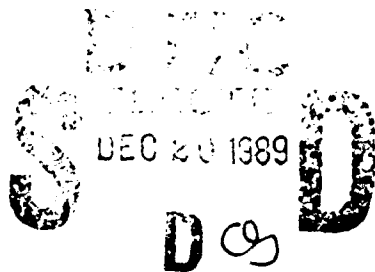
Final Report

May 1989

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EVT 12-89-1

RAIL IMPACT TEST OF EVALUATION
STRENGTHENED TOP LIFT ASSEMBLY
PA116 PALLET



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PREPARED FOR:

U.S. Army Armament Research, Development and
Engineering Center

ATTN: SMCAR-AEP

Picatinny Arsenal, NJ 07806-5000

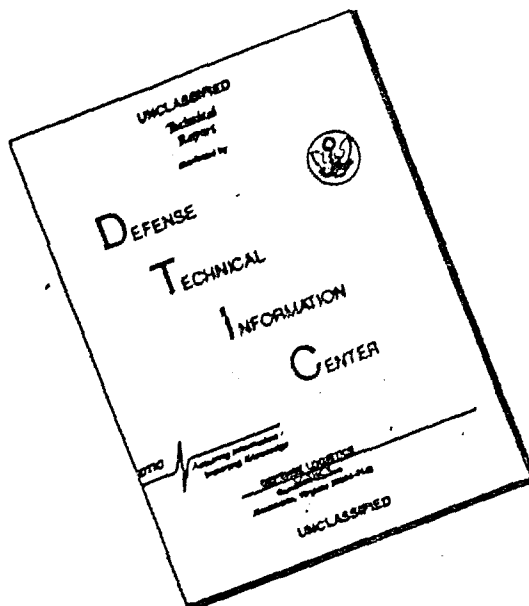
EVALUATION DIVISION
SAVANNA, ILLINOIS 61074-9639

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) The U.S. Army Defense Ammunition Center and School (USADACS) was tasked by the U.S. Army Research, Development and Engineering Center (ARDEC) to design a unitization system for PALL6 containers. The unitization system, consisting of a standard metal pallet, pallet adapter, and a top lift assembly was previously tested and met the requirements of MIL-STD-1660, Design Criteria for Ammunition Loads. This configuration of PALL6 containers on a standard metal pallet has not previously been tested in a rail transportation environment. This engineering test, based on a blocking and bracing procedure developed by the Storage and Outloading Division (SMCAC-DEO), was performed to determine the adequacy of the unitization procedure in a rail transportation environment. To accomplish this test, a 50-foot boxcar was center loaded with PALL6 containers unitized on metal pallets with a redesigned top lift assembly. The test samples consisted of one row of PALL6 pallets with three redesigned top lift assemblies. Six PALL6 pallets were placed at each end of the boxcar, two units high. Two PALL6 pallets with the					
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19. Abstract cont'd

redesigned top lift assemblies were placed at the 4, 6, and 8 mph impact (forward) end of the boxcar. The remaining pallet was placed at the reverse 8 mph impact end of the boxcar. Wooden pallets of boxed ammunition were used to simulate PAll6 pallets in the center of the load.

The redesigned top lift assembly satisfied the test requirements of this test by not deforming under columnar test loading.

REPORT NO. EVT 12-99-

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PART 1

INTRODUCTION

- A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division, was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to design a unitization system for PALL6 containers. The unitization system, consisting of a standard metal pallet, pallet adapter, and a top lift assembly was previously tested and met the requirements of MIL-STD-1660, Design Criteria for Ammunition Loads. This configuration of PALL6 containers on a standard metal pallet has not previously been tested in a rail transportation environment. This engineering test, based on a blocking and bracing procedure developed by the Storage and Outloading Division (SMCAC-DEO), was performed to determine the adequacy of the unitization procedure in a rail transportation environment.
- B. AUTHORITY. This test was conducted in accordance with mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL. Reference is made to Change 4, 4 October 1974, to AR-740-1, 23 April 1971, Storage and Supply Operations; AMCCOM-R 10-17, 13 January 1986, Mission and Major Functions of USADACS.
- C. OBJECTIVE. The objective of these tests was to determine if the redesigned toplift assembly would satisfy the rail transportation environment consisting of impacts at 4, 6, 8 and 8 reverse mph without deforming. Previous designs were stressed beyond the proportional region as a result of columnar loading in a boxcar.
- D. CONCLUSIONS. The redesigned toplift assembly satisfied the test requirements by not deforming. Full pallets using the older design repeated

a permanent set condition indicating that forces generated in this test are comparable to previous testing.

E. APPROVAL. The PAll6 container metal pallet assemblies, as configured for this test, is approved for transportation in a 50-foot boxcar.

PART 2

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PART 3

TEST PROCEDURES

1. RAIL IMPACT TEST. The test load or vehicle should be positioned in/on a railcar. For containers, the loaded container shall be positioned on a container chassis and securely locked in place using the twist locks at each corner. The container chassis shall be secured to a railcar. Equipment needed to perform the test includes the specimen (hammer) car, five empty railcars connected together to serve as the anvil, and a railroad locomotive. These anvil cars are positioned on a level section of track with air and hand brakes set and with the draft gear compressed. The locomotive unit pulls the specimen car several hundred yards away from the anvil cars and, then, pushes the specimen car toward the anvil at a predetermined speed, disconnects from the specimen car about 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it strikes the anvil. This constitutes an impact. Impacting is accomplished at speeds of 4, 6, and 8 mph in one direction and at a speed of 8 mph in the opposite direction. The 4 and 6 mph impact speeds are approximate; the 8 mph speed is a minimum. Impact speeds are to be determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars.

PART 4

TEST RESULTS

RAIL IMPACT TEST

DATE 11/9/54

TEST SPECIMEN: PAIR 16 METAL PALLETS WITH STRENGTHENED T RAILS

TEST BOXCAR NO. BN 249,341

BT WT 114,000 LBS

LOADING AND UNLOADING WT 114,000 LBS

TOTAL SPECIMEN WT 114,000 LBS

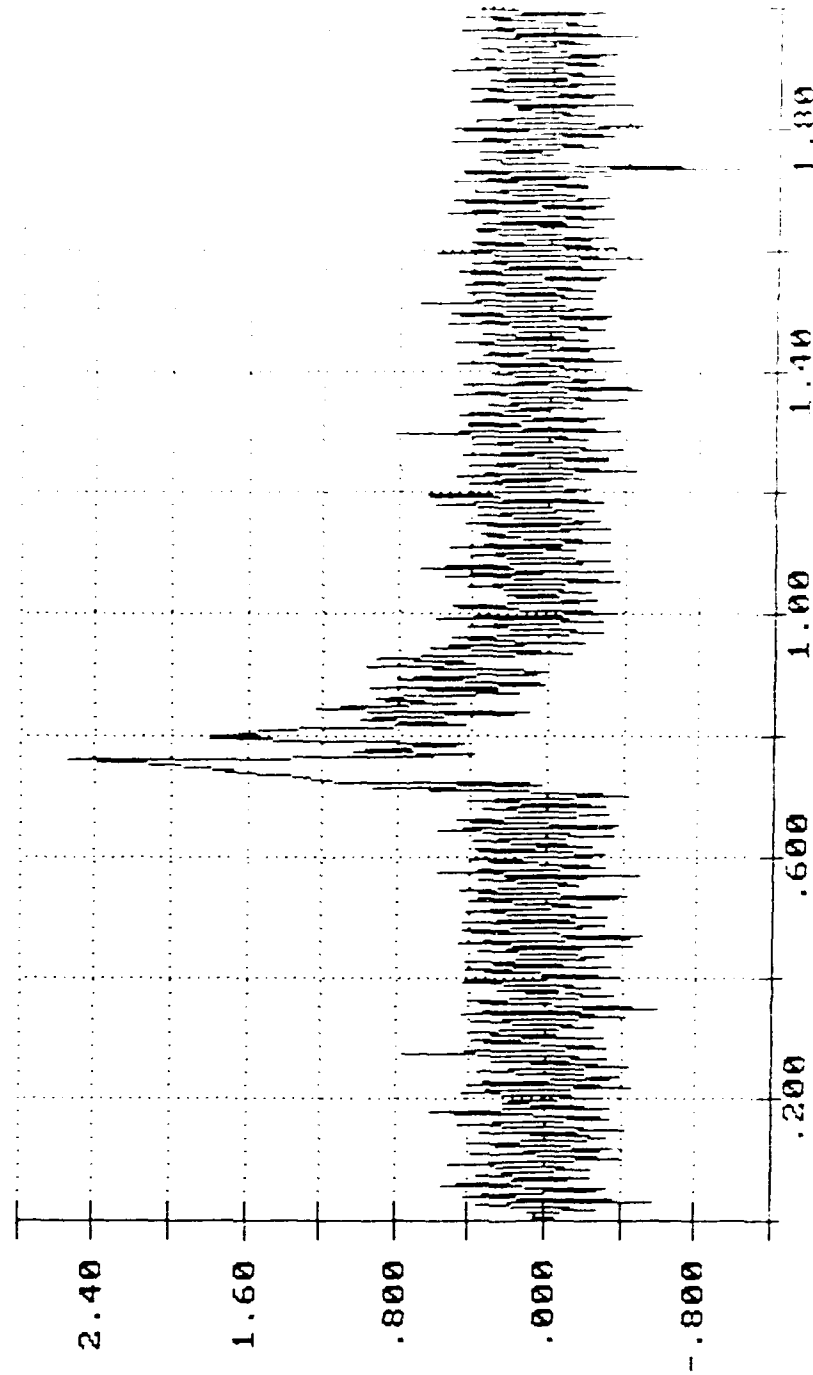
BUFFER CAR 5 CARB WT 114,000 LBS

IMPACT NO.	END STRUCK	VELOCITY	REMARKS
1	forward	4.15	Load moved toward impact 1 1/2 inches. A. Bowling redesigned pallet.
2	forward	6.19	Load moved toward impact 1 1/2 inches. No "bowling" or started in old pallet design.
3	forward	8.33	No horizontal movement. 3-1/2-inch gap at the rear of the car. No "bowling" or design. Bowling of old design 2 inches.
4	reverse	8.58R	Load movement 5 inches. No pallet tops have a permanent set. No deformation in new design.

TABLE 4
SAIL IMPACT DATA

RAIL COUPLER FORCE
IN POUNDS X 100000.00

RAIL IMPACT TEST ON PA116
IMPACT 1: 4.78 MPH

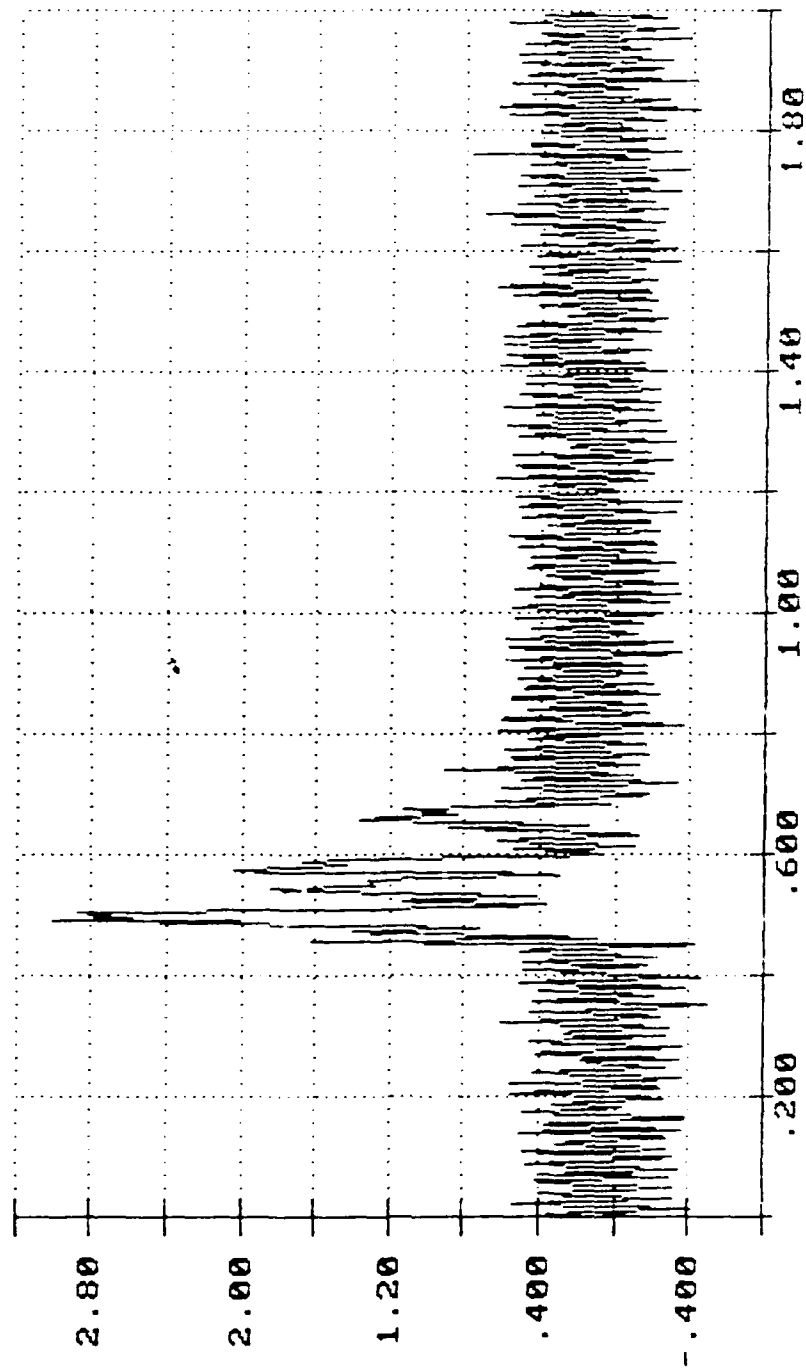


Time in Seconds
X 1.00

RAIL COUPLER FORCE

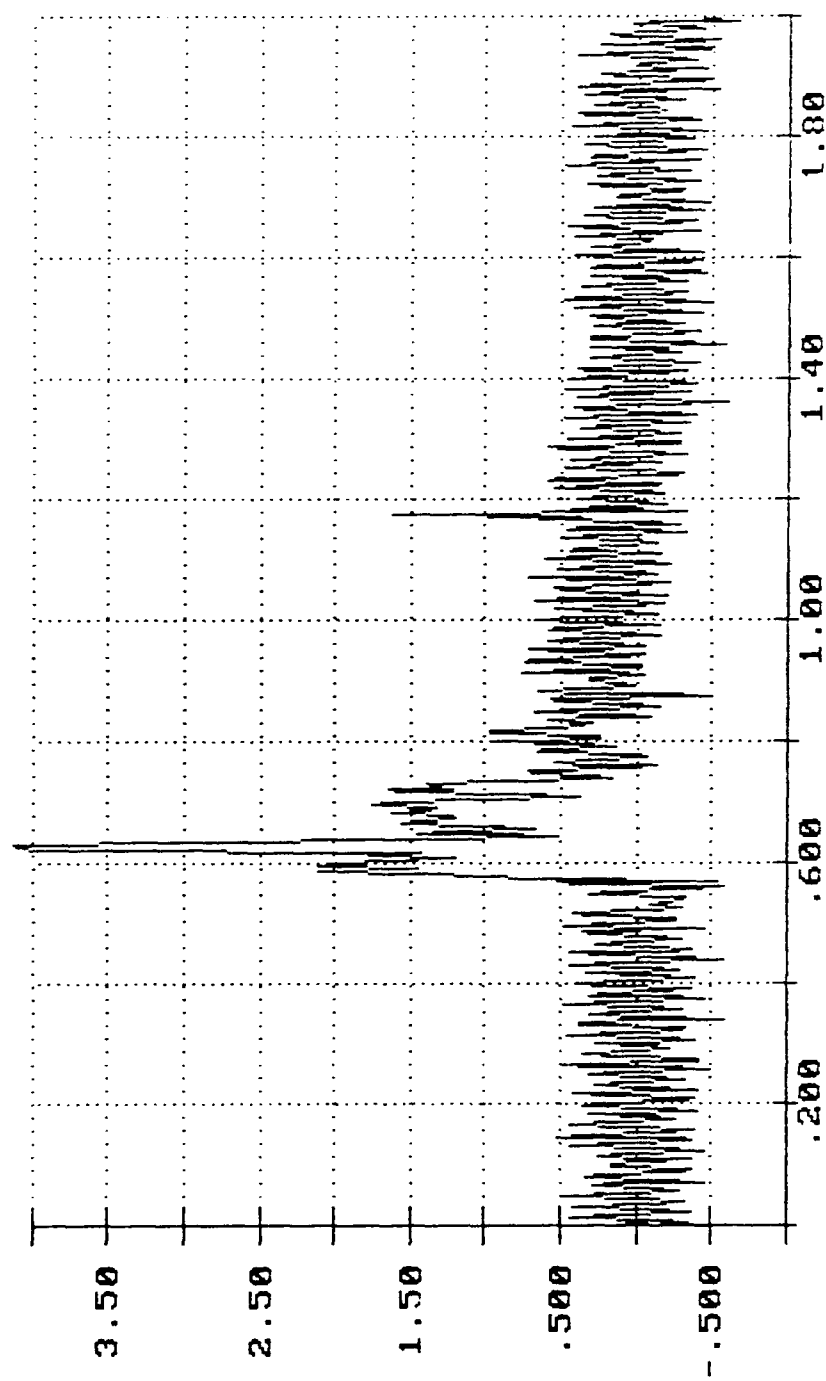
IN POUNDS X 100000.00

RAIL IMPACT TEST ON PA116
IMPACT 2: 6.82 MPH



Time in Seconds
X 1.00

RAIL IMPACT TEST ON PA116
IMPACT 3: 9.17 MPH

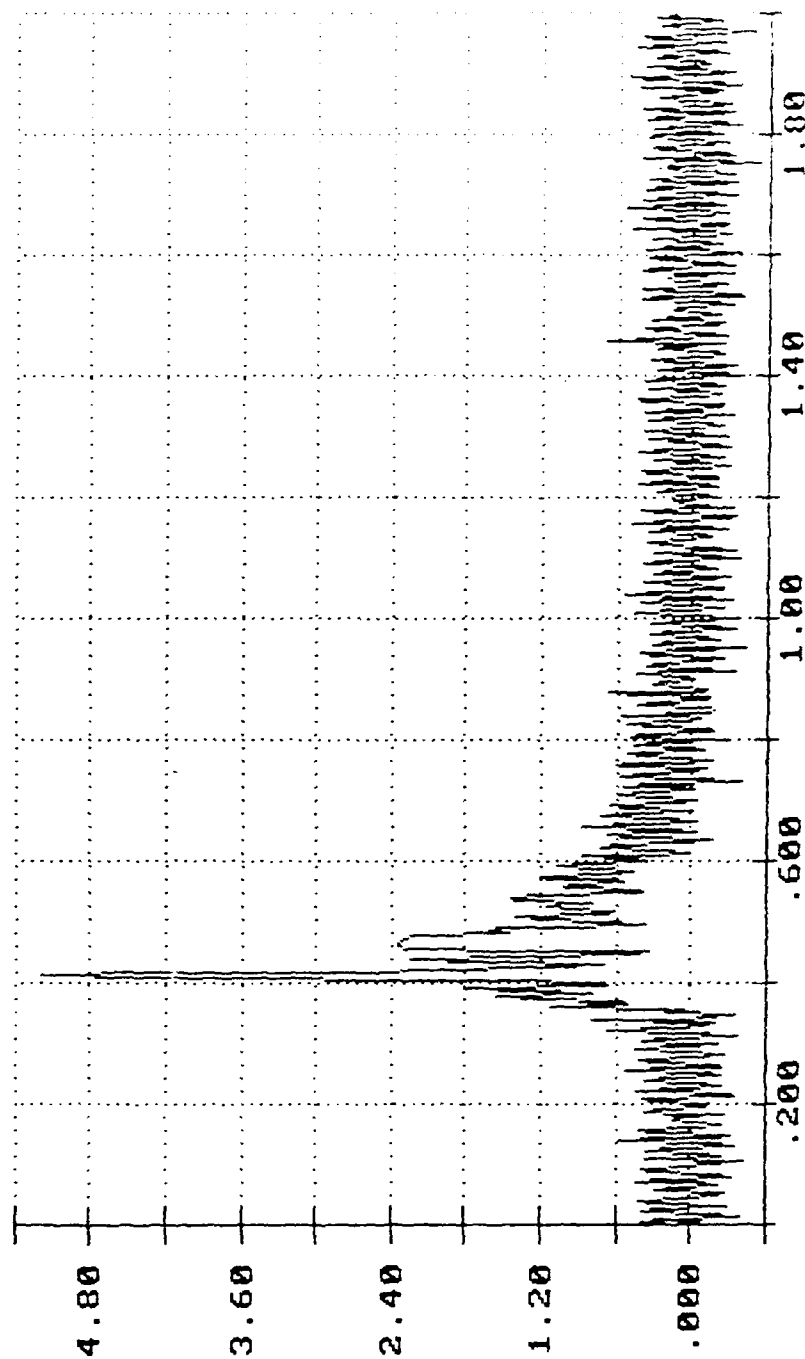


IN POUNDS X 100000.00

Time in Seconds
X 1.00

RAIL COUPLER FORCE

RAIL IMPACT TEST ON PA116
IMPACT 4: 9.09 MPH (REVERSE)



RAIL COUPLER FORCE
IN POUNDS X 100000.00

Time in Seconds
X 1.00