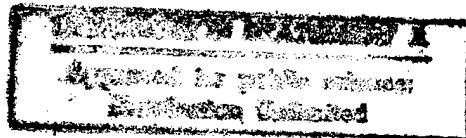


FINAL REPORT
JULY 1997

REPORT NO. 97-30

TTX COMPANY FLATCAR
CONVERTED TO A
CONTAINER-ON-FLATCAR (COFC)
RAIL IMPACT TEST



Prepared for:
U.S. Army Defense Ammunition Center
ATTN: SIOAC-DET
Savanna, IL 61073-9639

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VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639

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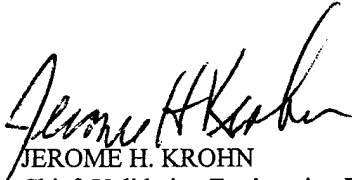
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1. Enclosed are the U.S. Army Defense Ammunition Center (DAC) Reports.
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<p>The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by DAC, Transportation Engineering Division (SIOAC-DET), to perform a rail impact test on a modified flatcar, supplied by TTX Company (TTX), designed to carry three 20-foot or one 40-foot and one 20-foot containers. These flatcars were first made available to the U.S. Army (USA) to transport ammunition laden containers; however, their use was questioned relating to the protective criteria of 49 CFR for the transportation of hazardous materials. The tested flatcar was modified to meet the transportation criteria of 49 CFR, and, as a result of these rail impact tests, it was found that the flatcar could transport three ammunition laden containers. One of the three ammunition laden containers was the M1 PLS flatrack loaded with boxed ammunition. This flatrack was rail impacted without the use of chains to restrict the outward movement of the flatrack end walls. The dimensional tolerances between the end walls were not exceeded and the rough terrain container handler (RTCH) was able to insert the twist locks into the corner fittings of the M1 PLS flatrack. <u>With the cushioned draft gear, the M1 PLS flatrack passed the rail impact test without chains.</u></p>					
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SAVANNA, IL 61074-9639

REPORT NO. 97-30

TTX COMPANY FLATCAR CONVERTED TO A
CONTAINER-ON-FLATCAR (COFC) RAIL IMPACT TEST

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PART 1

INTRODUCTION

A. **BACKGROUND.** The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by DAC, Transportation Engineering Division (SIOAC-DET), to perform a rail impact test on a modified flatcar supplied by TTX Company, to carry three 20-foot or one 40-foot and one 20-foot containers. These flatcars were first made available to the U.S. Army (USA) to transport ammunition laden containers; however, questions arose relating to the flatcars meeting the safety criteria of 49 CFR for the transportation of hazardous materials. The tested flatcar was modified to meet the transportation criteria of 49 CFR, and, as a result of these rail impact tests, it was found that the flatcar could transport three ammunition laden containers.

B. **AUTHORITY.** These tests were conducted IAW mission responsibilities delegated by U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-5000. Reference is made to Change 4, 4 October 1974, to AR 740-1, 23 April 1971, Storage and Supply Operations; AMCCOMR 10-17, 13 January 1986, Mission and Major Functions of the U.S. Army Defense Ammunition Center and School (USADACS).

C. **OBJECTIVE.** The objective of these tests was to determine if the modified flatcar would meet the transportation requirements with three 20-foot ammunition laden containers. The tests consisted of rail impacts at 4, 6, and 8.1 mph in the forward direction and one 8.1 mph impact in the reverse direction.

A secondary objective was to determine the movement of the M1 PLS flatrack end walls without the use of restraining chains.

D. CONCLUSION. The detailed results of these tests are contained in this report. As a result of the tests, it was found that the modifications to the flatcar allow safe transportation of ammunition laden containers.

The conclusion to the secondary objective was that with the use of a railcar with a cushioned draft gear, the M1 PLS flatrack end wall restraint chains were not necessary.

PART 2

29 JULY 1997

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PART 3

TEST PROCEDURES

A. These test procedures were extracted from TP-94-01, Transportability Testing Procedures, July 1994, of validating tactical vehicles and outloading procedures for shipping munitions by intermodal freight containers, commercial/tactical truck or trailer or railcar.

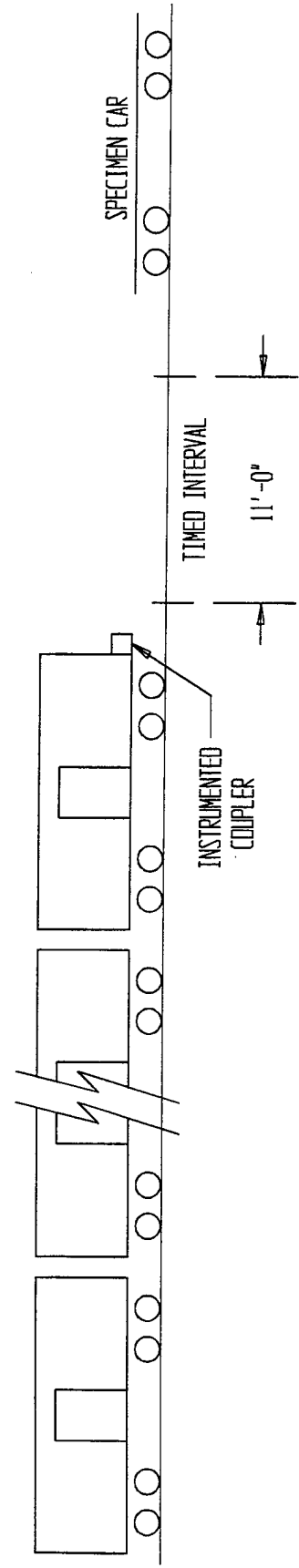
B. The test loads were prepared using the same blocking and bracing methods specified in the tiedown procedures proposed for use with munitions. A copy of these procedures is contained in Part 6 of this report. The weight and physical characteristics of the load configuration were identical to the live (explosive) ammunition provided for in the tiedown procedure; i.e., weights, physical dimensions, center of gravity (CG), materials, etc. The ammunition packages duplicated that of the live ammunition.

C. Tests conducted for this load configuration are Rail Impact - Commercial Flatrack(s) on flatcar (Test Method No. 1).

D. Test Method No. 1 (Rail Impact Test). The test intermodal commercial flatrack was loaded and secured to a standard flatcar. Equipment needed to perform the test included the specimen (hammer) car, five empty railroad cars connected together to serve as an anvil, and a railroad locomotive. These anvil cars were positioned on a level section of track with air and hand brakes set and with the draft gears compressed. The locomotive unit pulled the specimen car several hundred yards away from the anvil cars, and then, pushed the specimen car toward the anvil at a predetermined speed, then disconnected from the specimen car approximately 50 yards away from the anvil cars which allowed the specimen car to roll freely along the track until it struck the anvil cars. This constituted an impact. Impacting was accomplished at speeds of 4, 6, and 8.1 mph in one direction and at a speed of 8.1 mph in the reverse direction. The 4 and 6 mph

impact speeds were approximate; the 8.1 mph speed was a minimum. Impact speeds were determined by using an electronic counter to measure the time for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1).

**ASSOCIATION OF AMERICAN RAILROADS (AAR)
STANDARD TEST PLAN**



5 BUFFER CARS (ANVIL) WITH DRAFT GEAR
COMPRESSED AND AIR BRAKES IN A SET
POSITION
ANVIL CARS TOTAL WT 250,000 LBS (APPROX)

SPECIMEN CAR
IS RELEASED BY
SWITCH ENGINE TO
ATTAIN: IMPACT NO. 1 @ 4 MPH
IMPACT NO. 2 @ 6 MPH
IMPACT NO. 3 @ 8.1 MPH
THEN THE CAR IS REVERSED AND
RELEASED BY SWITCH ENGINE TO
ATTAIN: IMPACT NO 4. @ 8.1 MPH

FIGURE 1

PART 4

TEST RESULTS

Test No. 1:

Date: 29 July 1997

Specimen Load: Three containerized ammunition loads on a modified flatcar.

Flatcar No.: VTTX 92274

Lt. Wt.: 55,000

USAU 0100487 Flatrack, Boxed Ammunition

Wt.: 38,820

PLSM01 Milvan, 155MM SLP

Wt.: 41,280

USAU 0100614 Flatrack, MLRS pods

Wt.: 28,220

Total Specimen Wt.: 163,320

Buffer Car (five cars) Wt.: 250,000

<u>Impact</u>	<u>End Struck</u>	<u>Velocity</u>	<u>Remarks</u>
1	Forward	4.03	No Load Movement.
2	Forward	6.42	No Load Movement.
3	Forward	8.10	No Load Movement.
4	Reverse	8.26	No load Movement.

Note: 1. Flatcar has cushioned draft gear.

2. Car number changes from VTTX 92274 to ATTX 92274.

PART 5

PHOTOGRAPHS



U.S. ARMY DEFENSE AMMUNITION CENTER - SAVANNA, IL

PHOTO NO. DE972958. This photo shows the modified TTX Company railcar loaded with three 20-foot ISO container loads.



U.S. ARMY DEFENSE AMMUNITION CENTER - SAVANNA, IL

PHOTO NO. DE972976. This photo shows the side and floor of the TTX railcar along with the PLS flatrack with an MLRS rocket pod load.

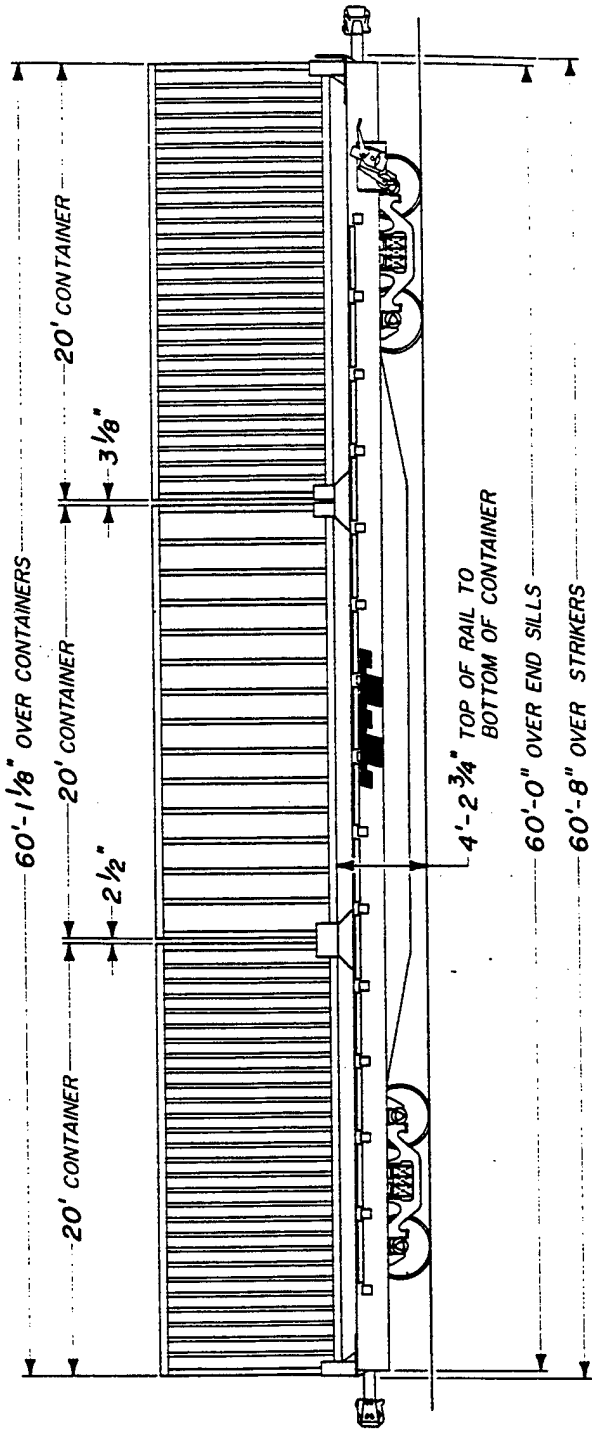


U.S. ARMY DEFENSE AMMUNITION CENTER - SAVANNA, IL

PHOTO NO. DE972982. This photo shows the openings in the floor of the TTX railcar exposing the railcar wheels.

PART 6

DRAWING



VTTX

TRAILER TRAIN COMPANY GENERAL SPECIFICATIONS FOR 60'-0" FLAT CAR TO CARRY CONTAINERS

CHARACTERISTICS OF CAR

1. Bottom of Container will be 50 3/4" from top of rail.
2. Container Bolsters are non-cushioned.
3. Car is equipped with 12" end of car cushioning.
4. One set of intermediate container bolsters are retractable to allow loading of one 40' container.
5. Reporting marks on car are VTTX with a 161,300 lbs. capacity and load limit.

NECESSARY LOADING CONDITIONS

1. Cars will handle the following combination of containers;
 - A. Three 20' Containers.
 - B. One 40' and One 20' Container.
2. Intermediate Double Pedestals toward "B" end of car must be retracted before loading a 40' container.
3. Weight Restrictions
 - A. 20' Containers to have a maximum gross weight of 53,760 lbs.
 - B. 40' Containers to have a maximum gross weight of 67,200 lbs.