Transportation Test of "Fast Pallet" with Multiple Launch Rocket System (MLRS) and Projectile Loads

Prepared for:
Office of the Project Manager for Ammunition Logistics
ATTN: AMCPM-AL
Picatinny Arsenal, NJ 07806-5000

EVALUATION DIVISION
SAVANNA, ILLINOIS 61074-9639
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* * *

The information contained herein will not be used for advertising purposes.
The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division (SMCAC-DEV), was tasked by the Office of the Project Manager for Ammunition Logistics (PM-AMMOLOG), AMCPM-AL, to test the "Fast Pallet" for shipment of Multiple Launch Rocket System (MLRS) and Army Tactical Missile System (ATACMS). The "Fast Pallet", which is manufactured by Load and Roll, Inc., has been offered for service by EDI, Inc., and is being considered for more economical handling and transportation of ammunition in the Pacific. Two "Fast Pallet" load configurations were tested in a standard International Standards Organization (ISO) container. The first pallet load consisted of four MLRS pods, restrained with 3-inch-wide web strapping. The second load consisted of 42 each pallets of 155mm projectiles to simulate the gross carrying capacity of the containerized unit. Both test loads were subjected to rail impact test, hazard course, panic stops, washboard course, and Shipboard Transportation Simulator (STS) tests.
The MLRS load successfully passed all of the transportation tests. The 155mm load failed at the 8 miles per hour (mph) impact when the rear header assembly collapsed due to compressional forces of the shifting load. The proposed load procedure for 155mm projectiles is not acceptable for transportation of this item.
TRANSPORTATION TEST OF "FAST PALLET" WITH MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) AND PROJECTILE LOADS

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School. Evaluation Division (SMCAC-DEV) was tasked by PM-AMMOLOG, AMCPM-AL to test the 'Fast Pallet' or Load and Roll Platform (LRP) for shipment of MLRS and future delivery of ATACMS. The 'Fast Pallet' which is manufactured by Load and Roll, Inc., has been offered for service by EDI Inc., and is being considered for more economical handling and transportation of ammunition in the Pacific. Two 'Fast Pallet' load configurations were tested in a standard ISO container. The first pallet load consisted of four MLRS pods, restrained with 3-inch-wide web strapping. The second load consisted of 42 each pallets of 155mm projectiles to simulate the gross carrying capacity of the containerized unit. Both test loads were subjected to rail impact test, hazard course, panic stops, washboard course, and STS tests. Blocking and bracing procedures were supplied by the Storage and Outloading Division (SMCAC-DEO). The loaded container and test 'Fast Pallet' were subjected to rail impact test, hazard course, road trip, panic stops, washboard course, and STS.

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 61299-6000. 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 U.S. Army Defense Ammunition Center and School.

C. OBJECTIVE. The objective of these tests was to determine if the 'Fast Pallet' unitized with two different test loads and shipped in an Intermodal
shipping container would be suitable in a road, ship, and rail transportation environment.

D. CONCLUSIONS. The Intermodal shipping container safely retained the inert load of MLRS/ATACMS unitized on a 'Fast Pallet' shipping pallet when subjected to rail, road, and STS tests. When the 'Fast Pallet' was configured with 42 pallets of 155mm inert ammunition, and reloaded into a standard ISO container, the unitization procedure failed to restrain the load during the rail transportation test. The 'Fast Pallet' remained intact.

E. RECOMMENDATIONS. It is recommended that the use of the 'Fast Pallet' in an ISO container be approved for the transportation of MLRS/ATACMS systems. It is further recommended that the outloading procedure developed for the 155mm ammunition be improved to support a 70,000- to 140,000-pound columnar compressive load and be retested.
PART 2

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Commandant
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Munitions Center and School
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Redstone Arsenal, AL 35897-6095
PART 3

TEST PROCEDURES

A. 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 railroad cars 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, and allows 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.

B. HAZARD COURSE. The specimen being tested will be subjected to the road hazard course. Using a suitable truck/tractor or tactical vehicle, the vehicle/specimen of test method No. 1 shall be towed/driven over a hazard course two times at a speed of approximately 5 mph. The speed may be increased or decreased, as appropriate, to produce the most violent load response.

C. ROAD TRIP. Using a suitable truck/tractor and trailer, or tactical vehicle, the tactical vehicle/specimen load shall be driven/towed for a total
distance of at least 30 miles over a combination of roads surfaced with
gravel, concrete, and asphalt. Test route shall include curves, corners,
railroad crossings, cattle guards, stops, and starts. The test vehicle shall
travel at the maximum speed suitable for the particular road being traversed,
except as limited by legal restrictions. This step provides for the tactical
vehicle/specimen load to be subjected to three full airbrake stops while
traveling in the forward direction and one in the reverse direction. The
first three stops are at 5, 10, and 15 mph, while the stop in the reverse
direction is of approximately 5 mph.

D. WASHBOARD COURSE. Using a suitable truck/tractor, and/or tactical
vehicle, the specimen shall be towed/driven over the washboard course at a
speed which produces the most violent response in the particular test load as
indicated by the resonant frequency of the suspension system beneath the
load).

E. SHIPBOARD TRANSPORTATION SIMULATOR. The test load (specimen) shall be
positioned onto the STS and securely locked in place using the cam lock at
each corner. Using the procedure detailed in the operating instruction, the
STS shall be started oscillating at an amplitude of 30° ± 2°, either side of
center and a frequency of 2 cycles-per-minute (30 seconds + 2 seconds total
roll period). This frequency shall be maintained for at least 15 minutes
during which time the load will be observed for apparent defects that could
cause a safety hazard. The frequency of oscillation shall then be increased
to 4 cycles-per-minute (15 seconds + 1 second roll period) and the apparatus
operated for 2 hours. If an inspection of the load does not indicate an
impending failure, the frequency of oscillation shall be further increased to
5 cycles-per-minute (12 seconds + 1 second cycle time), and the apparatus
operated for 4 hours. The operation does not necessarily have to be
continuous; however, no change or adjustments to the load or load restraints
shall be permitted at any time during the test. After once being set in place, the test load (specimen) shall not be removed from the apparatus until the test has been completed or is terminated.
PART 4

TEST RESULTS
**RAIL IMPACT DATA**

**DATE:** 6 FEBRUARY 1990

**TEST NO. 1**

**TEST SPECIMEN:** Trailer-on-flatcar (TOFC), ISO container, LRP and MLRS pods.

**TEST CAR NO.** TTX 153487  
**LT. WT.** 73,400 pounds

**CHASSIS NO.** 5394  
**LT. WT.** 6,040 pounds

**CONTAINER NO.** INBU 2598901  
**LT. WT.** 5,200 pounds

**LRP NO.** EDIT 3007  
**LT. WT.** 3,600 pounds

**LADING AND DUNNAGE**  
**WT.** 20,000 pounds

**TOTAL SPECIMEN**  
**WT.** 108,240 pounds

**BUFFER CAR (5 CARS)**  
**WT.** 250,000 pounds

<table>
<thead>
<tr>
<th>IMPACT NO.</th>
<th>END STRUCK</th>
<th>VELOCITY (MPH)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>rear</td>
<td>4.21</td>
<td>no movement.</td>
</tr>
</tbody>
</table>
| 2          | rear       | 6.47           | LRP shifted forward 3/4 inch.  
|            |            |                | Pallet chocks loose. Shim at  
|            |            |                | end of container omitted. |
| 3          | rear       | 7.75           | Velocity too slow. Impact  
|            |            |                | recycled. |
| 4          | rear       | 8.33           | LRP left side shifted 3/4 inch  
|            |            |                | toward rear. Right side.  
|            |            |                | 7/8 inch. |
| 5          | forward    | 8.33           | Pallet moved back to base  
|            |            |                | reference line. |

4-2
ROAD TEST DATA

TEST NO. 2       DATE: 6 FEBRUARY 1990

TEST SPECIMEN: TOFC. ISO container, LRP and MLRS pods.

PASS 1-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: Rear pallet chocks were disengaged from the container corner post. 1-inch x 3-inch channel steel bent. Damage was caused from engagement with a plate on the pallet. Pallet chocks were replaced and spaced to prevent pallet engagement. TEST SEQUENCE STARTED OVER.
RAIL IMPACT DATA

TEST NO. 3  DATE: 6 FEBRUARY 1990

TEST SPECIMEN:  TOFC, ISO container, LRP and MLRS pods.

<table>
<thead>
<tr>
<th>TEST CAR NO.</th>
<th>TTX 153487</th>
<th>LT. WT.</th>
<th>73,400 pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHASSIS NO.</td>
<td>5394</td>
<td>LT. WT.</td>
<td>6,040 pounds</td>
</tr>
<tr>
<td>CONTAINER NO.</td>
<td>INBU 2598901</td>
<td>LT. WT.</td>
<td>5,200 pounds</td>
</tr>
<tr>
<td>LPR NO. EDIT</td>
<td>3007</td>
<td>LT. WT.</td>
<td>3,600 pounds</td>
</tr>
<tr>
<td>LADING AND DUNNAGE</td>
<td></td>
<td>WT.</td>
<td>20,000 pounds</td>
</tr>
<tr>
<td>TOTAL SPECIMEN</td>
<td></td>
<td>WT.</td>
<td>108,240 pounds</td>
</tr>
<tr>
<td>BUFFER CAR (5 CARS)</td>
<td></td>
<td>WT.</td>
<td>250,000 pounds</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMPACT NO.</th>
<th>END STRUCK</th>
<th>VELOCITY (MPH)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>rear</td>
<td>5.36</td>
<td>Chocks loose both sides.</td>
</tr>
<tr>
<td>2</td>
<td>rear</td>
<td>6.15</td>
<td>Pallet moved 1/4 inch to rear.</td>
</tr>
<tr>
<td>3</td>
<td>rear</td>
<td>8.15</td>
<td>1/2-inch shift to rear.</td>
</tr>
<tr>
<td>4</td>
<td>forward</td>
<td>8.33</td>
<td>Pallet shifted a total of 1 inch to rear.</td>
</tr>
</tbody>
</table>
ROAD TEST DATA

TEST NO. 4

DATE: 7 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and MLRS pods.

PASS 1-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: 1/8 inch forward load movement. Pallet chocks loosened, started tight.

PASS 2-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: Total 1/2-inch load movement. Chocks loose. No pallet or load damage, container ok.

30-MILE ROAD TEST: No change in load or blocking.

PANIC STOP TEST: No load movement.

PASS 3-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: No change.

PASS 4-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: No damage or breakage to the unit loads or tiedown procedure.

WASHBOARD COURSE: No physical damage.

SHIPBOARD TRANSPORTATION SIMULATOR: No damage to container, LRP or MLRS pods.
RAIL IMPACT DATA

TEST NO. 5

DATE: 9 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and 155mm projectiles.

TEST CAR NO. TTX 153487
CHASSIS NO. 5394
CONTAINER NO. INBU 2598901
LRP NO. EDIT 3008

LADING AND DUNNAGE

TEST CAR NO. TTX 153487 LT. WT. 73,400 pounds
CHASSIS NO. 5394 LT. WT. 6,040 pounds
CONTAINER NO. INBU 2598901 LT. WT. 5,200 pounds
LRP NO. EDIT 3008 LT. WT. 3,600 pounds

TOTAL SPECIMEN LT. WT. 125,740 pounds
BUFFER CAR (5 CARS) LT. WT. 250,000 pounds

<table>
<thead>
<tr>
<th>IMPACT NO.</th>
<th>END STRUCK</th>
<th>VELOCITY (MPH)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>rear</td>
<td>6.58</td>
<td>LRP shifted to rear 1 inch at both sides. One pallet unit racked between first and second row.</td>
</tr>
<tr>
<td>3</td>
<td>rear</td>
<td>8.52</td>
<td>Unitization failed. LRP remained in position. Rear beam of unit load collapsed from impact force.</td>
</tr>
</tbody>
</table>
PART 5

TEST PROCEDURES
PROPOSED LOADING AND BRACING PROCEDURES
FOR ATACMS (OR MLRS) ROCKET POD/CONTAINERS
ON COMMERCIAL LOAD AND ROLL PLATFORM
(FAST PALLET) IN COMMERCIAL CONTAINER

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STRAPPING DETAILS                                  5
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PHOTOGRAPH OF 3 INCH WIDE WEB CARGO STRAP ASSEMBLY 10

NOTE: The attached 10 page document is an interim procedure (drawing D-SMCAC-4465) which is in the process of being superseded by a final procedure (drawing 19-48-8184 GM15RS3). This document is used to delineate proposed outloading procedures to be used for the shipment of ATACMS (or MLRS rocket pod/containers) when loaded on commercial Load and Roll Platform (Fast Pallet) and into a commercial container. The procedures as delineated are to be verified by rail impact, road transportability, and shipboard simulation tests prior to their approval for actual shipment.

Prepared during February 1989 by:

U.S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DEO
Savanna, IL 61074-9639
INTERIM PROCEDURES

MLRS

LOADING AND BRACING WITH LOAD AND ROLL PLATFORM IN COMMERCIAL CONTAINERS OF ROCKET POD/CONTAINERS (RP/C) FOR MULTIPLE LAUNCH ROCKET SYSTEM, FOR SHIPMENT BY T/COFC CARRIER

THE INTERIM LOADING AND BRACING PROCEDURES SPECIFIED BY THIS DRAWING ARE ONLY APPLICABLE, UNLESS OTHERWISE DIRECTED, FOR ONE TIME USE IN SUPPORT OF A TRIAL SHIPMENT PROGRAM. APPROVAL OF THIS DRAWING, AS REFLECTED HEREON, IS BASED ON THE CONSTRAINTS SET FORTH IMMEDIATELY ABOVE.

THE LOAD AND ROLL PLATFORM IS A COMMERCIAL PRODUCT. FOR A SOURCE OF SUPPLY, CONTACT CONTAINER CONCEPTS, INC., 1521 BOLSON DRIVE, DOWNERS GROVE, IL 60516. PHONE 1-312-968-1835.

LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLAT-CAR (TCOF) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS. SEE GENERAL NOTE "L" ON PAGE 2.
GENERAL NOTES

A. This document has been prepared and issued in accordance with AR 740-1 and augments TM 740-300-1 (Chapter 5).

B. This document has been prepared and issued to support a trials shipment program. The outloading procedures described herein are applicable to the multiple launch rocket system rocket pod/container by 90-2. Subsequent reference to containers herein means the rocket with rocket components.

C. For details of the rocket pod/container, see U.S. Army Missile Command Drawing No. 1302900.

**Container Dimensions**
- Length: 13'-0" long by 41'-1/2" wide by 33'-0" high.
- Gross Weight: 5,078 pounds (approx.)

D. This item is a dot class "A" explosive, and a coast guard class X-C. The outloading procedures specified herein can also be utilized for the shipment of the depicted containers when they are loaded with an item which is identified differently by nomenclature than the item designated in the drawing title.

E. The load as shown is based on a 4,700 pound 20'-4" long by 8'-4" wide by 8'-4" high intermodal commercial container with inside dimensions of 19'-4" long by 9'-2" wide by 9'-0" high. The load is designed for trailer/container-on-flatcar (T/COFC) shipment. However, the load as designed can also be moved by other surface modes of transport. Notice: Other containers of the same design configuration can be used.

F. When loading the containers, they are to be positioned so as to achieve tight load (right against the forward blocking assembly). Although a total of one and one-half inches of unblocked space across the width of the load bay is permitted, lateral voids within the load are to be held to a minimum. Excessive slack can be eliminated from a load by laminating additional pieces of appropriate thickness to the fill pieces on the corner retainer pieces. Nail each additional piece to the fill piece with appropriately sized nails. Additionally, the thickness of the fill pieces may be adjusted as required to facilitate variance in the length of the load and roll platform.

G. Dunnage lumber specified is of nominal size. For example, 1" x 4" material is actually 3/4" thick by 3'-0" wide and 2" x 4" material is actually 1 1/2" thick by 3'-0" wide.

H. When steel strapping is sealed at an end-over-end lap joint, a minimum of one seal with two pairs of notches will be used. A minimum of two seals, butted together, with two pairs of cramps per seal will be used to seal the joint when a crimp type sealer is being used. Refer to the "strap joint A" and "strap joint B" details on page 5 for guidance.

I. Portions of the container depicted within this drawing, such as one of the side walls, have not been shown in the load view for clarity purposes.

J. Dimensions given for dunnage pieces or assemblies will be field checked prior to their assembly and installation in the commercial container.

K. Requirements cited within the bureau of explosives pamphlet 6C apply when the shipment moves by trailer/container-on-flatcar (T/COFC). Special T/COFC notes follow:

1. A loaded container must be on a chassis equipped with two boom assemblies when being moved in T/COFC service.

2. The load limit of a T/COFC railcar must not be exceeded, nor will a car be loaded so that the truck under one end of the car carries more than one-half of the load limit for that car.

(continued at right)

MATERIAL SPECIFICATIONS

**Lumber**
- TM 740-200-1 (dunnage lumber) and red spec M4-L-151.

**Nails**
- Red spec PF-N-1051 common.

**Wire**
- Red spec QQ-W-441.

**Load and Roll Platform**
- LSF-107NP-MIL-S-28577.

**Anti-Clamping Material**
- Red spec PP-N-688-1068 type of (old fireblock), class-domestic, all grades.
SPECIAL HANDLING GUIDANCE

1. CONTAINER STACKING FOR OUTLOADING PURPOSES:
   A. THE UPPER CONTAINER SHOULD BE PLACED AS CLOSELY AS POSSIBLE IN VERTICAL ALIGNMENT WITH THE LOWER CONTAINER.
   B. WHEN STACKING THESE CONTAINERS, CARE MUST BE EXERCISED TO ENSURE THAT THE INTERLOCKING HOLES IN THE BOTTOM OF THE CONTAINER SKIDS ALIGN CORRECTLY WITH THE INTERLOCKING PIN ORS ON THE TOP OF THE CONTAINER FRAME. THIS WILL PRECLUDE DAMAGE TO THE SKIDS AND INCREASE PROPER FUNCTIONING OF THE INTERLOCKS.

2. CONTAINER OR CONTAINER STACK HANDLING:
   NOTES: (1) MATERIALS HANDLING EQUIPMENT (MHE) IS INTENDED TO MANAGE, SUCH AS FORKLIFT TRUCKS, CRANES, HAND TRUCKS, DOLIES, ROLLER ASSEMBLIES, SLINGS, AND SPREADER BARS, THAT CAN BE USED TO HANDLE THE DEPICTED CONTAINERS.
   (2) PRECAUTIONARY HANDLING TECHNIQUES NORMALLY EMPLOYED OR AS SPECIFIED FOR THE TYPE OF COMMODITY INVOLVED WILL BE OBSERVED.
   A. ONLY APPROVED AND APPROPRIATELY SIZED MHE WILL BE USED FOR HANDLING THE DEPICTED CONTAINERS.
   B. IF HANDLING IS ACCOMPLISHED WITH A FORKLIFT TRUCK, THE CONTAINERS SHOULD BE HANDLED FROM A SIDE POSITION ONLY. CARE MUST BE EXERCISED WHEN INVERTING THE FORKS UNDER THE CONTAINER TO PREVENT DAMAGE TO THE CONTAI NERS OR THE FORK TINES OR THE FORKLIFT PACKAGE GUARD. ADDITIONALLY, THE FORK TINES SHOULD BE PLACED UNDER THE CONTAINER'S STRONGEST AREAS, THAT IS THE LATERAL FRAME MEMBERS/BRIDGEHEA D LOCATED NEAR THE LONGITUDINAL CENTER OF THE CONTAINER.

3. SEQUENTIAL CONTAINER LOADING:
   C. APPLY THE STACK UNITIZING STRAP. NOTE: FIBERBOARD ANTI-CHAFFING MATERIAL MUST BE INSTALLED UNDER THE STRAPS AT ALL POINTS OF CONTACT WITH THE CONTAINERS.

(Continued at right)

D. INSTALL THE CENTER FILL PIECES. POSITION THE CENTER FILL PIECES SO THAT THEY ARE SUPPORTED BY THE TOP SIDE OF THE FORK POCKET (TUNNEL) ON THE LOAD AND ROLL PLATFORM. WIRE THE CENTER FILL PIECES TO THE CONTAINER FRAME.

E. NEXT, LOAD AND UNITIZE THE REMAINING CONTAINERS IN THE MANNER DETAILED IN PARAGRAPHS 3B AND 3C AT LEFT.

F. APPLY THE HOLD-DOWN STRAPS, POSITIONING FIBERBOARD ANTI-CHAFFING MATERIAL UNDER THE STRAPS AT ALL POINTS OF CONTACT WITH THE CONTAINERS. CAUTION: THE HOLD-DOWN STRAPS MUST BE INSTALLED WITH CARE SO AS NOT TO HAVE EDGE-TO-EDGE CONTACT WITH THE STACK UNITIZING STRAPS.


OUTLOADING THE LOAD AND ROLL PLATFORM FROM THE COMMERCIAL CONTAINER:

A. THE LOAD AND ROLL PLATFORM MAY BE OUTLOADED USING THE REVERSE OF THE METHOD DETAILED IN 3G ABOVE.

ISOMETRIC VIEW

KEY NUMBERS

1. FORWARD BLOCKING ASSEMBLY (1 REQD). See page 5-9.
2. LOAD AND ROLL PLATFORM, LOADED (1 REQD). See the detail on page 6.
INDICATES A SEAL FOR THE HOLD-DOWN STRAP.

INDICATES A SEAL FOR THE PAD.

TIEDOWN DETAIL

SPECIAL NOTE:
The seal(s) used to fasten the hold-down strap to load and roll platform tiedown anchor should be located a minimum of 18" above the platform deck.

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; x 4&quot;</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>STEEL STRAPPING, 2&quot; x .080&quot;</td>
<td>120' Req'd</td>
<td>43 lbs</td>
</tr>
<tr>
<td>SEAL FOR 2&quot; STRAPPING</td>
<td>24 Req'd</td>
<td>5 lbs</td>
</tr>
<tr>
<td>STEEL STRAPPING, 1-1/4&quot; x .028&quot; OR .031&quot;</td>
<td>60' Req'd</td>
<td>12 lbs</td>
</tr>
<tr>
<td>SEAL FOR 1-1/4&quot; STRAPPING</td>
<td>6 Req'd</td>
<td>1/2 lbs</td>
</tr>
<tr>
<td>WIRE, NO. 16 GAGE</td>
<td>8' Req'd</td>
<td>NIL</td>
</tr>
<tr>
<td>FREEBOARD ANTI-CRIMPING MATERI</td>
<td>AS Req'd</td>
<td>NIL</td>
</tr>
<tr>
<td>LOAD AND ROLL PLATFORM</td>
<td>1 Req'd</td>
<td>1,953 lbs</td>
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LOAD AS SHOWN

<table>
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<tr>
<th>ITEM</th>
<th>QUALITY</th>
<th>WEIGHT (APPROX)</th>
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</thead>
<tbody>
<tr>
<td>MAIN RPM'SHEAVY DUTY</td>
<td>4</td>
<td>22,372 lbs</td>
</tr>
<tr>
<td>DUMPLING NOS.</td>
<td></td>
<td>2,016 lbs</td>
</tr>
<tr>
<td>COMMERICAL/GENERAL NOS.</td>
<td>1</td>
<td>4,709 lbs</td>
</tr>
<tr>
<td>TOTAL WEIGHT</td>
<td></td>
<td>27,097 lbs</td>
</tr>
</tbody>
</table>
For the test program, a 3-inch-wide web cargo strap assembly is to be used in lieu of the steel strap and seal. The web cargo strap assembly is ANCRA part no. 48050-12 (8M-3D-3D-24-260P3) consisting of a heavy capacity ratchet, 3-inch-wide polyester webbing, a keepered flat hook on both ends, and a minimum capacity of 15,000 pounds. See page 5-12 for photograph.
Header. 4" x 4" hardwood, 3" deep (min) x 3-1/2" high x 92" (1 reqd).

Tie Piece. 3/4" plywood triangle, 8-1/2" leg by 5" leg (2 reqd). Nail to Guide Block w/2-6d nails and to the header w/3-6d nails.

Guide Block. 4" x 4" hardwood triangle, 3-1/2" leg by 6" leg (2 reqd). Locate tight against container side walls.

FORWARD BLOCKING ASSEMBLY

Shim. 6" x 11" plywood by thickness to suit (as reqd). Select thickness of plywood to fill void between face of retainer and end of loading platform. Nail plywood to filler block w/2-5d nails before inserting into retainer.

Filler Block. 11" long piece of hardwood by thickness and depth to suit (2 reqd). Select size of block to fill void between retainer and side of loading platform.

Retainer Nails. 10d common (4 reqd). Nail through each retainer piece into shim and filler block with a minimum of two 10d nails.

CORNER RETAINER PIECE
MLRS PODS SECURED ON LOAD AND ROLL PLATFORM (LRP) AND BLOCKED INSIDE STANDARD COMMERCIAL CONTAINER

AFTER REMOVING CORNER BLOCKS AND ROLLING OUT LRP, MLRS PODS ARE ACCESSIBLE FOR DIRECT SIDE HANDLING
TWO 6K FORKLIFTS PERFORM ENTIRE UNLOADING OPERATION
AND LOAD TRAILER, WITH THE FOUR PODS IN 5 MINUTES

OBSERVERS VIEW EMPTY LRP JUST PRIOR TO BEING ROLLED
BACK INTO COMMERCIAL END OPENING CONTAINER
The 3-inch-wide web cargo strap assemblies are depicted. Note the extension handle inserted in the ratchet of the strap assembly in the foreground.
PROPOSED LOADING AND BRACING PROCEDURES
FOR PALLETRIZED UNITS OF 155MM SEPARATE LOADING
PROJECTILES ON COMMERCIAL LOAD AND ROLL
PLATFORM (FAST PALLET) IN COMMERCIAL CONTAINER

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PALLETS</td>
<td>42 @ 873 LBS</td>
<td>36,666 LBS</td>
</tr>
<tr>
<td>DUNNAGE</td>
<td></td>
<td>225 LBS</td>
</tr>
<tr>
<td>FAST PALLET</td>
<td></td>
<td>3,800 LBS</td>
</tr>
<tr>
<td>CONTAINER</td>
<td></td>
<td>4,700 LBS</td>
</tr>
<tr>
<td>TOTAL WEIGHT</td>
<td></td>
<td>45,191 LBS</td>
</tr>
</tbody>
</table>

INDEX

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PAGE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISOMETRIC OF FULL LOAD PROCEDURES</td>
<td>2</td>
</tr>
<tr>
<td>DETAILS</td>
<td>3-8</td>
</tr>
</tbody>
</table>

NOTE: This 8 page document delineates proposed outloading procedures to be used for the shipment of palletized 155mm separate loading projectiles on commercial Load and Roll Platform (Fast Pallet) and into a commercial container. The procedures as delineated are to be verified by rail impact, road transportability, and shipboard simulation tests prior to their approval for actual shipment.

Prepared during February 1989 by:

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Center and School
ATTN: SMCAC-DEO
Savanna, IL 61074-9639
ISOMETRIC VIEW

1-1/4" X .031" OR .035"
STEEL STRAPPING. FORM
FROM TWO 18'-0" PIECES.

HEADER ASSEMBLY (2 REQD). NAIL
THROUGH STOP ASSEMBLIES INTO
HEADER W/8-8d NAILS. SEE PAGE 3.

SEAL FOR 1-1/4" STRAPPING
(21 REQD). CRIMP WITH
DOUBLE NOTCH.

STRAPPING BOARD ASSEMBLY
(7 REQD). SEE PAGE 4.

FIBERBOARD EDGE PROTECTORS (14 REQD).

LEFT-HAND STOP ASSEMBLY
(2 REQD). POSITION ONE AT
EACH END AS SHOWN. SEE PAGE 5.

RIGHT-HAND STOP ASSEMBLY
(2 REQD). POSITION ONE AT
EACH END AS SHOWN. SEE PAGE 6.
BEARING PIECE, 2" X 6" X 6'-11" (2 REQD). NAIL TO THE STRUTS WITH 2-10d NAILS AT EACH JOINT.

STRUT, 2" X 6" X 5" (6 REQD).
PURCHASE BOARD, 2" X 4" X 36" (1 REQD), NAIL TO THE STRAPPING BOARD W/5-10G NAILS.

STRAPPING BOARD ASSEMBLY

STRAPPING BOARD, 2" X 4" X 7'-0" (1 REQD).

24"
LEFT-HAND STOP ASSEMBLY

ANGLE (1 REQD), SEE DETAIL ON PAGE 7.

STAKE (3 REQD), SEE DETAIL ON PAGE 8.

28-1/8"  15-1/2"  4-3/4"

END VIEW
STAKE PIECE

CHAMFER: 1/4" X 1/4" (2 HEAD).

SHEET STEEL: 1/4" X 5-1/2" X 11-1/2". NOTE: GRIND SHARP POINT OFF ALL CORNERS.
PART 6

PHOTOGRAPHS
Photo No. 3 This photo shows the ISO container loaded with the LRP and MLRS. The test specimen is being subjected to the road hazard course. The vehicle is driven over the alternately spaced railroad ties at approximately 5 mph.
photo No. 4. This photo shows a special design check that is required to retain the LRP inside the container. Straps are inserted between the check and LRP for a lip that prevents longitudinal and lateral movement. A second check is placed opposite the one shown. The vent flange on the LRP is a stacking aid for LRPCs and interferes with check installation. A vertical bar on the check butts against the ISO container corner post.
PHOTO NO. 1  This photo shows the LRP check after becoming disengaged while traversing the road hazard course. Note damage to the channel steel. The channel steel was probably bent when the LRP slid forward during rail impact testing. The plate on the LRP which contacted the channel steel can be seen in the photo at the left side of the pallet, on the container floor.
Photo No. 6. This photo shows a damaged BPP sheet. Damage was probably caused by collision with a plate mounted to the bottom of the BPP that protruded about four inches from the edge.
Photo No. 7  This photo shows the pallet chock with wood spacers to prevent contact with the EMP plate. With the vertical and horizontal shin, both right and left chocks remained intact throughout the rail, real, and STS test sequences.