FINAL REPORT
MARCH 1994

REPORT NO. 94-05

ENHANCED PALLETTIZED FLATRACK (EPF)
TRANSPORTABILITY TESTING ON THE PALLETTIZED LOADING SYSTEM (PLS) TRUCK/TRAILER

Prepared for:
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The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by the U.S. Army Tank-Automotive Command, Program Manager for Heavy Tactical Vehicles (SFAE-CS-TVH), to test the Enhanced Palletized Flatrack (EPF) on the Palletized Loading System (PLS) truck/trailer with ammunition loads for compliance with Transportability Testing Procedures, TP-91-01, July 1991. Testing included Container-on-flatcar (COFC), Trailer-on-flatcar (TOFC), loaded PLS truck with EPF cabled on a flatcar, loaded PLS truck/trailer cabled on a flatcar, road hazard course, road trip, washboard, and Shipboard Transportation Simulator (STS) of four different ammunition loads. Minor mechanical discrepancies were observed in the EPF; however, problems did not hinder successful transportation of the ammunition loads. Although the EPF satisfied basic ammunition transportation test criteria, the wooden deck contained 1/8- to 1/2-inch gaps which do not (continued)
19. ABSTRACT (continued)
meet the tight floor requirements of Code of Federal Regulations (CFR) 177.835(f). As a result, the EPF (as designed) cannot be used for the transportation of ammunition until this floor requirement is met.

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U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
VALIDATION ENGINEERING DIVISION
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ON THE PALLETTIZED LOADING SYSTEM (PLS) TRUCK/TRAILER

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TABLE OF CONTENTS

PART PAGE NO.
1. INTRODUCTION ................................................................................................................ 1-1
   A. BACKGROUND ........................................................................................................ 1-1
   B. AUTHORITY ........................................................................................................... 1-1
   C. OBJECTIVE ........................................................................................................... 1-1
   D. CONCLUSIONS AND RECOMMENDATIONS ..................................................... 1-1
2. ATTENDEES ................................................................................................................ 2-1
3. TEST PROCEDURES ............................................................................................... 3-1
4. TEST RESULTS ......................................................................................................... 4-1
5. PHOTOGRAPHS ....................................................................................................... 5-1
6. DRAWINGS ............................................................................................................... 6-1
PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by the U.S. Army Tank-Automotive Command, Program Manager for Heavy Tactical Vehicles (SFAE-CS-TVH), to test the Enhanced Palletized Flatrack (EPF) on the Palletized Loading System (PLS) truck and the PLS truck/trailer with ammunition loads for compliance with Transportability Testing Procedures, TP-91-01, July 1991.

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 U.S. Army Defense Ammunition Center and School (USADACS).

C. OBJECTIVE. The objective of these tests is to validate the design criteria of the EPF for the transportation of ammunition in all modes, including the newly fielded PLS truck/trailer. Rail impact tests were conducted with various types of ammunition loaded on the EPF transported on a Container-on-flatcar (COFC) railcar, Trailer-on-flatcar (TOFC) railcar, PLS truck or standard flatcar, and PLS trailer on standard flatcar. Test loads on the EPF also traversed the road hazard course and were subjected to the Shipboard Transportation Simulator (STS).

D. CONCLUSIONS AND RECOMMENDATIONS. Basically, the EPF offered good load support through the testing cycle. There are, however, several design deficiencies on the EPF. These deficiencies are as follows:
1. Wooden pallet decks are recessed 1/2-inch below the outside rail of the EPF. When loading pallets with their skids lateral to the EPF, the pallet skids rest on the outside rail and span over the deck such that the end of the skids supports the bulk of the pallet weight. As a result of the lack of uniform skid support, pallet wooden ends break and metal pallet skids deform. The EPF deck should be level from side rail to side rail.

2. When loading or unloading low center of gravity (CG) loads; i.e., 155mm Separate Loading Projectiles (SLPs), it was noted that the ISO corner fittings cut into the loading/unloading surface after the EPF rollers made initial contact with the loading/unloading surface. This was attributed to the position of the EPF rollers in relation to the outside corner of the ISO fittings and possibly the hardness of the plastic rollers. The heavy load compressed the rollers which effectively reduced the clearance between the corner fitting and the loading/unloading surface.

3. The weight of the end walls prevented them from being raised from the stowed position. A forklift was required to position them prior to pinning the end walls in an upright position. The spring assist did not function properly, or was not adjusted properly at the factory. Spring assist is constructed to operate only in one direction. Since the end walls fold in both directions, they should be spring assisted to reduce the lifting load in both directions.

4. During testing, the end wall locking pins retracted out of the sockets. This is a potential safety hazard as the end wall could fall off while a load is in transit. The end wall locking devices should have a more positive locking device to prevent extraction while the EPF is in transit.

5. The bail bar end wall has several degrees of rotational movement between the load and end wall when lifting the EPF onto the PLS truck. This movement yields approximately two to
three inches at the top of the wall and prevents the EPF from fully engaging the frame locks on the truck. Tolerances need to be reduced on the locking pins and related assemblies to reduce this rotational movement.

6. The pallet roller axle assemblies are designed to be aligned under the rear edge of the pallet. If the roller position could be shifted further to the rear of the pallet so that the roller axle aligns along the end of the pallet, more clearance between the rear ISO fittings and the ground could be achieved.

7. The trailer bumper plate on the PLS truck used in testing the EPF interfered with the cross ribs on the EPF. Several loading/unloading cycles distorted the plate to the point where the load handling system (LHS) could not unload an EPF. The solution was to remove the bumper. Tolerances on the bumper and the EPF should be checked for interference. Possibly, the height of the bumper plate could be reduced to allow greater clearance between the top of the plate and the flatrack.

8. The bail bar end of the EPF has two fixed pins acting as hinges. The hinge pins are restricted from movement by a nut and bolt assembly positioned in a retractor hole. This assembly became loose and allowed the pins to come out during testing. The pins should be welded in place to prevent removal. This will also eliminate the cost of another assembly in the EPF.

9. Each EPF end wall has built in, recessed tiedown fittings. These fittings are restrained by a metal bar which prevents them from protruding when not being used. In a course of normal transportation, these fittings bounce outside of the recessed housing and rest on the metal restraint bar. As a result, the fittings interfere with loading/unloading operations and could damage the flatrack or be damaged when the end walls are lowered for retrograde.
10. An EPF cannot have its cargo loaded/unloaded with the truck crane. The EPF end wall height restricts the ability of the crane boom to descend lower than 30 degrees to the horizontal. This angle precludes unloading any pallets off the end of the truck. This is a system specification requirement. The height of the end wall could be lowered 14 inches, reducing the crane interference area.

11. Sideboards cannot effectively be used with the EPF since ammunition loads extend laterally from side rail to side rail. Some loads may fall a few inches within the side rails; however, there is not enough clearance between the load and and sideboards for the tiedown devices.

12. The wooden planking used for flooring on the EPF does not fit tight against the longitudinal side rails. Gaps were observed between the wood and side rails varying from 1/8- to 1/2-inch. The gaps provide an unobstructed view from the top of the EPF to the ground below and vice versa. This manufacturing oversight prevents the EPF from being used to ship ammunition over public highways. This is IAW CFR section 177.835(f). The key phrase is "... Motor Vehicles transporting Division 1.1, 1.2, or 1.3 (Class A or Class B explosive) materials shall have tight floors ..." Additional criteria for inspection of intermodal containers is given in MIL-HDBK-138, Container Inspection Handbook for Commercial and Military Intermodal Containers. Both documents require a tightly-sealed floor to offer protection from road debris being thrown into the load during transportation. On this basis, the EPF cannot be used for transporting ammunition.
### ATTNDEES

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MARKED) TOGETHER

AFTER ALL BOXES ARE STACKED, HOOK FLAIIING BOXES IN LAYERS ON TOP OF THE BOTTOM LAYER. BOTTOM LAYER OF BOXES TIGHT AGAINST EACH OTHER BOXES ON THE FLOOR AND ON TOP OF THE STRAPS. KEEP FLOOR OF THE FLATRACK PRIOR TO LOADING BOXES. MAKE POSITION ADJUSTMENTS TO THE BOXES, IF NECESSARY, SO THEY FORM A COMPACT TIGHT BUNDLE. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WEB STRAP TIEDOWN ASSEMBLY (TWO REQUIRED FOR EACH BUNDLE OF FOUR OR MORE LOOSE BOXES). INSTALL EACH STRAP AROUND ALL BOXES IN THE BUNDLE AT THE APPROPRIATE LOCATION SHOWN. PRE-POSITION THESE TWO STRAPS ON THE FLOOR OF THE FLATRACK PRIOR TO LOADING THE BOXES. USE Attach STRAP TIEDOWN ASSEMBLIES, MARKED "F" TO THE SAME TIEDOWN ANCHORS PRIOR TO RATCHETING STRAPS MARKED "E". TIGHT, TAKE UP SLACK IN STRAPS AND THEN RATCHET TIGHT BOTH STRAPS AT THE SAME TIME, AS THE STRAPS ARE BEING TIGHTENED, MAKE POSITION ADJUSTMENTS TO THE BOXES, IF NECESSARY, SO THEY FORM A COMPACT TIGHT BUNDLE. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WEB STRAP TIEDOWN ASSEMBLY (TWO REQUIRED FOR EACH BUNDLE OF FOUR OR MORE LOOSE BOXES). INSTALL EACH STRAP FROM A TIEDOWN ANCHOR ON SIDE OF FLATRACK, AROUND END OF BUNDLED BOXES AT LOCATION SHOWN, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. IF THESE STRAPS ARE BEING ATTACHED TO THE SAME TIEDOWN ANCHORS AS STRAPS MARKED "D", ATTACH RATCHET ENDS TO THE SAME TIEDOWN ANCHORS THAT THE NON-RATCHET ENDS OF STRAPS MARKED "D" ARE ATTACHED TO, TAKE UP SLACK IN STRAPS AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F", "G" AND "N" ON PAGE 2.


WEB STRAP TIEDOWN ASSEMBLY (ONE REQUIRED FOR EACH STACK OF FOUR OR MORE LOOSE BOXES). INSTALL EACH STRAP FROM A TIEDOWN ANCHOR ON ONE SIDE OF FLATRACK, OVER TOP OF BOXES, TO A TIEDOWN ANCHOR ON THE OPPOSITE SIDE OF FLATRACK. POSITION BOTH STRAP RATCHETS ON THE SAME SIDE OF FLATRACK. POSITION BOTH STRAP RATCHETS ON THE SAME SIDE OF FLATRACK. MAKE POSITION ADJUSTMENTS TO THE BOXES, IF NECESSARY, SO THEY FORM A COMPACT TIGHT BUNDLE. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.
INDICATES TWENTY-TWO BOXES OF 7.62MM CARTRIDGES ON A 35" X 45-1/2" PALLET.

INDICATES ONE FULL PALLET OF C44S 105MM CARTRIDGES WITH 2 LOOSE BOXES ON TOP.

INDICATES TWENTY-TWO BOXES OF 7.62MM CARTRIDGES ON A 35" X 45-1/2" PALLET.

INDICATES ONE FULL PALLET OF C44S 105MM CARTRIDGES WITH 8 LOOSE BOXES ON TOP.

ISOMETRIC VIEW

SPECIAL NOTES:

1. TYPICAL METHODS OF SECURING LOOSE BOXES ON TOP OF A PALLET UNIT AND/OR 35" X 45-1/2" PALLET ARE SHOWN LOADED ON THE A-FRAME FLATRACK HAVING CARGO DECK DIMENSIONS OF 7'-6"-1/2" WIDE BY 19'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. THE PROCEDURES FOR SECURING 7.62MM OR 105MM CARTRIDGES IN WOODEN BOXES SHOWN ON THIS PAGE MAY ALSO BE USED ON THE M1 FLATRACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE 105MM CARTRIDGE, PACKED TWO PER WOODEN BOX HAVING DIMENSIONS OF 45-3/4" LONG BY 14-1/4" WIDE BY 6-3/4" HIGH AND THE 7.62MM CARTRIDGE PACKED FOUR PER WOODEN BOX HAVING DIMENSIONS OF 17-1/2" LONG BY 11-1/2" WIDE BY 8-1/8" HIGH, ARE SHOWN. THESE PROCEDURES MAY BE USED FOR BOXES OF DIFFERENT SIZES AND WEIGHTS.

4. THE QUANTITY OF BOXES POSITIONED ON A 35" X 45-1/2" PALLET AND/OR ON TOP OF A PALLET UNIT IS LIMITED TO THE QUANTITY THAT CAN BE ENCLOSED WITH ONE WEB STRAP TIEDOWN ASSEMBLY, SHOWN AS KEY NUMBERS 1 AND 2 ABOVE.

5. FOR ALTERNATIVE METHODS OF SECURING LOOSE BOXES, SEE PAGES 38 AND 39.

6. A 35" X 45-1/2" PALLET IS SHOWN, HOWEVER, PALLETS OF OTHER DIMENSIONS MAY BE USED.
KEY NUMBERS

1. WEB STRAP TIEDOWN ASSEMBLY (2 REQD.). INSTALL EACH STRAP TO ENCLOSE ALL BOXES AND TOP DECK OF THE PALLETT MARKED 8 PRIOR TO POSITIONING BOXES ON PALLETT. THREAD STRAPS MARKED 6 UNDER THE TOP DECK OF PALLET WITH BOTH RATCHET ENDS ON THE SAME SIDE OF PALLET. MAKE SURE THE STRAPS LAY FLAT WITH NO TIGHTNESS IN THEM. AFTER THE BOXES ARE POSITIONED ON THE PALLET, BRING ENDS OF STRAP UP OVER TOP OF BOXES AND HOOK ENDS OF STRAP TOGETHER. TAKE UP EXCESS SLACK IN STRAPS AND RATCHET TIGHT BOTH STRAPS AT THE SAME TIME. SEE GENERAL NOTES "F", "G" AND "M" ON PAGE 2.

2. WEB STRAP TIEDOWN ASSEMBLY (2 REQD.). INSTALL EACH STRAP FROM A TIE DOWN ANCHOR ON SIDE OF FLATRACK OVER TOP OF BOXES TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION BOTH STRAP RATCHETS ON THE SAME SIDE OF THE LOAD. ATTACH WEB STRAP TIE DOWN ASSEMBLIES MARKED 3 TO THE SAME TIE DOWN ANCHORS PRIOR TO RATCHETING STRAPS MARKED 1. TAKE UP SLACK IN STRAPS AND THEN RATCHET TIGHT BOTH STRAPS MARKED 2 AT THE SAME TIME. NOTE: THE BOXES SHOULD BE POSITIONED SO STRAPS 1 ARE ATTACHED TO THE SAME TIE DOWN ANCHORS AS STRAPS MARKED 2. ATTACH RATCHET ENDS TO THE SAME TIE DOWN ANCHORS THAT THE NON-RATCHET ENDS OF STRAPS MARKED 2 ARE ATTACHED TO. TAKE UP SLACK IN STRAPS HAND THEN RATCHET TIGHT. SEE GENERAL NOTES "F", "G" AND "M" ON PAGE 2.


4. WEB STRAP TIE DOWN ASSEMBLY (4 REQD.). INSTALL EACH STRAP TO EXTEND FROM A TIE DOWN ANCHOR ON SIDE OF FLATRACK, OVER TOP OF PALLETIZED UNIT. UNDER ALL LOOSE BOXES WHICH ARE POSITIONED ON TOP OF THE PALLETIZED UNIT, TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. NOTE: STRAPS MARKED 6 MUST BE INSTALLED OVER TOP OF THE PALLETIZED UNIT PRIOR TO POSITIONING THE LOOSE BOXES ON TOP OF THE PALLETIZED UNIT. TAKE UP EXCESS SLACK IN STRAPS AND THEN RATCHET TIGHT BOTH STRAPS AT THE SAME TIME. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

5. WEB STRAP TIE DOWN ASSEMBLY (4 REQD.). INSTALL EACH STRAP TO EXTEND FROM A TIE DOWN ANCHOR ON SIDE OF FLATRACK. AROUND END OF PALLET AS SHOWN, TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. TAKE UP EXCESS SLACK IN STRAP AND RATCHET TIGHT. SEE GENERAL NOTES "F", "G" AND "M" ON PAGE 2.


7. WEB Pallet, 35" X 45-1/2" (1 REQD.). SEE KEY NUMBER 1 ON THIS PAGE.

7.62MM AND 105MM CARTRIDGES IN WOODEN BOXES

PAGE 41

PROJECT CAP-TV 4-93
STEP 1
IN THIS VIEW PART OF THE RATCHET HOUSING IS SHOWN BROKEN AWAY TO DEPICT WEBBING-TO-WEBBING CONTACT ON THE TAKE-UP SPOOL OF THE RATCHET. WEBBING-TO-WEBBING CONTACT IS ACHIEVED WHEN THE OPERATOR HOLDS THE DOUBLE LINE OF WEBBING IN AN "IN LINE PLANE TO THE RATCHET" AND IT MAKES CONTACT WITH THE SINGLE LINE OF WEBBING.

STEP 2
THIS VIEW DEPICTS THE LOCATION OF THE FIXED MARK ON THE RATCHETING HANDLE, WITH ANOTHER MATCHING MARK ON THE TAKE-UP SPOOL, AFTER WEBBING-TO-WEBBING CONTACT HAS BEEN MADE.

STEP 3
THIS VIEW DEPICTS THE LOCATION OF THE MARK ON THE END OF THE TAKE-UP SPOOL AFTER THE SPOOL HAS BEEN ROTATED ONE-HALF TURN, AFTER WEBBING-TO-WEBBING CONTACT HAS BEEN MADE.

STEP 4
THIS VIEW DEPICTS THE LOCATION OF THE MARK ON THE END OF THE TAKE-UP SPOOL AFTER THE SPOOL HAS BEEN ROTATED ONE FULL TURN, AFTER WEBBING-TO-WEBBING CONTACT HAS BEEN MADE.
4. **THE OTHER METHOD THAT CAN BE USED TO**

   **DETERMINE THE LOCATION OF THE MARK ON THE END OF THE TAKE-UP SPOOL.**

   **AFTER THE SPOOL HAS BEEN ROTATED ONE TO ONE-HALF TURNS, AFTER**

   **WEBBING-TO-WEBBING CONTACT HAS BEEN MADE.**

   **ALSO IN THIS VIEW, PART OF**

   **THE RATCHET HANDLE IS BROKEN AWAY TO SHOW THE LOCKING BAR FULLY SEATED**

   **IN THE MATCHING LOCKING NOTCH (SPROCKET GEAR TEETH).**

   **NOTE:**

   **LOCAL.**

   **NOTCH**

   **TIP OF TOOTH.**

   **MARK ON END OF**

   **RATCHET HANDLE.**

   **MARK ON SIDE OF**

   **RATCHET HANDLE.**

   **LOCKING BAR.**

   **LOCKING NOTCH.**

   **TIP OF TOOTH.**

   **AT THIS POSITION THE OUTSIDE LAYER OF**

   **WEBBING SHOULD BE BETWEEN THE LOCKING**

   **NOTCH AND BELOW THE TIP OF THE TOOTH.**

   **SEE SPECIAL NOTE 6 BELOW.**

   **STEP 5**

   **THIS VIEW DEPICTS THE LOCATION OF THE MARK ON THE END OF THE TAKE-UP**

   **SPOOL.**

   **AFTER THE SPOOL HAS BEEN ROTATED ONE AND ONE-HALF TURNS, AFTER**

   **WEBBING-TO-WEBBING CONTACT HAS BEEN MADE.**

   **ALSO IN THIS VIEW, PART OF**

   **THE RATCHET HANDLE IS BROKEN AWAY TO SHOW THE LOCKING BAR FULLY SEATED**

   **IN THE MATCHING LOCKING NOTCH (SPROCKET GEAR TEETH).**

   **SPECIAL NOTES:**

   **1. THE PURPOSE OF THE RATCHET DETAILS ON PAGE 42 AND THE**

      **DETAIL AND NOTES ON THIS PAGE ARE TO AUGMENT THE**

      **GUIDANCE SET FORTH WITHIN GENERAL NOTE "F" ON PAGE 2.**

   **2. THE REQUIREMENTS FOR 1/2 BUT NOT MORE THAN 1-1/2 WRAPS**

      **OF STRAP ON THE TAKE-UP SPOOL OF THE TENSIONING RATCHET,**

      **AS SPECIFIED WITHIN GENERAL NOTE "F" ON PAGE 2, ACTUALLY**

      **MEANS 1/2 TO 1-1/2 WRAPS OF DOUBLE WEBBING.**

      **ALSO, THE**

      **1/2 TO 1-1/2 WRAPS (TURNS) ARE TO BE ACCOMPLISHED ONLY**

      **AFTER ENOUGH WEBBING HAS BEEN WOUND ONTO THE SPOOL TO**

      **ACHIEVE A WEBBING-TO-WEBBING CONTACT CONFIGURATION,**

      **AS SHOWN IN THE "STEP 1" DETAIL ON PAGE 42.**

   **3. ONE METHOD THAT CAN BE USED TO ENSURE THAT THE 1/2 TO**

      **1-1/2 WRAPS ARE ACHIEVED, AFTER WEBBING-TO-WEBBING CONTACT HAS BEEN MADE**

      **IS TO PLACE A FIXED MARK (PAINT OR SIMILAR MATERIAL) ON THE SIDE OF**

      **THE RATCHETING HANDLE, WITH THE HANDLE IN ITS CLOSED**

      **(DOWN) POSITION, AND ANOTHER SHORT MATCHING MARK ON THE**

      **END OF THE SPOOL,**

      **AS SHOWN IN THE "STEP 2" DETAIL ON PAGE 42.**

      **AS THE SPOOL IS ROTATED TO TENSION A TIEDOWN STRAP ASSEMBLY,**

      **THE NUMBER OF WRAPS (TURNS) CAN BE**

      **DETERMINED VISUALLY BY COMPARING THE "MARK" LOCATION ON**

      **THE SPOOL TO THE "MARK" LOCATION ON THE RATCHETING**

      **HANDLE WITH THE HANDLE IN CLOSED POSITION.**

      **SEE THE "STEP 3" AND "STEP 4" DETAILS ON PAGE 42,**

      **AND "STEP 5" ABOVE.**

   **4. ANOTHER METHOD THAT CAN BE USED TO ENSURE THAT THE 1/2**

      **TO 1-1/2 WRAPS ARE ACHIEVED, AFTER WEBBING-TO-WEBBING**

      **CONTACT HAS BEEN MADE, IS TO COUNT THE AUDIBLE CLICKS**

      **MADE BY THE RATCHET ASSEMBLY AS A WEB STRAP ASSEMBLY IS**

      **BEING TENSIONED.**

      **THE RATCHET ASSEMBLY ON MOST WEB STRAP**

      **ASSEMBLIES HAS 11 TEETH ON THE GEARLIKE DEVICE ON EACH**

      **END OF THE TAKE-UP SPOOL; SOME OTHER STRAP ASSEMBLIES**

      **HAVE ONLY 9 TEETH. THEREFORE, AFTER INITIAL WEBBING-TO-**

      **WEBBING CONTACT HAS BEEN MADE, ROTATE (TURN) THE SPOOL**

      **THROUGH A MINIMUM OF 6 TO A MAXIMUM OF 18 CLICKS (1/2 TO**

      **1-1/2 WRAPS) WHEN THE GEAR HAS 11 TEETH, AND ROTATE**

      **(TURN) THE SPOOL THROUGH A MINIMUM OF 5 TO A MAXIMUM OF**

      **13 CLICKS (1/2 TO 1-1/2 WRAPS) IF THE GEAR HAS 9 TEETH.**

      **(CONTINUED AT RIGHT)"**
PART 3

TEST PROCEDURES

A. These test procedures are extracted from TP-91-01, Transportability Testing Procedures, July 1991, for validating tactical vehicles and outloading procedures used for shipping munitions by intermodal freight containers, commercial or tactical truck, or trailer or railcar.

B. The test load was 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 EPFs used in these tests were inspected to ensure their adequacy for munitions transport. Items used to build the load were inert (nonexplosive). 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 set of load configurations are as follows:

1. Rail Impact - COFC (Test Method No. 1).
2. Rail Impact - TOFC (Test Method No. 1).
3. Hazard Course (Test Method No. 2).
4. Road Trip (test Method No. 3).
5. Hazard Course (Test Method No. 2).
6. Washboard Course (Test Method No. 6).
7. Shipboard Transportation Simulator (STS) (Test Method No. 4).
   Rail Impact - PLS TOFC (Test Method No. 1).
   Rail Impact - PLS on flatcar (Test Method No. 1).
8. Hazard Course (Test Method No. 2).
9. Road Trip (Test Method No. 3).
10. Hazard Course (Test Method No. 2).
11. Washboard Course (Test Method No. 6).

D. The test methods are as follows:

1. Test Method No. 1 (Rail Impact Test). The EPF was loaded on a COFC railcar, a container chassis secured to a stanchion on a TOFC railcar, the PLS truck secured to a flatcar, and the PLS trailer secured to a 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. 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).

2. Test Method No. 2 (Hazard Course). This step required the loaded EPF to be transported over the 200-foot-long segment of concrete-paved road which consisted of two series of railroad ties projecting 6 inches above the level of the road surface. The loaded EPF traversed this course two times.
MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Enhanced Palletized Flatrack (EPF) Transportability Testing on the Palletized Loading System (PLS) Truck/Trailer

1. Enclosed is the U.S. Army Defense Ammunition Center and School (USADACS) Report No. 94-05.

2. The POC is Mr. A. C. McIntosh, SMCAC-DEV, DSN 585-8989, commercial (815) 273-8989.

FOR THE DIRECTOR:

Encl as

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(CONT)
SMCAC-DEV
SUBJECT: Enhanced Palletized Flatrack (EPF) Transportability Testing on the Palletized Loading System (PLS) Truck/Trailer

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Senior Inspector
Association of American Railroads/Bureau of Explosives, 309 North Douglas, Arlington Heights, IL 60004
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
3. Test Method No. 3 (Road Trip). The loaded EPF was transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete, or asphalt. The test route included curves, corners, railroad crossings, cattle guards, and stops and starts. The EPF traveled at the maximum speed for the particular road being traversed, except as limited by legal restrictions. Upon completion of the 30-mile road trip, the loaded EPF was subjected to three full airbrake stops while traveling in the forward direction and one in the reverse direction. The first three stops were at 5, 10, and 15 mph, while the stop in the reverse direction was approximately 5 mph.

4. Test Method No. 4 (Shipboard Transportation Simulator [STS]). The EPF was positioned onto the STS and securely locked in place using the cam lock at each ISO corner fitting. The STS started oscillation at an angle of 30 degrees plus or minus 2 degrees, either side of center at a frequency of 2 cycles-per-minute (cpm) (30 seconds plus or minus 2 seconds total roll period). This frequency was observed for apparent defects that could cause a safety hazard. The frequency of oscillation was increased to 4 cpm (15 seconds plus or minus one second roll period) and the apparatus operated for 2 hours. If inspection of the load does not indicate an impending failure, the frequency of oscillation is increased to 5 cpm (12 seconds plus or minus 1 second-cycle-time) and the apparatus operated for 4 hours. The operation does not have to be continuous; however, no change or adjustments to the load or load restraints was permitted at any time during the test. After being set in place, the EPF was not removed from the STS until the test was completed.

5. Test Method No. 6 (Washboard Course). The EPF was driven over the washboard course (see Figure 2) at a speed which produced the most violent response in the EPF.
FIGURE 2
PART 4

TEST RESULTS
TEST NO. 1
RAIL IMPACT DATA

Test No.: 1  
Date: 15-16 November 1993

Specimen Loads: Enhanced Palletized Flatracks (EPFs) with 155MM Separate Loading Projectiles (SLPs) and 120MM tank ammunition on metal pallets on a Container-on-flatcar (COFC) railcar.

Flatcar No.: TTWX 975424  
Lt. Wt.: 73,000

EPF No. 1  
Wt.: 7,500

Lading, 155MM SLPs  
Wt.: 28,000

EPF No. 2  
Wt.: 7,500

Lading, 120MM Tank Ammunition on Metal Pallets  
Wt.: 24,000

Total Specimen Wt.: 140,000

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

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120MM</td>
<td>4.34</td>
<td>No load movement.</td>
</tr>
<tr>
<td>2</td>
<td>120MM</td>
<td>6.52</td>
<td>No load movement.</td>
</tr>
<tr>
<td>3</td>
<td>120MM</td>
<td>8.93</td>
<td>155MM SLPs moved 3/4-inch from end wall opposite impact. 120MM metal pallets were 1-1/2 inches from end wall at the top of the pallet and 1/2-inch at the bottom of the pallet.</td>
</tr>
<tr>
<td>4</td>
<td>155MM</td>
<td>9.38</td>
<td>Both 155MM SLPs and 120MM metal pallets displaced the same distances to the opposite end of the respective flatracks after impact.</td>
</tr>
</tbody>
</table>

During impact, it was observed that the top of the EPF end walls displaced approximately two to three inches in the direction of impact. No permanent deformation was observed in the flatrack or load after COFC rail impact testing.

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Lateral Acceleration
Gs x 1,000

Time of Sample
Seconds x 1,000

Long Acceleration
Gs x 1,000

Time of Sample
Seconds x 1,000

Vert. Acceleration
Flatrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Flatrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000

**Time of Sample**

Seconds x 1,0000


**Time of Sample**

Seconds x 1,0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

**Vertical Acceleration**

- Time of Sample
- Seconds X 1.0000


**Longitudinal Acceleration**

- Time of Sample
- Seconds X 1.0000

Time of Sample
Seconds X 1.0000

Vertical Acceleration
Flatrack Deck
G's X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Flatrack Deck
G's X 1.0000

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000


Lateral Acceleration
Top of Flatrack Gs X 1.0000

Time of Sample
Seconds X 1.0000


Long. Acceleration
Top of Flatrack Gs X 1.0000

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000
TEST NO. 2
RAIL IMPACT DATA

Test No.: 2  
Date: 16 November 1993

Specimen Loads: EPF with 155MM SLPs and 120MM Tank Ammunition on Metal Pallets on a TOFC railcar.

Flatcar No.: TTWX 975424  
Lt. Wt.: 73,000

Trailer Chassis No.: ISCZ 164587  
Wt.: 6,540

EPF No. 1  
Wt.: 7,500

Lading, 120MM Tank Ammunition on Metal Pallets  
Wt.: 24,000

Trailer Chassis No.: 5394  
Wt.: 6,500

EPF No. 2  
Wt.: 7,500

Lading, 155MM SLPs  
Wt.: 28,000

Total Specimen Wt.: 157,040

Buffer Car (five cars) Wt: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear</td>
<td>4.49</td>
<td>120MM load - 2-inch gap at top of pallet and end wall, 1-inch gap at pallet base and end wall. 155MM load - 3/4-inch uniform gap top to bottom to EPF end wall.</td>
</tr>
<tr>
<td>2</td>
<td>Rear</td>
<td>6.36</td>
<td>No change in either load.</td>
</tr>
<tr>
<td>3</td>
<td>Rear</td>
<td>8.73</td>
<td>No change in either load.</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>8.82</td>
<td>Load shifted on both pallets: 120MM load - 2-inch gap at top of pallet and end wall, 1-inch gap at pallet base and end wall. 155MM load - 3/4-inch uniform gap top to bottom to EPF end wall.</td>
</tr>
</tbody>
</table>
During impact, it was observed that the top of the EPF end walls displaced approximately two to three inches in the direction of impact. No permanent deformation was observed in the EPF or load after TOFC rail impact testing.

Vert. Acceleration
Top of Flattrack
G's x 1.0000

Time of Sample
Seconds x 1.0000


Lateral Acceleration
Top of Flattrack
G's x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000

Time of Sample
Seconds x 1.0000

Lateral Acceleration
Top of Flatrack
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Long. Acceleration
Top of Flatrack
Gs x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

**Lateral Acceleration**

**Flatrack Deck**

Go x 1.0000

Time of Sample

Seconds X 1.0000


**Long. Acceleration**

**Flatrack Deck**

Go x 1.0000

Time of Sample

Seconds X 1.0000

Vert. Acceleration Center Still Gs X 1.0000

Time of Sample
Seconds X 1.0000


Long. Acceleration Center Still Gs X 1.0000

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

### Long. Acceleration
Top of Flatrack
Gs x 1.0000

Time of Sample
Seconds x 1.0000


### Vert. Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatracks, Impact 4: 8.82MPH Nov 16 14:24:34 1993
R.I. of PLS Flattracks, Impact 4: 8.82MPH Nov 16 14:24:34 1993

Lateral Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Long. Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000
R.I. of PLS Flatracks, Impact 4: 8.82MPH Nov 16 14:24:34 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Flatracks, Impact 4: 8.82MPH Nov 16 14:24:34 1993

Time of Sample
Seconds X 1.0000

Vert. Acceleration
Center Still
Gs x 1.0000

Time of Sample
Seconds x 1.0000


Long. Acceleration
Center Still
Gs x 1.0000

Time of Sample
Seconds x 1.0000
TEST NO. 3
ROAD TEST DATA

Test No.: 3  Date: 17-18 November 1993

Specimen Load: EPF with 155MM SLPs on a container chassis.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.56 SEC 5.2 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 6.18 SEC 5.3 MPH

REMARKS: No damage to EPF or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 6.68 SEC 5.1 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.55 SEC 5.0 MPH

REMARKS: No damage to EPF or load movement.

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 6.20 SEC 5.5 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 6.18 SEC 5.3 MPH

REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 6.56 SEC 5.2 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 6.06 SEC 5.4 MPH

REMARKS: No damage or load movement.

WASHBOARD COURSE: No observed damage or load movement.

SHIPBOARD TRANSPORTATION SIMULATOR: No damage or load movement.
TEST NO. 4
ROAD TEST DATA

Test No.: 4  
Date: 17-22 November 1993

Specimen Load: EPF with 120MM PA116 metal pallets on a container chassis.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.32 SEC  5.14 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 6.21 SEC  5.27 MPH

REMARKS: Metal pallet skids deformed when contact was made with the raised EPF side rails.

PASS 2-A OVER FIRST SERIES OF TIES: 6.15 SEC  5.54 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 5.82 SEC  5.62 MPH

REMARKS: Metal pallet skids deformed when contact was made with the raised EPF side rails.

30-MILE ROAD TEST: No additional damage.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 6.33 SEC  5.38 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 6.03 SEC  5.43 MPH

REMARKS: Continuing deformation of pallet skids.

PASS 4-A OVER FIRST SERIES OF TIES: 5.97 SEC  5.71 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 5.15 SEC  6.35 MPH

REMARKS: Continuing deformation of pallet skids.

WASHBOARD COURSE: Drive-on end wall ramp locking pins became disengaged.

SHIPBOARD TRANSPORTATION SIMULATOR: No additional damage or loose pins.
DETAILS OF FAILURE

During road hazard course testing, the EPF loaded with 120MM tank ammunition metal pallets caused deformation of the pallet skids. The pallets are 40 by 44 inches and loaded laterally along the 44-inch side. This loading configuration allows a maximum payload of 10 pallets on the EPF. If the pallets were oriented with their 40-inch dimension in the lateral direction, only 8 pallets could be configured on the EPF floor area.

The outer end of the pallet skids rested on the EPF rail. The inner end of the pallet skid sloped slightly downward making contact at the centerline of the EPF deck. The 120MM tank ammunition pallet skids were approximately 1/2-inch above the EPF deck at the outer rail with minimal or no support until the other end of the skid touched the deck at the center of the EPF. After traversing the road hazard course, the pallet skids were in complete contact with the recessed deck from the center of the EPF to the outer rail. As a result of the deformation of the pallet skids, the load loosened to a point where the securement would yield in the transportation environment and possibly damage the load.

Since there are many ammunition loads that are unitized on 44-inch to 48-inch width pallets, the deck should uniformly support the cargo loaded onto it. Loads that stretch from rail-to-rail will actually bridge the recessed deck so that the outside rails will carry most of the load. For this reason, it is desirable to have the EPF deck at the same elevation as the side rails. The recessed deck is unacceptable for transporting ammunition.

At the conclusion of road transportation testing it was observed that the ramp locking/hinge pins on the right side of the rack had become disengaged. Both ratchet assemblies slid toward the center of the of the EPF. It appeared that the locking assembly became disengaged during the transportation cycle which allowed the pin assemblies to retract.
TEST NO. 5
RAIL IMPACT DATA

Test No.: 5  Date: 23 November 1993

Specimen Load: PLS trailer with an EPF loaded with 155MM SLPs.

Flatcar No.: EJ&E 6099  Lt. Wt.: 56,200

PLS Trailer  Wt.: 13,240

EPF No. 1  Wt.: 7,500

Lading, 155MM SLPs  Wt.: 28,000

Total Specimen Wt.: 104,940

Buffer Car (five cars) Wt: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forward</td>
<td>3.91</td>
<td>1-inch gap at rear of EPF.</td>
</tr>
<tr>
<td>2</td>
<td>Forward</td>
<td>4.81</td>
<td>EPF rollers 1/2-inch from stops.</td>
</tr>
<tr>
<td>3</td>
<td>Forward</td>
<td>6.83</td>
<td>No change in load or rollers. Locking pin immovable - wedged diagonally.</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>8.62</td>
<td>Load shifted back 1/2-inch. Spacing equal at each end of load.</td>
</tr>
<tr>
<td>5</td>
<td>Rear</td>
<td>8.42</td>
<td>Front trailer wheels 2 inches from chocks. One cable loose. 1-inch gap at rear of EPF.</td>
</tr>
</tbody>
</table>
R.I. of PLS Flatrack, Impact 1: 3.91MPH Nov 23 09:29:49 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Flatrack, Impact 1: 3.91MPH Nov 23 09:29:49 1993

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatrack, Impact 1: 3.91MPH Nov 23 09:29:49 1993

Time of Sample
Seconds x 1.6666
R.I. of PLS Flatrack, Impact 1: 3.91 MPH Nov 23 09:29:49 1993

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 1: 3.91 MPH Nov 23 09:29:49 1993

Time of Sample
Seconds x 1.0000
R.I. of PLS Flatrack, Impact 1: 3.91MPH Nov 23 09:29:49 1993

Vert. Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 1: 3.91MPH Nov 23 09:29:49 1993

Lateral Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000
R.I. of PLS Flatrack, Impact 1: 3.91MPH Nov 23 09:29:49 1993

Long. Acceleration Flatrack Deck Gs x 1.0000

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 1: 3.91MPH Nov 23 09:29:49 1993

Vert. Acceleration Center Stll Gs x 1.0000

Time of Sample
Seconds x 1.0000

Lateral Acceleration
G's X 1.0000

Time of Sample
Seconds X 1.0000


Long Acceleration
G's X 1.0000

Time of Sample
Seconds X 1.0000

Vert. Acceleration
Top of Load
Gs X 1,0000

Time of Sample
Seconds X 1,0000

Lateral Acceleration
Top of Load
Gs X 1,0000

Time of Sample
Seconds X 1,0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Vert. Acceleration
Top of Flatrack
Gs × 1.0000

Time of Sample
Seconds × 1.0000


Lateral Acceleration
Top of Flatrack
Gs × 1.0000

Time of Sample
Seconds × 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000
R.I. of PLS Flatrack, Impact 4: 8.52MPH Nov 23 09:58:57 1993

![Graph of Vertical Acceleration](image1)

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 4: 8.52MPH Nov 23 09:58:57 1993

![Graph of Lateral Acceleration](image2)

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 4: 8.52MPH Nov 23 09:58:57 1993

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds x 1.0000
R.I. of PLS Flatrack, Impact 4: 0.52MPH Nov 23 09:58:57 1993

Vert. Acceleration
Center Still Gs x 1.0000

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 4: 0.52MPH Nov 23 09:58:57 1993

Long. Acceleration
Center Still Gs x 1.0000

Time of Sample
Seconds x 1.0000

Vert. Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Lateral Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatrack, Impact 5: 0.43MPH Nov 23 10:25:16 1993

Time of Sample
Seconds x 1.8666
TEST NO. 6
RAIL IMPACT DATA

Test No.: 6  
Date: 23 November 1993

Specimen Load: PLS trailer with an EPF loaded with 120MM tank ammunition on metal pallets.

Flatcar No.: EJ&E 6099  
Lt. Wt.: 56,200

PLS Trailer  
Wt.: 13,240

EPF No. 2  
Wt.: 7,500

Lading, 120MM Tank Ammunition on Metal Pallets  
Wt.: 24,000

Total Specimen Wt.: 100,940

Buffer Car (five cars) Wt: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forward</td>
<td>5.68</td>
<td>1-1/2-inch gap at pallet tops at rear and at center gate.</td>
</tr>
<tr>
<td>2</td>
<td>Forward</td>
<td>6.36</td>
<td>1/2-inch gap at rear of EPF and 1-inch gap at front and back of center gate.</td>
</tr>
<tr>
<td>3</td>
<td>Forward</td>
<td>8.62</td>
<td>1-1/2-inch gap at end wall of EPF. No trailer movement.</td>
</tr>
<tr>
<td>4</td>
<td>Rear</td>
<td>8.52</td>
<td>1-1/2-inch gap at rear end wall (complete load shifted to opposite end of EPF).</td>
</tr>
</tbody>
</table>

- Time of Sample
  Seconds X 1.0000


- Time of Sample
  Seconds X 1.0000

Vertical Acceleration
Flatrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Flatrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatrack, Impact 1: 5.68MPH Nov 23 13:30:56 1993

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 1: 5.68MPH Nov 23 13:30:56 1993

Time of Sample
Seconds x 1.0000
R.I. of PLS Flatrack, Impact 1: 5.60 MPH Nov 23 13:38:50 1993

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000

Lateral Acceleration
Top of Flatrack
G's x 1.0000

Time of Sample
Seconds x 1.0000


Long. Acceleration
Top of Flatrack
G's x 1.0000

Time of Sample
Seconds x 1.0000
Time of Sample
Seconds x 1.0000

**Vertical Acceleration**

<table>
<thead>
<tr>
<th>Time of Sample</th>
<th>Seconds X 1.0000</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.83</td>
<td>-0.980</td>
</tr>
<tr>
<td>5.07</td>
<td>-0.380</td>
</tr>
<tr>
<td>5.31</td>
<td>-0.980</td>
</tr>
<tr>
<td>5.55</td>
<td>-1.58</td>
</tr>
<tr>
<td>5.79</td>
<td>-0.980</td>
</tr>
</tbody>
</table>

**Longitudinal Acceleration**

<table>
<thead>
<tr>
<th>Time of Sample</th>
<th>Seconds X 1.0000</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.83</td>
<td>3.000</td>
</tr>
<tr>
<td>5.07</td>
<td>2.000</td>
</tr>
<tr>
<td>5.31</td>
<td>1.000</td>
</tr>
<tr>
<td>5.55</td>
<td>-0.600</td>
</tr>
<tr>
<td>5.79</td>
<td>-1.800</td>
</tr>
</tbody>
</table>
R.I. of PLS Flatrack, Impact 3: 8.72MPH Nov 23 13:44:00 1993

Vert. Acceleration
Top of Flatrack
Gs x 1,000

Time of Sample
Seconds x 1,000

R.I. of PLS Flatrack, Impact 3: 8.72MPH Nov 23 13:44:00 1993

Lateral Acceleration
Top of Flatrack
Gs x 1,000

Time of Sample
Seconds x 1,000

Vertical Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000


Lateral Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000
Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Vert. Acceleration
Gm X 1,00000

Time of Sample
Seconds X 1.0000


Lam. Acceleration
Gm X 1,00000

Time of Sample
Seconds X 1.0000
TEST NO. 7
RAIL IMPACT DATA

Test No.: 7  Date: 24 November 1993

Specimen Load: PLS truck with an EPF loaded with 155MM SLPs.

Flatcar No.: EJ&E 6001  Lt. Wt.: 57,200

PLS Truck  Wt.: 54,750

EPF No. 1  Wt.: 7,500

Lading, 155MM SLPs.  Wt.: 28,000

Total Specimen Wt.: 147,450

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

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear</td>
<td>4.66</td>
<td>Load shifted 1-inch to rear of EPF.</td>
</tr>
<tr>
<td>2</td>
<td>Rear</td>
<td>7.08</td>
<td>No change.</td>
</tr>
<tr>
<td>3</td>
<td>Rear</td>
<td>8.66</td>
<td>No change.</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>8.33</td>
<td>Load shifted 1-inch forward on EPF.</td>
</tr>
</tbody>
</table>

Lateral Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000


Long. Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000

![Graph of Vert. Acceleration](image)

Time of Sample
Seconds x 1.0000


![Graph of Lateral Acceleration](image)

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Vert. Acceleration
Gs X 1.0000

Time of Sample
Seconds x 1.0000

Long. Acceleration
Gs X 1.0000

Time of Sample
Seconds x 1.0000

Vert. Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Lateral Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds X 1.0000

R.I. of PLS Truck, Impact 4: 8.33 MPH  Nov 24 14:06:38 1993

Time of Sample
Seconds X 1.0000
R.I. of PLS Truck, Impact 4: 8.33 MPH  Nov 24 14:06:38 1993

Vertical Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000

R.I. of PLS Truck, Impact 4: 8.33 MPH  Nov 24 14:06:38 1993

Lateral Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000
RAIL IMPACT DATA

Test No.: 8  
Date: 30 November 1993

Specimen Load: PLS truck with an EPF loaded with 120MM tank ammunition on metal pallets.

Flatcar No.: EJ&E 6001  
Lt. Wt.: 57,200

PLS Truck  
Wt.: 54,750

EPF No. 2  
Wt.: 7,500

Lading, 120MM Tank Ammunition on Metal Pallets  
Wt.: 24,000

Total Specimen Wt.: 143,450

Buffer Car (five cars) Wt: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear</td>
<td>4.29</td>
<td>Bail bar end wall not vertical in relation to load. Pulled forward by hook. 2-inch gap in pallets at top and 1-inch gap at bottom.</td>
</tr>
<tr>
<td>2</td>
<td>Rear</td>
<td>6.36</td>
<td>Gaps unchanged. Metal banding on front of load angled approximately 5 degrees to the rear of the EPF.</td>
</tr>
<tr>
<td>3</td>
<td>Rear</td>
<td>8.33</td>
<td>Load rebounded. 1-inch gap at rear and 1/2-inch gap at front. Metal banding is straight.</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>8.82</td>
<td>Load shifted 1/2-inch toward the front. No damage observed to load, vehicle, or vehicle tie-downs.</td>
</tr>
</tbody>
</table>
R.I. of PLS Truck, Impact 1: 4.29 MPH  Nov 30 10:03:12 1993

Time of Sample
Seconds x 1.0000

R.I. of PLS Truck, Impact 1: 4.29 MPH  Nov 30 10:03:12 1993

Time of Sample
Seconds x 1.0000
R.I. of PLS Truck, Impact 1: 4.29 MPH  Nov 30 18:03:12 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Truck, Impact 1: 4.29 MPH  Nov 30 18:03:12 1993

Time of Sample
Seconds X 1.0000
R.I. of PLS Truck, Impact 1: 4.29 MPH  Nov 30 18:03:12 1993

Vert. Acceleration
Flatrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000

R.I. of PLS Truck, Impact 1: 4.29 MPH  Nov 30 18:03:12 1993

Lateral Acceleration
Flatrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000

*6.29*
R.I. of PLS Truck, Impact 1: 4.29 MPH  Nov 10 10:03:12 1993

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000
R.I. of PLS Truck, Impact 2: 6.36 MPH
Nov 30 10:09:24 1993

Lateral Acceleration
Top of Flatrack
Gs x 1.0000

Time of Sample
Seconds x 1.0000

R.I. of PLS Truck, Impact 2: 6.36 MPH
Nov 30 10:09:24 1993

Long. Acceleration
Top of Flatrack
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Vert. Acceleration
Center Stull
Gs x 1.0000

Time of Sample
Seconds x 1.0000


Long. Acceleration
Center Stull
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds x 1,0000


Time of Sample
Seconds x 1,0000

Vert. Acceleration
Flattack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Flattack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000

R.I. of PLS Truck, Impact 4: 8.82 MPH  Nov 30 16:49:03 1993

Time of Sample
Seconds X 1.0000

Lateral Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Long. Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000
R.I. of PLS Truck, Impact 4: 0.02 MPH   Nov 30 18:49:03 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Truck, Impact 4: 0.02 MPH   Nov 30 18:49:03 1993

Time of Sample
Seconds X 1.0000

Vert. Acceleration
Center Sill
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Long. Acceleration
Center Sill
Gs X 1.0000

Time of Sample
Seconds X 1.0000
ROAD TEST DATA

Test No.: 9  Date: 1 December 1993

Specimen Loads: EPF with 155MM SLPs loaded on the PLS trailer and an EPF with 120MM tank ammunition on metal pallets loaded on the PLS truck.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.56 SEC  5.2 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 6.34 SEC  5.4 MPH

REMARKS: No damage to the EPF or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 5.87 SEC  5.6 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.55 SEC  5.0 MPH

REMARKS: No damage to the EPF or load movement.

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 6.28 SEC  5.4 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 6.41 SEC  5.3 MPH

REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 6.46 SEC  5.3 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 6.05 SEC  5.4 MPH

REMARKS: No damage or load movement.

WASHBOARD COURSE: No observed damage or load movement.
TEST NO. 10
ROAD TEST DATA

Test No.: 10  
Date: 1 December 1993

Specimen Loads: EPF with 155MM SLPs loaded on the PLS truck and an EPF loaded with 120MM tank ammunition on metal pallets loaded on the PLS trailer.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.05 SEC 5.6 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 5.93 SEC 5.7 MPH
REMARKS: No damage to the EPF or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 6.34 SEC 5.2 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.46 SEC 5.1 MPH
REMARKS: No damage to the EPF or load movement.

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 5.87 SEC 5.8 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 5.25 SEC 6.5 MPH
REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 5.54 SEC 5.9 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 5.93 SEC 5.5 MPH
REMARKS: No damage or load movement.

WASHBOARD COURSE: No observed damage or load movement.
TEST NO. 11
RAIL IMPACT DATA

Test No.: 11                      Date: 6 December 1993

Specimen Loads: EPF with propelling charge containers on wooden pallets and Multiple Launch Rocket System (MLRS) pods on a COFC railcar.

Flatcar No.: TTWX 978622            Lt. Wt.: 73,000

EPF No. 1                          Wt.: 7,500
Lading, Propelling Charge Containers on Wooden Pallets  Wt.: 14,128
EPF No. 2                          Wt.: 7,500
Lading, Four MLRS Pods              Wt.: 22,000

Total Specimen Wt.: 124,128
Buffer Car (five cars) Wt: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forward*</td>
<td>4.55</td>
<td>No load movement.</td>
</tr>
<tr>
<td>2</td>
<td>Forward</td>
<td>6.52</td>
<td>No load movement.</td>
</tr>
<tr>
<td>3</td>
<td>Forward</td>
<td>8.92</td>
<td>Propelling charge container load compacted toward impact end with a 2-inch gap at the rear wall. MLRS pods had a 1/2-inch gap at the rear wall.</td>
</tr>
<tr>
<td>4</td>
<td>Rear</td>
<td>8.82</td>
<td>Propelling charge container load shifted back 2 inches. MLRS pods recovered 1/2-inch at the forward wall. The MLRS pod frame cut into the 4- by 4-foot blocking. Struts were pulling out.</td>
</tr>
</tbody>
</table>

* EPF bail bar impacted buffer cars first.

Vert. Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000
Vertical Acceleration

Flatrack Deck

Gs x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds × 1.0000


Time of Sample
Seconds × 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000
Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000


Lateral Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000


Long-Acceleration
Flatrack Deck
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Vert. Acceleration
Center Still Gs x 1.0000

Time of Sample
Seconds x 1.0000


Long. Acceleration
Center Still Gs x 1.0000

Time of Sample
Seconds x 1.0000

Vertical Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Top of Flatrack
Gs X 1.0000

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatracks, Impact 3: 0.93MPH Dec 06 10:50:44 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Flatracks, Impact 3: 0.93MPH Dec 06 10:50:44 1993

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Vert. Acceleration
Flatrack Deck
Gs x 1,0000

Time of Sample
Seconds X 1,0000


Lateral Acceleration
Flatrack Deck
Gs x 1,0000

Time of Sample
Seconds X 1,0000

Time of Sample
Seconds X 1.0000

R.I. of PLS Flatracks, Impact 4: 8.82MPH Dec 06 11:19:09 1993

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatracks, Impact 4: 8.82MPH Dec 06 11:19:09 1993

Time of Sample
Seconds X 1.6666

R.I. of PLS Flatracks, Impact 4: 8.82MPH Dec 06 11:19:09 1993

Time of Sample
Seconds X 1.6666
R.I. of PLS Flatracks, Impact 4: 0.82MPH Dec 06 11:19:09 1993

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatracks, Impact 4: 0.82MPH Dec 06 11:19:09 1993

Time of Sample
Seconds x 1.0000
RAIL IMPACT DATA

Test No.: 12
Specimen Load: EPF with MLRS pods on a TOFC railcar.

Flatcar No.: TTX 978622
Lt. Wt.: 73,000

Trailer Chassis No.: ISCT 164587
Wt.: 6,540

EPF No. 2
Wt.: 7,500

Lading, Four MLRS Pods
Wt.: 22,000

Trailer Chassis No.: 5394
Wt.: 6,500

EPF No. 1
Wt.: 7,500

Lading, Propelling Charge Containers on Wooden Pallets
Wt.: 14,128

Total Specimen Wt.: 137,168

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

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear</td>
<td>4.72</td>
<td>No load movement.</td>
</tr>
<tr>
<td>2</td>
<td>Rear</td>
<td>6.58</td>
<td>The 4- by 4-inch struts on the MLRS pods pulled up at the rear (impact end) of the load.</td>
</tr>
<tr>
<td>3</td>
<td>Rear</td>
<td>8.33</td>
<td>No change in struts from impact No. 2. The propelling charge containers compacted to yield a 2-inch gap at the forward (bail bar) end of the EPF.</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>8.72</td>
<td>MLRS had a 1/2-inch void at the rear EPF end wall. Propelling charge container pallets moved 2-inches from the rear end wall.</td>
</tr>
</tbody>
</table>
R.I. of PLS Flatracks, Impact 1: 4.72MPH Dec 06 14:44:45 1993

**Time of Sample**
Seconds × 1.0000

R.I. of PLS Flatracks, Impact 1: 4.72MPH Dec 06 14:44:45 1993

**Time of Sample**
Seconds × 1.0000
R.I. of PLS Flattracks, Impact 1: 4.72MPH Dec 06 14:44:45 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Flattracks, Impact 1: 4.72MPH Dec 06 14:44:45 1993

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatracks, Impact 1: 4.72MPH Dec 06 14:44:45 1993

![Graph of Vertical Acceleration](image1)

![Graph of Lateral Acceleration](image2)

Time of Sample
Seconds $\times 1.0000$

R.I. of PLS Flatracks, Impact 1: 4.72MPH Dec 06 14:44:45 1993
R.I. of PLS Flatracks, Impact 1: 4.72MPH Dec 86 14:44:45 1993

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Lateral Acceleration
Top of Flattrack Gs x 1.0000

Time of Sample
Seconds x 1.0000

Lateral Acceleration Top of Lead Gs x 1.0000

Time of Sample
Seconds x 1.0000


Long Acceleration Top of Lead Gs x 1.0000

Time of Sample
Seconds x 1.0000

Vert. Acceleration
Flattrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Flattrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds \( \times 1.0000 


Time of Sample
Seconds \( \times 1.0000 

...

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Vert. Acceleration
Top of Load
Gs X 1.0000

Time of Sample
Seconds X 1.0000


Lateral Acceleration
Top of Load
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.000e8


Time of Sample
Seconds x 1.000e8

**Lateral Acceleration**

<table>
<thead>
<tr>
<th>Flattrack Deck</th>
<th>Gs x 1.0000</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.45</td>
<td>-0.648</td>
</tr>
<tr>
<td>4.59</td>
<td>-0.648</td>
</tr>
<tr>
<td>4.93</td>
<td>-0.648</td>
</tr>
<tr>
<td>5.17</td>
<td>-0.648</td>
</tr>
<tr>
<td>5.41</td>
<td>-0.648</td>
</tr>
</tbody>
</table>

**Time of Sample**

Seconds x 1.0000


**Longitudinal Acceleration**

<table>
<thead>
<tr>
<th>Flattrack Deck</th>
<th>Gs x 1.0000</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.45</td>
<td>6.00</td>
</tr>
<tr>
<td>4.59</td>
<td>6.00</td>
</tr>
<tr>
<td>4.93</td>
<td>6.00</td>
</tr>
<tr>
<td>5.17</td>
<td>6.00</td>
</tr>
<tr>
<td>5.41</td>
<td>6.00</td>
</tr>
</tbody>
</table>

**Time of Sample**

Seconds x 1.0000

Vert. Acceleration
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Long. Acceleration
Gs X 1.0000

Time of Sample
Seconds X 1.0000
TEST NO. 13
ROAD TEST DATA

Test No.: 13  Date: 7-8 December 1993

Specimen Load: EPF with propelling charge containers on wooden pallets on a container chassis.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.09 SEC  5.6 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 6.31 SEC  5.3 MPH

REMARKS: No damage to the EPF or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 6.07 SEC  5.3 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.22 SEC  5.2 MPH

REMARKS: No damage to the EPF or load movement.

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 6.44 SEC  5.3 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 6.21 SEC  5.5 MPH

REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 6.41 SEC  5.1 MPH
PASS 4-B OVER SECOND SERIES OF TIES: .01 SEC  5.4 MPH

REMARKS: No damage or load movement.

WASHBOARD COURSE: No observed damage or load movement.

SHIPBOARD TRANSPORTATION SIMULATOR: No damage or load movement.
TEST NO. 14
ROAD TEST DATA

Test No.: 14  
Date: 7-9 December 1993

Specimen Load: EPF with MLRS pods on a container chassis.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.27 SEC  5.4 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 6.64 SEC  5.1 MPH

REMARKS: No damage to the EPF or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 6.07 SEC  5.3 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.45 SEC  5.1 MPH

REMARKS: No damage to the EPF or load movement.

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 6.19 SEC  5.5 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 6.23 SEC  5.5 MPH

REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 6.28 SEC  5.2 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 6.44 SEC  5.1 MPH

REMARKS: No damage or load movement.

WASHBOARD COURSE: No observed damage or load movement.

SHIPBOARD TRANSPORTATION SIMULATOR: No damage or load movement.
TEST NO. 15
# RAIL IMPACT DATA

Test No.: 15  
Date: 9 December 1993

Specimen Load: PLS trailer with an EPF loaded with MLRS pods.

<table>
<thead>
<tr>
<th>Flatcar No.: EJ&amp;E 6099</th>
<th>Lt. Wt.: 56,200</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLS Trailer</td>
<td>Wt.: 13,240</td>
</tr>
<tr>
<td>EPF No. 2</td>
<td>Wt.: 7,500</td>
</tr>
<tr>
<td>Lading, MLRS Pods</td>
<td>Wt.: 22,000</td>
</tr>
</tbody>
</table>

Total Specimen Wt.: 98,940

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

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forward</td>
<td>4.49</td>
<td>No load movement.</td>
</tr>
<tr>
<td>2</td>
<td>Forward</td>
<td>6.25</td>
<td>1/8-inch compression in 4- by 4-inch blocking from metal angle assembly on the bottom MLRS pods. The EPF shifted 1-inch from rear stops. The EPF retainer pin could not be removed.</td>
</tr>
<tr>
<td>3</td>
<td>Forward</td>
<td>8.82</td>
<td>No additional compression. Floorline blocking started to pull out of the floor.</td>
</tr>
<tr>
<td>4</td>
<td>Rear</td>
<td>8.93</td>
<td>The EPF shifted 1-inch to the starting loaded position. The retainer pin between the EPF and the trailer is removable.</td>
</tr>
</tbody>
</table>
R.I. of PLS Flatrack, Impact 1: 4.34MPH Dec 09 09:44:35 1993

Time of Sample
Seconds x 1.0000

Vert. Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000
R.I. of PLS Flatrack, Impact 1: 4.34MPH Dec 09 09:44:35 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Flatrack, Impact 1: 4.34MPH Dec 09 09:44:35 1993

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatrack, Impact 1: 4.34MPH  Dec 09 09:44:35 1993

Time of Sample
Seconds X 1.0000

R.I. of PLS Flatrack, Impact 1: 4.34MPH  Dec 09 09:44:35 1993

Time of Sample
Seconds X 1.0000

Vert. Acceleration
Top of Flatrack
Gs x 1.0000

Time of Sample
Seconds x 1.0000


Lateral Acceleration
Top of Flatrack
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds x 1.0000


Time of Sample
Seconds x 1.0000
R.I. of PLS Flatrack, Impact 4: 8.43MPH Dec 89 10:34:13 1993

Time of Sample
Seconds x 1.0000

R.I. of PLS Flatrack, Impact 4: 8.43MPH Dec 89 10:34:13 1993

Time of Sample
Seconds x 1.0000

Long. Acceleration
Top of Load
Gs X 1.0000

Time of Sample
Seconds X 1.0000

Vert. Acceleration
Flatrack Deck
Gs X 1.0000

Time of Sample
Seconds X 1.0000
R.I. of PLS Flatrack, Impact 4: 8.43 MPH Dec 09 10:34:13 1993

Vert. Acceleration
G x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds x 1.0000
TEST NO. 16
RAIL IMPACT DATA

Test No.: 16  
Date: 9 December 1993

Specimen Load: PLS trailer with an EPF loaded with propelling charge containers on wooden pallets.

Flatcar No.: EJ&E 6099  
Lt. Wt.: 56,200

PLS Trailer  
Wt.: 13,240

EPF No. 1  
Wt.: 7,500

Lading, 155MM Propelling Charge Containers  
Wt.: 14,128

Total Specimen Wt.: 91,068

Buffer Car (five cars) Wt: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forward</td>
<td>4.34</td>
<td>No load movement.</td>
</tr>
<tr>
<td>2</td>
<td>Forward</td>
<td>6.30</td>
<td>The EPF moved 1-inch from rear stops on trailer.</td>
</tr>
<tr>
<td>3</td>
<td>Forward</td>
<td>8.62</td>
<td>The load shifted 2 inches toward impact end of the EPF.</td>
</tr>
<tr>
<td>4</td>
<td>Rear</td>
<td>8.43</td>
<td>The load shifted 2 inches toward the rear of EPF. The EPF moved back to the stops on the trailer.</td>
</tr>
</tbody>
</table>
RAIL IMPACT DATA

Test No.: 17 Date: 13 December 1993

Specimen Load: PLS truck with an EPF loaded with propelling charge containers on wooden pallets.

Flatcar No.: EJ&E 6001 Lt. Wt.: 57,200
PLS Truck Wt.: 54,750
EPF No. 1 Wt.: 7,500
Lading, 155MM Propelling Charge Containers on Wooden Pallets Wt.: 14,128

Total Specimen Wt.: 133,578
Buffer Car (five cars) Wt.: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear</td>
<td>4.55</td>
<td>No load movement.</td>
</tr>
<tr>
<td>2</td>
<td>Rear</td>
<td>6.41</td>
<td>2-inch gap between the load and the EPF front end wall.</td>
</tr>
<tr>
<td>3</td>
<td>Rear</td>
<td>8.43</td>
<td>No change in gap between the load and the front end wall.</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>8.82</td>
<td>Longest cables on rear of PLS truck loosened after impact. No gap at the forward end wall and load. The load shifted forward and there was a 2-inch gap between the rear end wall and the pallets.</td>
</tr>
</tbody>
</table>

Time of Sample
Seconds X 1.6066

Vert. Acceleration
Top of Load
Gs X 1.0000

Time of Sample
Seconds X 1.6066
R.I. of PLS Truck, Impact 1: 4.29MPH
Dec 13 09:59:52 1993

Time of Sample
Seconds x 1.0000

R.I. of PLS Truck, Impact 1: 4.29MPH
Dec 13 09:59:52 1993

Time of Sample
Seconds x 1.0000

Time of Sample

Seconds x 1.0000


Time of Sample

Seconds x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Vert. Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000


Lateral Acceleration
Top of Load
Gs x 1.0000

Time of Sample
Seconds x 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000

Time of Sample
Seconds X 1.0000


Time of Sample
Seconds X 1.0000
TEST NO. 18
RAIL IMPACT DATA

Test No.: 18  Date: 13 December 1993

Specimen Load: PLS truck with an EPF loaded with MLRS pods.

Flatcar No.: EJ&E 6001  Lt. Wt.: 57,200

PLS Truck  Wt.: 54,750

EPF No. 2  Wt.: 7,500

Lading, MLRS Pods  Wt.: 22,000

Total Specimen Wt.: 141,450

Buffer Car (five cars) Wt: 250,000

<table>
<thead>
<tr>
<th>Impact</th>
<th>End Struck</th>
<th>Velocity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rear</td>
<td>4.29</td>
<td>PLS truck cables remained tight. No load movement.</td>
</tr>
<tr>
<td>2</td>
<td>Rear</td>
<td>6.85</td>
<td>PLS truck cables remained tight. A 3/4-inch gap between the 4- by 4-inch dunnage and MLRS pods developed at the front of the load.</td>
</tr>
<tr>
<td>3</td>
<td>Rear</td>
<td>8.15</td>
<td>No change in dunnage and the MLRS pods at the front of the load. Long cables on the rear of the truck were loose.</td>
</tr>
<tr>
<td>4</td>
<td>Forward</td>
<td>8.24</td>
<td>The longest and middle set of tiedown cables loosened at the front of the PLS truck. No deformation observed in the front tiedown fittings on the truck. The MLRS frame cut approximately 1/8-inch into the wood blocking.</td>
</tr>
</tbody>
</table>
TEST NO. 19
ROAD TEST DATA

Test No.: 19  Date: 14 December 1993

Specimen Loads: EPF with MLRS pods loaded on the PLS trailer and an EPF with 155MM propelling charge containers on wooden pallets loaded on the PLS truck.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.50 SEC  5.2 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 6.34 SEC  5.4 MPH

REMARKS: No damage to the EPF or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 6.33 SEC  5.2 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.43 SEC  5.1 MPH

REMARKS: No damage to the EPF or load movement.

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 6.36 SEC  5.4 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 6.27 SEC  5.4 MPH

REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 6.61 SEC  5.0 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 6.01 SEC  5.4 MPH

REMARKS: No damage or load movement.

WASHBOARD COURSE: No observed damage or load movement.
TEST NO. 20
ROAD TEST DATA

Test No.: 20  
Date: 14 December 1993

Specimen Loads: EPF with MLRS pods loaded on the PLS truck and an EPF with 155MM propelling charge containers on wooden pallets loaded on the PLS trailer.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 6.65 SEC 5.1 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 6.10 SEC 5.4 MPH

REMARKS: No damage to the EPF or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 6.56 SEC 5.2 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.77 SEC 4.8 MPH

REMARKS: No damage to the EPF or load movement.

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since this load was previously rail impact tested.

PASS 3-A OVER FIRST SERIES OF TIES: 6.43 SEC 5.3 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 6.99 SEC 4.7 MPH

REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 6.12 SEC 5.3 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 6.87 SEC 4.8 MPH

REMARKS: No damage or load movement.

WASHBOARD COURSE: No observed damage or load movement.
Sideboard Evaluation

1. After transportability testing, an attempt was made to install the sideboard kit on the EPF loaded with 155MM propelling charge containers on wooden pallets. The load was secured to the EPF with 2-inch metal banding. The load was symmetrical on the EPF deck with approximately 2 inches of space between the inside of the EPF side rail and the load pallet skids. The 2-inch metal banding was secured to the tiedown fittings on the outside of the EPF side rail.

2. The first sideboard, positioned at the bail bar end on the right side of the EPF, distorted as the lower edge of the sideboard was engaged in the lock mounted on the end wall and the sideboard post was inserted into the receptacle mounted on the EPF side rail. The sideboard could not be fully pushed down into the mounts due to the interference between the plywood siding and the 2-inch metal band used to secure the load between the end wall and the sideboard mounting post receptacle. A mallet was used to drive the post into full engagement causing excessive distortion of the side wall.

3. An attempt was made to install a second sideboard with less success. This sideboard interfered with two metal bands used to secure the 155MM propelling charge container load. A mallet was used to drive the post into the mount without ever being able to fully seat the post. Again, distortion was observed in the sideboard due to interference from the banding.

4. As a check, a web strap was placed over the load and secured so that the ratchet assembly was on the right side of the EPF. A third sideboard was attempted to be installed without success. The plywood sideboard interfered with the web strap ratchet and prevented it from
being fully seated in the mount on the EPF side rail. The sideboard prevented access to the ratchet for tightening or loosening of the strap.

5. These problems of interference between the sideboards and securements of the load occurred with a load that had several inches of clearance between the inside of the EPF side rail and the pallet base. Other loads, such as the 120MM tank ammunition metal pallets, extend from the outside of the EPF side rail to the outside of the opposite side. These loads are secured with 2-inch metal banding attached to the tiedown fittings on the outside of the EPF side rail. With these loads, sideboards cannot be fitted to the EPF because there is no space left on the EPF for them to be mounted.

6. The sideboard mounting post design does not facilitate easy assembly to the EPF. The single post in the center of the sideboard allows the sideboard a large degree of position variation making it difficult to assemble along the side of the EPF and requires the installer to juggle it into position with the end post installed to the previous sideboard. Also, with the outside posts installed in the EPF side rail mounts, there is a tendency for the sideboards to bind between these posts if they are not held level to the EPF deck. To facilitate easier assembly, a sideboard should be constructed with a minimum of a post at each end of the sideboard section. This design change will provide the installer easier alignment and reduce the number of pieces required to be installed when using sideboards.
PART 5

PHOTOGRAPHS
Photo No. SCN-94-113-1399. This photo shows an EPF mounted on the PLS trailer being positioned for a rail impact. The EPF is secured to the trailer with steel pins. The trailer is secured to the flatcar with 5/8-inch wire rope. Note the chain holding the trailer tongue to the flatcar deck.
Photo No. SCN-94-113-1401. This photo shows an EPF mounted on the PLS trailer. The trailer is cabled to the flatcar. The locomotive is preparing to accelerate the loaded railcar to a speed suitable for rail impacting. The test load consists of PA116 120mm tank ammunition container metal pallets.
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. SCN-94-113-1402. This photo shows the EPF mounted on the PLS trailer. The trailer is cabled to the flatcar. The locomotive is preparing to accelerate the loaded railcar to a speed suitable for rail impacting. The test load consists of PA116 120mm tank ammunition container metal pallets.
Photo No. SCN-94-113-1418. This photo shows the EPF mounted on the PLS truck. The EPF is secured to the truck with steel pins. The pins are required for rail transportation only. The truck is secured to the railcar with six 5/8-inch wire rope cables. The ammunition load consists of four MLRS pods.
Photo No. SCN-94-113-1404. This photo shows the EPF with a load of 155mm SLPs. The flatrack is secured to the truck with steel pins. The pins are used only when a flatrack is being transported on the truck via rail. The truck is secured to the flatcar with six 5/8-inch wire ropes at each end.
Photo No. SCN-94-113-1407. This photo shows the EPF with a load of PA116 120mm tank ammunition container metal pallets. The flatrack is secured to the truck with steel pins. The pins are used only when a flatrack is being transported on the truck via rail. The truck is secured to the flatcar with six 5/8-inch diameter wire ropes at each end.
Photo No. SCN-94-113-1412. The second part of the testing sequence included rail impact of the EPF mounted on a chassis which was mounted on a TOFC railcar. The following loads were being tested: a load of 155mm propelling charge containers and MLRS pods.
Photo No. SCN-94-113-1413. Phase three of testing included rail impact of each test load on the PLS trailer. The EPF is pinned to the trailer during rail transportation. The trailer is tied to the flatcar with two 5/8-inch wire ropes at each end. This load consists of MLRS pods.
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. SCN-94-113-1416. Phase three of testing included rail impact of a 1000 lb test load on the PLS trailer. The EPF is pinned to the trailer during rail transportation. The trailer is tied to the flatcar with two 5/8-inch wire ropes at each end. This load consists of 155mm propelling charge containers.
<table>
<thead>
<tr>
<th>U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo No. A0317-SPN-94-020-407. This photo shows the first two EPFs mounted on a COFC railcar. The first load consists of 155mm SLPs and the second consists of PA116 120mm tank ammunition container metal pallets.</td>
</tr>
</tbody>
</table>
LOADING AND TIEDOWN PROCEDURES
FOR CONVENTIONAL AMMUNITION ITEMS
LOADED ON THE PALLETIZED LOADING
SYSTEM (PLS) A-FRAME FLATTRACK
(M1077) AND/OR THE ISO COMPATIBLE
PLS FLATTRACK (IPF) (M1)

INDEX

ITEM

GENERAL NOTES AND MATERIAL SPECIFICATIONS
ITEMIZED INDEX
PALLETTIZED UNITS (ONE HIGH)
COMBAT CONFIGURED LOADS
PALLETTIZED UNITS (TWO HIGH)
LOOSE BOXES AND/OR CONTAINERS

PAGE(S)

2
3
4-25
6-15.20-23
26-31
32-41

U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY ARMAMENT, MUNITIONS AND
CHEMICAL COMMAND

B. LEONARD

J. SIMONS

APPROVED BY ORDER OF COMMANDING GENERAL, U.S.
ARMY MATERIEL COMMAND

W. SMITH

W. EINSTEIN

FEBRUARY 1994

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

CLASS

19

DIVISION

48

DRAWING

4903

FILE

CA1704

PROJECT CAP-TV 4-93

DO NOT SCALE
GENERAL NOTES

A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR-740-1.

B. THIS DRAWING COVERS PROCEDURES APPLICABLE TO THE TRANSPORT OF CONVENTIONAL AMMUNITION ITEMS, LOADED ON THE PALLETTIZED LOADING SYSTEM (PLS) M1077 A-FRAME AND/OR M1 150 COMPATIBLE FLATTRACKS, SECURED WITH WEB STRAP TIE-DOWN ASSEMBLIES, FOR ON AND/OR OFF HIGHWAY. NOTE: THE PROCEDURES ARE APPLICABLE WHETHER THE FLATTRACKS MOVE ON THE PLS TRUCK OR ON THE PLS TRAILER.

C. DEPICTED PROCEDURES APPLY TO A-FRAME FLATTRACKS HAVING AN ALL METAL CARGO DECK AREA 18'-8" LONG BY 7'-6-1/2" WIDTH EQUIPPED WITH ELEVEN TIEDOWN ANCHORS ON EACH SIDE AND FOUR ON EACH END. THE EMPTY FLATTRACK WEIGHT IS 3,200 POUNDS AND THE LOAD CAPACITY IS 30,000 POUNDS. THE DEPICTED PROCEDURES ALSO APPLY TO THE M1 FLATTRACK WHICH HAS A WOOD AND METAL CARGO DECK AREA 18'-8" LONG BY 7'-6-1/2" WIDE EQUIPPED WITH ELEVEN TIEDOWN ANCHORS ON EACH SIDE. THE EMPT FLATTRACK WEIGHT IS 7,200 POUNDS AND THE LOAD CAPACITY IS 26,750 POUNDS.

D. ALL LOADS SHOWN HEREIN ARE TYPICAL AND ARE BASED ON ESTIMATED PROCEDURES FOR OFF HIGHWAY TRANSPORT. COMBINATIONS OF PROCEDURES MAY BE USED. HOWEVER, THE APPROVED METHODS SPECIFIED HEREIN MUST BE FOLLOWED AS CLOSELY AS POSSIBLE.

E. BECAUSE OF THE FACT THAT ALL LOADS HEREIN ARE TYPICAL IT IS MOST LIKELY THAT THE ACTUAL ITEM OR QUANTITY TO BE TRANSPORTED WILL NOT BE DEPICTED. IN ORDER TO MAINTAIN SIMILARITY PROCEDURES SHALL BE HIERARCHICALLY STRUCTURED TO MAKE AN ACTUAL PENCIL SKETCH OF THE LOAD, USING THE VARIOUS TYPICAL LOADS AND PROCEDURES SHOWN HEREIN FOR GUIDANCE THE TIE-DOWN GUIDANCE SHOULD BE ADVANTAGEOUS FOR MAXIMUM LOADS USING A MINIMUM QUANTITY OF WEB STRAP TIE-DOWN ASSEMBLIES.

F. WEB STRAP TIE-DOWN ASSEMBLIES MUST BE SECURELY HOOKED INTO ANCHORING DEVICES ON THE TRANSPORTING VEHICLE AND PERMANENTLY TENSIONED MECHANICALLY. WHEN THE OPERATOR PULLS ON THE HANDLE, THE RATCHET WILL NOT ADVANCE ANOTHER NOTCH. NO TYPE OF MECHANICAL EXTENSION OR LEVER WILL BE USED. EXERCISE CARE DURING TIE-DOWN TO AVOID TWISTS IN THE STRAP TO THE EXTENT POSSIBLE (IF TIME PERMITS) BUT ENSURE THERE ARE NO KNOTS IN THE STRAP ON THE TIE-UP SPool OF THE TIE-DOWN ASSEMBLY. TENSIONS THE STRAP WHEN TENSIONING. AFTER INITIAL WEBBING-TO-WEBBING CONTACT HAS BEEN MADE, ROTATING THE TIE-UP SPool UNTIL NO METAL ON THE SPool IS SHOWING AND THE STRAP HAS MADE CONTACT WITH ITSELF. THE TENSIONED STRAP MUST FORM AT LEAST 1/2 BUT NOT MORE THAN 1-1/2 WRAPS OF STRAP ON THE TIE-UP SPool. THE TENSIONING IS COMPLETED, ENSURE THAT THE LOOP LOCKING LATCH IS FULLY SEATED AT BOTH ENDS OF THE SPool. WHEN RATCHETING, TIE-UP SPool OR TIDED TO THE TENSIONING STRAP IF TIME PERMITS. FOR ADDITIONAL GUIDANCE SEE "RATCHET/ RATCHETING DETAILS" ON PAGES 42 AND 43.

G. ADJUSTABLE SCUFF SLEEVES PROVIDED ON WEB STRAP ASSEMBLIES WILL BE LOCATED TO PROVIDE A PAD WHERE STRAPS PASS OVER SHARP EDGES, OR RATCHETS AND HOOKS ON PREVIOUSLY INSTALLED WEB STRAP TIE-DOWN ASSEMBLIES.

H. PROCEDURES DEPICTED HEREIN ARE TYPICAL IN NATURE RELATIVE TO ITEM LOCATION OF THE FLATTRACK AND THE QUANTITIES SHOWN. ITEM LOCATION AND QUANTITIES OF THE DESIGNATED ITEM MAY BE VARIED TO SATISFY OPERATIONAL REQUIREMENTS. PROVIDING LOADING AND TIE-DOWN PRINCIPLES SPECIFIED HEREIN ARE RETAINED.

I. WHEN ONE WEB STRAP TIE-DOWN ASSEMBLY IS NOT LONG ENOUGH TO SPAN THE DISTANCE DEPICTED, TWO ASSEMBLIES MAY BE HOOKED TOGETHER TO GAIN THE NECESSARY LENGTH.

J. (CONTINUED AT RIGHT)

K. AFTER ALL LOADING PROCEDURES ARE COMPLETE, CHECK ALL WEB STRAP TIE-DOWN ASSEMBLIES FOR MAXIMUM TIGHTNESS AND RATCHET TIGHTEN IF REQUIRED PRIOR TO FOLDING UP AND SECURING THE LOOSE ENDS OF THE STRAP AS INSTRUCTED IN GENERAL NOTE "F".

L. DURING LONG HAULS THE WEB STRAPS SHOULD BE CHECKED AT ALL VEHICLE STOPS AND TIGHTENED IF NECESSARY.

M. DUE TO VARIOUS REASONS SUCH AS ROUGH TERRAIN DURING OFF HIGHWAY TRANSPORT, PANCE STOPS, METAL FLOORS, AND NORMAL STRETCH OF WEB STRAPS LOADED ITEMS MAY SLIDE SLIGHTLY LATERALLY AND/OR LONGITUDINALLY DURING TRANSPORT. THIS IS AN ACCEPTABLE CHARACTERISTIC AND IS NOT DETRIMENTAL TO LOAD SECURITY.

N. THE TIE-DOWN METHODS WITHIN THIS DRAWING SHOW TWO STRAP HOOKS CONNECTED TO THE SAME TIE-DOWN ANCHOR. THIS IS AUTHORIZED AS SPECIFIED HEREIN.

O. CONVERSION TO METRIC EQUIVALENTS: DIMENSIONS WITHIN THIS DOCUMENT ARE EXPRESSED IN INCHES AND WEIGHTS ARE EXPRESSED IN POUNDS. WHEN NECESSARY THE METRIC EQUIVALENTS MAY BE COMPUTED ON THE BASIS OF ONE INCH EQUALS 25.4MM AND ONE POUND EQUALS 0.454 KG.

P. THROUGHOUT THIS PROCEDURAL DRAWING WHICH INCLUDES PROCEDURES FOR BOTH PALLETTIZED UNITS AND SKIDDED UNITS THE GUIDANCE SHOWN FOR ONE TYPE OF UNIT MAY ALSO BE USED FOR THE OTHER TYPE OF UNIT.

Q. EACH FLATTRACK IS PROVIDED WITH 22 WEB STRAP TIE-DOWN ASSEMBLIES. SIDE BOARD KITS AND CARGO COVERS ARE NOT PROVIDED, BUT ARE CONTAINED ON THE ADDITIONAL AUTHORIZED LIST (AAL) AND MAY BE OBTAINED THROUGH THE ARMY SUPPLY SYSTEM.

R. ONE M1 FLATTRACK CAN BE LOADED ON AN M971 SEMITRAILER, AND TWO THE M972 SEMITRAILER, USING THE FOUR BOTTOM ISO CORNER FITTINGS.

S. THE FLATTRACKS ARE CAPABLE OF BEING TRANSPORTED ON C-130, C-141, C-5, AND C-17 AIRCRAFT.

T. THE FLATTRACKS ARE CAPABLE OF BEING SLING-LIFTED BY A CH-47D HELICOPTER WITH A REDUCED PAYLOAD. THE MAXIMUM WEIGHT FOR SLING-LIFT IS 22,900 POUNDS.

U. FOR ADDITIONAL GUIDANCE SEE THE "LOADING PROCEDURES" ON PAGE 3 AND THE "SPECIAL NOTES" ON EACH LOAD PAGE.

MATERIAL SPECIFICATIONS

STRAP -- -- -- -- -- -- WEBBING, UNIVERSAL TIE-DOWN, NSN 5340-01-204-3009, PHR832415, OR 1570-00-725-1497, PHN370-013, OR 5340-00-680-9277, PHNO00880.

ANTI-CHAFING MATERIAL -- -- -- -- -- - CANVAS, BURLAP, TAPE OR ANY OTHER SUITABLE MATERIAL.

PAGE 2

PROJECT CAP-TV 4-93
LOADING PROCEDURES:

1. Position full and/or partial loads tight against the A-frame at the forward end of the flatrack or the front wall on the M1 flatrack. If desired, partial loads may be positioned anywhere on the length of the flatrack. However, one more web strap tiedown assembly will be required. Position this strap from a tiedown anchor on the side of flatrack around pallet bases on forward pallets, to a tiedown anchor on the opposite side of the flatrack.

2. Prior to loading items on the flatrack assure that the deck is free of excessive amounts of dirt, sand and gravel.

3. When attaching the web strap hook to the tiedown anchor on the flatrack, assure that the tiedown anchor is in a raised or vertical position prior to and after the strap is tightened. If the web strap is positioned at a near horizontal angle, such as strap mark en 0° on page 4, assure that the tiedown anchor is positioned in line with the full of the strap when possible. However, if two straps are attached to the same tiedown anchor the vertical strap has precedence.

4. Assure that all pallet units and/or other items are positioned tightly against each other laterally and longitudinally as loading progresses. This will reduce load movement and the quantity of web straps required to secure the load. Void spaces between pallet units will fill in during transport causing web strapping to become loose.

5. During long hauls, when possible, straps should be checked during vehicle stops and tightened if necessary.

6. After all loading procedures are completed, check all web straps for maximum tightness and ratchet tighter if required. Prior to folding up and tapering the loose ends of straps as instructed in general note "F" on page 2.

7. Before loading a PLS flatrack with ammunition or explosives, check the overall condition of the flatrack to ensure it is serviceable. Check for cracks, breaks, distortions, or excessive corrosion which would make use of the flatrack unsafe. Check the cargo tiedown anchors and web strap tiedown devices to ensure they are serviceable. Make sure they are not cracked, broken, bent, distorted or excessively corroded to preclude safe usage of the tiedown device. Leaking or damaged tiedown device on the hook end of the PLS flatrack. Make sure the hook-up device is not cracked, broken, worn, or distorted to such an extent so as to make the device unserviceable or unsafe to use.

8. Check the end walls on the M1 flatrack to assure that they can be raised and/or lowered without difficulty. Follow the manufacturers step-by-step procedures for raising and/or lowering the end walls as serious injury or death to personnel could result due to the 1,700 pound weight of the front wall and the 1,100 pound weight of the rear wall.

9. Both flatracks are equipped with eleven tiedown anchors along each side. The tiedown anchors at each end and in the center have a 25,000 pound capacity and the remaining eight tiedown anchors have a 10,000 pound capacity. All eleven tiedown anchors will accept web strap tiedown assemblies or steel strapping.

10. Two sets of forklift pockets are provided underneath the A-frame and M1 flatrack. The set near the ends of the flatrack must be used when lifting loaded flatracks. The set closest to the center of the flatrack is for lifting unloaded flatracks only. Use of the wrong forklift pockets could cause damage to equipment. The forks on the forklift must be 70.00" long or longer.

INDEX (SEE "NOTE O" BELOW)

- GENERAL NOTES AND MATERIAL SPECIFICATIONS - 2
- LOADING AND TIEDOWN PROCEDURES - 3
- 155MM SEPARATE LOADING PROJECTILES - 4.5
- 120MM COMBAT CONFIGURED LOAD FOR AMOR - 6.7
- 105MM COMBAT CONFIGURED LOAD FOR AMOR - 8.9
- 9-INCH COMBAT CONFIGURED LOAD FOR FIELD ARTILLERY - 10.11
- 155MM COMBAT CONFIGURED LOAD FOR FIELD ARTILLERY - 12.13
- SMALL ARMS, COMBAT CONFIGURED LOAD FOR INFANTRY - 14.15
- 7.62MM CARTRIDGE (CHIMNEY PATTERN LOAD) - 16.17
- MIXED BOX AMMUNITION - 18.19
- M66A3 LINEAR DEMOLITION CHARGE (MICLIC) - 20.21
- COMBAT CONFIGURED LOAD FOR ENGINEERS - 22.23
- COMBAT CONFIGURED LOAD FOR AIR DEFENSE ARTILLERY - 24.25
- 105MM CARTRIDGES IN WOODEN BOXES - 26.27
- 105MM CARTRIDGES IN WOODEN BOXES (TWO HIGH) - 28.29
- 105MM CARTRIDGE IN PALLET CONTAINER (TWO HIGH) - 30.31
- 155MM PROPELLING CHARGE CONTAINERS (TWO HIGH) - 32.33
- 9-INCH PROPELLING CHARGE CONTAINERS - 34.35
- 105MM CARTRIDGE CONTAINERS - 36.37
- 120MM CARTRIDGE CONTAINERS - 38.41
- 7.62MM AND 105MM CARTRIDGES IN WOODEN BOXES - 42.43
- RATCHET/RATCHETING DETAILS - 42.43

NOTE O:

All loads listed in the index above are depicted on the A-frame flatrack with the exception of the loads on pages 14, 15 and 18 through 23 which are depicted on the M1 Flatrack. Due to its shorter length and reduced load weight, the M1 flatrack cannot always be loaded with the same quantity of ammunition as the A-frame flatrack. See general note "C" on page 2.
**ISOMETRIC VIEW**

**KEY NUMBERS**

1. Web strap tie-down assembly (14 PC), install each strap to extend from a tie-down anchor on side of flatrack, over top of a row of pallet units, to a tie-down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See general notes "F" and "G" on page 2 and special note 6 on page 5.

2. Web strap tie-down assembly (1 PC), install strap to extend from a tie-down anchor on side of flatrack, around pallet base/skid of rear row as shown, to a tie-down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See general notes "F" and "G" on page 2.

---

**TYPICAL AMMUNITION ITEM**

<table>
<thead>
<tr>
<th>ITEM ID</th>
<th>ITEM</th>
<th>ITEM QUANTITY</th>
<th>LOAD QUANTITY</th>
<th>TOTAL WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0503</td>
<td>PROJ. 155MM. ICM. M403A1</td>
<td>14.02 L x 29.12 W x 36.36 H</td>
<td>256</td>
<td>37 pallets</td>
</tr>
</tbody>
</table>

---

**155MM SEPARATE LOADING PROJECTILES**

**PROJECT CAP-TV 4-93**
1. A TYPICAL LOAD OF 37 PALLETS OF 155MM SLP IS SHOWN LOADED ON THE A-FRAME FLATRACK HAVING CARGO DECK DIMENSIONS OF 7'6" x 4'-1/2" WIDE BY 18'-6" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. IF LOADING AN H1 FLATRACK HAVING A MAXIMUM LOAD WEIGHT OF 29,750 POUNDS, Omit THE NEAREST ROW OF FIVE PALLETS. THIS WILL REDUCE THE LOAD QUANTITY FROM 37 PALLETS TO 32 PALLETS AND THE LOAD WEIGHT FROM 32,300 POUNDS TO 27,800 POUNDS. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE PALLET SHOWN IS TYPICAL ONLY. IF LOADING PALLETTIZED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

4. PRIOR TO LOADING THE SLP PALLETS ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.


6. EACH LATERAL ROW OF ONE OR MORE PALLETS UNITS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW. HOWEVER, THEY MUST BE POSITIONED TO THE INSIDE OF LIFTING RING ON THE NOSE END OF THE END PROJECTILES, OF EACH PALLET UNIT ON THE END OF A ROW, AS SHOWN IN THE LOAD ON PAGE 4. THIS WILL ASSURE THAT THERE ARE TWO STRAPS OVER EACH ROW. THE LIFTING RING WILL ALSO HELP TO KEEP THE STRAP IN POSITION.

7. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUIONALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

8. A TOTAL OF FIFTEEN WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

<table>
<thead>
<tr>
<th>LOAD AS SHOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM</td>
</tr>
<tr>
<td>155MM SLP</td>
</tr>
</tbody>
</table>

---

**155MM SEPARATE LOADING PROJECTILES**

PROJECT CAP-TV 4-93
WEB STRAP TIE-DOWN ASSEMBLY (10 REQD). INSTALL EACH STRAP TO EXTEND FROM A TIE-DOWN ANCHOR ON SIDE OF FLAT TRACK, OVER TOP OF PALLETS, TO A TIE-DOWN ANCHOR ON OPPOSITE SIDE OF FLAT TRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 8 ON PAGE 7.

WEB STRAP TIE-DOWN ASSEMBLY (1 REQD). INSTALL STRAP TO EXTEND FROM A TIE-DOWN ANCHOR ON SIDE OF FLAT TRACK, AROUND PALLETS BASES OF REAR PALLETS, TO A TIE-DOWN ANCHOR ON OPPOSITE SIDE OF FLAT TRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

<table>
<thead>
<tr>
<th>DODIC</th>
<th>ITEM</th>
<th>ITEM QUANTITY</th>
<th>LOAD QUANTITY</th>
<th>TOTAL WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>C785</td>
<td>120MM COMP RD APF365-T 39.50 L x 44.50 W x 51.50 H</td>
<td>240</td>
<td>8 PALLETS</td>
<td>19.128 LBS</td>
</tr>
<tr>
<td>C787</td>
<td>120MM COMP RD HEAT-MP-T 40.13 L x 44.50 W x 51.75 H</td>
<td>80</td>
<td>2 PALLETS</td>
<td>4.805 LBS</td>
</tr>
</tbody>
</table>
SPECIAL NOTES:

1. A TYPICAL 120mm COMBAT CONFIGURED LOAD FOR ARMOR IS SHOWN LOADED ON THE A-FRAME FLATTRACK HAVING CARGO DECK DIMENSIONS OF 7'-6"-1/2" WIDE BY 18'-6" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. IF LOADING AN M1 FLATTRACK HAVING A CARGO DECK 18'-6" LONG, POSITION THE TWO REARMOST PALLETS WITH THE 36.5" DIMENSION PARALLEL TO THE SIDE OF THE FLATTRACK IN LIEU OF THE 44.5" DIMENSION. THIS WILL REDUCE THE LOAD LENGTH FROM 18'-6-1/2" LONG TO 18'-1-1/2" LONG. SEE GENERAL NOTE "C" ON PAGE 2.

3. IF FAST UNLOADING OF ROUNDS FROM THE PALLETTIZED CONTAINERS IS DESIRED, USE THE PROCEDURES SHOWN FOR THE 105mm COMPLETE ROUNDS IN THE PALLET CONTAINER, ON PAGES 8 AND 9.

4. THE PALLETS SHOWN ARE TYPICAL ONLY. IF LOADING PALLETTIZED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

5. PRIOR TO LOADING THE 120mm PALLETS ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSED AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.


7. IF DESIRED, THE 120mm PALLETS MAY BE POSITIONED WITH THE 36.5" DIMENSION PARALLEL TO THE SIDES OF THE FLATTRACK.

8. EACH LATERAL ROW OF TWO 120mm PALLETS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW.

9. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO LOOSE.

10. A TOTAL OF ELEVEN WEB STRAP TIE-DOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120mm PALLETS</td>
<td>-10-</td>
<td>23,984 LBS</td>
</tr>
</tbody>
</table>

120mm COMBAT CONFIGURED LOAD FOR ARMOR

PROJECT CAP-TV 4-93

PAGE 7
ISOMETRIC VIEW

KEY NUMBERS

1. Web strap tie down assembly (8 reqd). Install each strap to extend from a tie down anchor on side of flatrack over top of pallet units, to a tie down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See general notes "F" and "G" on page 2 and special note 8 on page 9.

2. Web strap tie down assembly (1 reqd). Install strap to extend from a tie down anchor on side of flatrack, around pallet bases of rear pallets, to a tie down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See general notes "F" and "G" on page 2.

<table>
<thead>
<tr>
<th>DOOC</th>
<th>ITEM</th>
<th>QTY</th>
<th>LOAD QTY</th>
<th>TOTAL WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS94</td>
<td>105MM COMP RD APP300-T</td>
<td>240</td>
<td>8 pallets</td>
<td>15,352 lbs</td>
</tr>
<tr>
<td>CS98</td>
<td>105MM COMP RD HEAT</td>
<td>80</td>
<td>2 pallets</td>
<td>4,388 lbs</td>
</tr>
</tbody>
</table>

105MM COMBAT CONFIGURED LOAD FOR ARMOR
SPECIAL NOTES:

1. A typical 105mm combat configured load for armor is shown loaded on the A-frame flatrack having cargo deck dimensions of 7'-5-1/2" wide by 16'-6" long and a maximum load weight of 33,000 pounds.

2. The procedures shown on page 8 may be used for fast unloading of the complete rounds from the palletized containers without removing the pallets or containers from the flatrack. Loosen the two straps marked (4) for access to all containers. After complete rounds are removed ratchet straps marked (4) tight to secure the pallets.

3. The load as shown on page 8 may also be loaded on an M1 flatrack. See general note "C" on page 2.

4. The pallets shown are typical only. If loading palletized units of other items, sizes, or quantities, follow these same procedures.

5. Prior to loading the 105mm pallets assure that all steel strapping on each pallet is in position and is tight. Missing and/or loose steel strapping should be replaced.

6. When loading the flatrack position the load tight against the A-frame and centered across the width of the flatrack.

7. If rapid unloading is not required, the 105mm pallets may be positioned with the 44.50" and 45.81" dimension parallel to the sides of the flatrack.

8. Each lateral row of two 105mm pallets must be secured with two web straps over the top as shown. These two straps may be crossed and/or positioned straight across the top of a row.

9. All pallets must be positioned tightly against each other laterally and longitudinally. This will reduce load movement and the quantity of web straps required to secure the load. Void spaces between pallet units will fill in during transport causing web strapping to become loose.

10. Note that the two pallets of CSDB at the forward end of the load exceed the flatrack cargo deck width by 1.12" and may prevent the use of the flatrack side walls. If desired, the two CS6 pallets may be positioned at the aft end of the flatrack with the 45.81" dimension parallel to the sides of the flatrack. This would still allow rapid unloading but access would be from the aft end of the flatrack in lieu of the side.

11. A total of eleven web strap tiedown assemblies are required for the load as shown.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105mm Pallet</td>
<td>-10</td>
<td>19,462 LBS</td>
</tr>
</tbody>
</table>

LOAD AS SHOWN

105MM COMBAT CONFIGURED LOAD FOR ARMOR

PROJECT CAP-TV 4-93
INBA, 1 ATES
12 SW
3 TANTATTNDICAAES
3 LOOSE 9040 FUZE BOXES.

INDICATES 3 LOOSE M83 FUZE BOXES.

52.50"

INDICATES 4 DB82 PROP CHARGE PALLET UNITS.

INDICATES 1 LOOSE NS23 PRIMER BOX.

AFT END.

ISOMETRIC VIEW

<table>
<thead>
<tr>
<th>DODIC</th>
<th>ITEM</th>
<th>ITEM QUANTITY</th>
<th>LOAD QUANTITY</th>
<th>TOTAL WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>D882</td>
<td>PROP CHG, 8-INCH</td>
<td>80</td>
<td>4 PALLETS</td>
<td>6,952 LBS</td>
</tr>
<tr>
<td>D824</td>
<td>PROJ, 8-INCH, M850</td>
<td>72</td>
<td>12 PALLETS</td>
<td>15,036 LBS</td>
</tr>
<tr>
<td>N40</td>
<td>FUZE, M738</td>
<td>32</td>
<td>2 BOXES</td>
<td>92 LBS</td>
</tr>
<tr>
<td>N405</td>
<td>FUZE, M728</td>
<td>48</td>
<td>3 BOXES</td>
<td>142 LBS</td>
</tr>
<tr>
<td>NS23</td>
<td>PRIMER, M82</td>
<td>500</td>
<td>1 BOX</td>
<td>37 LBS</td>
</tr>
</tbody>
</table>

8-INCH COMBAT CONFIGURED LOAD

KEY NUMBERS

1. WEB STRAP TIE DOWN ASSEMBLY (6 REQD). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF FLATRACK, OVER TOP OF A ROW OF PALLETS TIGHT, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 6 ON PAGE 11.

2. WEB STRAP TIE DOWN ASSEMBLY (4 REQD). PRE-POSITION EACH STRAP UNDER TOP DECK OF PALLETS TIGHT AGAINST EACH OTHER. AFTER STRAPS MARKED @ ARE INSTALLED AND RATCHETED TIGHT POSITION LOOSE BOXES ON TOP OF PALLETS TIGHT. BRING ENDS OF STRAPS MARKED @ UP OVER TOP OF LOOSE BOXES AND HOOK ENDS OF STRAP TOGETHER. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

3. WEB STRAP TIE DOWN ASSEMBLY (4 REQD). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF FLATRACK, OVER TOP OF PALLETS TIGHT, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. DO NOT POSITION THESE STRAPS OVER TOP OF LOOSE BOXES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 6 ON PAGE 11.

4. WEB STRAP TIE DOWN ASSEMBLY (1 REQD). INSTALL STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF FLATRACK, AROUND PALLETS TIGHT, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

8-INCH COMBAT CONFIGURED LOAD FOR FIELD ARTILLERY

PROJECT CAP-TV 4-93

PAGE 10
1. A TYPICAL 8-INCH COMBAT CONFIGURED LOAD FOR FIELD ARTILLERY IS SHOWN LOADED ON THE A-FRAME FLATTRACK HAVING CARRIED DECK DIMENSIONS OF 7'-0" X 1'-1/2" WIDE BY 16'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. THE LOAD AS SHOWN ON PAGE 10 MAY ALSO BE LOADED ON THE A1 FLATTRACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE LOAD SHOWN IS TYPICAL ONLY. IF LOADING UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

4. PRIOR TO LOADING THE SLP AND PROPULSING CHARGE PALLETs ASSUME THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSINg AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.


6. EACH LATERAL ROW OF ONE OR MORE PALLETS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW. THESE STRAPS MUST NOT BE POSITIONED OVER TOP OF THE LOOSE BOXES.

7. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

8. A TOTAL OF FIFTEEN WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-INCH CCL</td>
<td>1</td>
<td>22,250 LBS</td>
</tr>
</tbody>
</table>

8-INCH COMBAT CONFIGURED LOAD FOR FIELD ARTILLERY

PROJECT CAP-TV 4-93
INDICATES 1 LOOSE N523 PROP CHARGE PALLETS.

INDICATES 1 LOOSE N523 M110 FUZE BOXES.

INDICATES 1 LOOSE N523 M4 FUZE BOXES.

INDICATES 22 DE533 155MM PALLETS.

KEY NUMBERS

1. WEB STRAP TIEDOWN ASSEMBLY (B REDD). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF FLATRACK, OVER TOP OF PALLETS, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 5 ON PAGE 13.

2. WEB STRAP TIEDOWN ASSEMBLY (7 REDD). PRE-POSITION EACH STRAP UNDER TOP DECK OF PALLETS AT LOCATION DESIGNED PRIOR TO POSITIONING PALLET TIGHT AGAINST EACH OTHER. POSITION LOOSE BOXES ON TOP OF PALLET UNITS. NOTE: IF ANY STRAPS MARKED (Q) HAVE TO BE POSITIONED UNDER LOOSE BOXES DO SO AT THIS TIME. BRING ENDS OF STRAPS MARKED (Q) UP OVER TOP OF LOOSE BOXES AND HOOK ENDS TOGETHER. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

3. WEB STRAP TIEDOWN ASSEMBLY (4 REDD). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF FLATRACK, OVER TOP OF PALLETS, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. DO NOT POSITION THESE STRAPS OVER TOP OF LOOSE BOXES. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 6 ON PAGE 13.

4. WEB STRAP TIEDOWN ASSEMBLY (1 REDD). INSTALL STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF FLATRACK, AROUND PALLETS BASES OF REAR PALLETS, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

155MM COMBAT CONFIGURED LOAD

<table>
<thead>
<tr>
<th>DODIC</th>
<th>ITEM</th>
<th>ITEM QTY</th>
<th>LOAD QTY</th>
<th>TOTAL WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0533</td>
<td>PROP M110, 155MM, 160 M110</td>
<td>45.50 L X 35.75 W X 49.00 H</td>
<td>30</td>
<td>1 PALLET</td>
</tr>
<tr>
<td>0541</td>
<td>PROP M4, 155MM, 160 M4</td>
<td>55.00 L X 40.00 W X 44.88 H</td>
<td>150</td>
<td>3 PALLETS</td>
</tr>
<tr>
<td>H326</td>
<td>FUZE, MTSO, M483A1</td>
<td>14.52 L X 10.75 W X 41.18 H</td>
<td>175</td>
<td>11 BOXES</td>
</tr>
<tr>
<td>M623</td>
<td>PERCUSSION PRIMER, M62</td>
<td>24.13 L X 12.00 W X 11.25 H</td>
<td>500</td>
<td>1 BOX</td>
</tr>
</tbody>
</table>

155MM COMBAT CONFIGURED LOAD FOR FIELD ARTILLERY

PROJECT CAP-TV 4-93
1. A typical 155mm Combat Configured Load for Field Artillery is shown loaded on the A-Frame Flatrack having cargo deck dimensions of 7'-6"-1/2" wide by 18'-0" long and a maximum load weight of 33,000 pounds.

2. If loading an M1 Flatrack having a cargo deck 18'-0" long, turn the rearmost pallet of 155mm Prop Charges (OS41) 90° so the 40" dimension is parallel to the side of the Flatrack in lieu of the 95" dimension. This will reduce the load length from 18'-10'-1/2" to 18'-1" long. Note: The width of these two pallets combined will be 7'-6"-3/4". See General Note "C" on Page 2.

3. The load shown is typical only. If loading units of other items, sizes, or quantities, follow these same procedures.

4. Prior to loading the slip and propelling charge pallets ensure that all steel strapping on each pallet is in position and is tight. Missing and/or loose steel strapping should be replaced.

5. When loading the Flatrack position the rows of six slip pallets tight against the A-Frame and centered across the width of the Flatrack. Position two rows of five slip pallets tight against the last row of 6 pallets and centered across the width of the Flatrack. Position two rows of two prop charge pallets tight against the slip pallets and centered across the width of the Flatrack. Then position one prop charge pallet tight against the load. Position loose boxes of fuses and propellers on top of pallet units as loading progresses.

6. Each lateral row of one or more pallet units must be secured with two web straps over the top as shown. These two straps may be crossed and/or positioned straight across the top of a row. These straps must not be positioned over top of the loose boxes.

7. All pallets must be positioned tightly against each other laterally and longitudinally. This will reduce load movement and the quantity of web straps required to secure the load. Void spaces between pallet units will fill in during transport causing web strapping to become loose.

8. A total of twenty web strap tiedown assemblies are required for the load as shown.

---

**Load as shown**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>155mm CCL.</td>
<td>1</td>
<td>26,750 LBS</td>
</tr>
</tbody>
</table>

**155mm Combat Configured Load for Field Artillery**

**Project** CAP-TV 4-93
INDICATES 4 A576 .50 CAL CARTRIDGE PALLETS.

INDICATES 1 K143 ANTIPERSONNEL MINE PALLETS.

INDICATES 1 A088 5.56MM CARTRIDGE PALLETS.

INDICATES 2 A071 5.56MM CARTRIDGE PALLETS.

INDICATES 1 G881 HAND GRENADE PALLETS.

ISOMETRIC VIEW

SMALL ARMS COMBAT CONFIGURED LOAD

<table>
<thead>
<tr>
<th>DODIC</th>
<th>ITEM</th>
<th>QUANTITY</th>
<th>LOAD QUANTITY</th>
<th>TOTAL WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A131</td>
<td>7.62MM CARTRIDGE, LXD 4/1</td>
<td>64,000</td>
<td>2 PALLETS</td>
<td>6,352 LBS</td>
</tr>
<tr>
<td>A088</td>
<td>5.56MM CARTRIDGE, TRACER</td>
<td>76,720</td>
<td>1 PALLETS</td>
<td>3,016 LBS</td>
</tr>
<tr>
<td>A071</td>
<td>5.56MM CARTRIDGE, BALL</td>
<td>80,840</td>
<td>1 PALLETS</td>
<td>3,398 LBS</td>
</tr>
<tr>
<td>A576</td>
<td>.50 CAL CARTRIDGE LXD 4/1</td>
<td>19,200</td>
<td>4 PALLETS</td>
<td>8,408 LBS</td>
</tr>
<tr>
<td>G881</td>
<td>HAND GRENADE, FRAG</td>
<td>720</td>
<td>1 PALLETS</td>
<td>1,308 LBS</td>
</tr>
<tr>
<td>K143</td>
<td>MINE, ANTIPERSONNEL</td>
<td>192</td>
<td>1 PALLETS</td>
<td>1,808 LBS</td>
</tr>
<tr>
<td>A363</td>
<td>3MM CARTRIDGE, BALL</td>
<td>4,000</td>
<td>2 BOXES</td>
<td>180 LBS</td>
</tr>
</tbody>
</table>

KEY NUMBERS

1. WEB STRAP TIEDOWN ASSEMBLY (6 REQD.). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF PLATFACK. OVER TOP OF PALLETS TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF PLATFACK. POSITION STRAP LOOP SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

2. WEB STRAP TIEDOWN ASSEMBLY (1 REQD.). PRE-POSITION STRAP UNDER TOP DECK OF PALLETS AT LOCATION DESIRED PRIOR TO POSITIONING PALLETS TIGHT AGAINST EACH OTHER. POSITION LOOP BOWS ON TOP OF PALLETS. BRING ENDS OF STRAP UP OVER TOP OF LOOP BOWS AND HOOK ENDS TOGETHER. POSITION STRAP SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

3. WEB STRAP TIEDOWN ASSEMBLY (2 REQD.). HOOK TWO STRAPS TOGETHER AND ENCIRCLE ALL FOUR .50 CAL (A576) PALLETS AT TWO PLACES. POSITION STRAP LOOP SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

4. WEB STRAP TIEDOWN ASSEMBLY (1 REQD.). INSTALL STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF PLATFACK, AROUND PALLETS BASES OF REAR PALLETS. TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF PLATFACK. POSITION STRAP LOOP SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

SMALL ARMS, COMBAT CONFIGURED LOAD FOR INFANTRY

PROJECT CAP-TV 4-93

PAGE 14
SPECIAL NOTES:

1. A TYPICAL SMALL ARMS COMBAT CONFIGURED LOAD FOR INFANTRY IS SHOWN LOADED ON THE VI FLATRACK HAVING CARDED DECK DIMENSIONS OF 7'-6" X 12' X 3'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 28,750 POUNDS.

2. THE LOAD AS SHOWN ON PAGE 14 MAY ALSO BE LOADED ON AN A-FRAME FLATRACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE LOAD SHOWN IS TYPICAL ONLY. IF LOADING UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

4. PRIOR TO LOADING THE SMALL ARMS PALLETS ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSED AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.

5. WHEN LOADING THE FLATRACK, POSITION THE LOAD TIGHT AGAINST THE FORWARD END WALL AND CENTERED ACROSS THE WIDTH OF THE FLATRACK.

6. EACH LATERAL ROW OF ONE OR MORE PALLET UNITS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW. THESE TWO STRAPS MUST NOT BE POSITIONED OVER TOP OF LOOSE BOXES.

7. ALL PALLETS MUST BE POSITIONED TIGHT AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

8. ONLY A PARTIAL AFT END WALL IS SHOWN ON THE ISOMETRIC VIEW TO PREVENT DISTRACTION OF THE LOADING AND TIEDOWN PROCEDURES AND TO IMPROVE THE CLARITY OF THE DEPICTED PROCEDURES.

9. A TOTAL OF FOURTEEN WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL ARMS CL.</td>
<td>- - - - - 1</td>
<td>24,451 LBS</td>
</tr>
</tbody>
</table>

SMALL ARMS, COMBAT CONFIGURED LOAD FOR INFANTRY

PROJECT CAP-TV 4-93
WEB STRAP TIEDown ASSEMBLY (10 REQD). INSTALL EACH STRAP TO EXTEND FROM A TIEDown ANCHOR ON SIDE OF FLATRACK, OVER TOP OF PALLEt UNITS, TO A TIEDown ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 17.

WEB STRAP TIEDown ASSEMBLY (1 REQD). INSTALL STRAP TO EXTEND FROM A TIEDown ANCHOR ON SIDE OF FLATRACK, AROUND PALLEt BASES OF REAR ROW AS SHOWN, TO A TIEDown ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

TYPICAL AMMUNITION ITEM

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<tr>
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<th>ITEM</th>
<th>QUANTITY</th>
<th>LOAD QUANTITY</th>
<th>TOTAL WEIGHT</th>
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</thead>
<tbody>
<tr>
<td>A131</td>
<td>7.62MM CTG</td>
<td>46.00 L</td>
<td>35.00 W X 45.12 H</td>
<td>320,000</td>
</tr>
</tbody>
</table>

7.62MM CARTRIDGE (CHIMNEY PATTERN LOAD)
SPECIAL NOTES:

1. A TYPICAL CHIMNEY PATTERN LOAD OF 10 PALLETS OF 7.62MM CARTRIDGE IS SHOWN LOADED ON THE A-FRAME FLATRACK HAVING CARGO DECK DIMENSIONS OF 7'-6"-1/2" WIDE BY 19'-4" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. IF LOADING AN A1 FLATRACK HAVING A MAXIMUM LOAD WEIGHT OF 28,750 POUNDS, OMIT ONE PALLET FROM AFT END. THIS WILL REDUCE THE LOAD QUANTITY TO 9 PALLETS AND THE LOAD WEIGHT TO 28,000 POUNDS. SEE GENERAL NOTE "C" ON PAGE 2.

3. A CHIMNEY PATTERN LOAD MAY BE USED TO REDUCE THE LOAD LENGTH AND/OR INCREASE THE LOAD QUANTITY. FOR EXAMPLE, IF THE PALLETS SHOWN IN THE LOAD ON PAGE 18 WERE POSITIONED TWO WIDE AND FOUR LONG WITH THE 48.00" DIMENSION PARALLEL TO THE SIDE OF THE FLATRACK THERE WOULD BE ENOUGH ROOM AT THE AFT END TO POSITION ONE MORE PALLET WITH THE 35.00" DIMENSION PARALLEL TO THE SIDE OF THE FLATRACK FOR A MAXIMUM LOAD OF NINE PALLETS. HOWEVER, BY POSITIONING EIGHT PALLETS IN A CHIMNEY PATTERN ENOUGH SPACE IS GAINED TO POSITION TWO MORE PALLETS AT THE AFT END FOR A LOAD QUANTITY OF TEN PALLETS. NOTE: WHEN LOADING PALLETS IN A CHIMNEY PATTERN THE PALLET LENGTH PLUS THE PALLET WIDTH MUST NOT EXCEED THE CARGO DECK WIDTH OF THE FLATRACK (REF: 7'-6'-1/2''). FOR AN ALTERNATIVE METHOD SEE THE LOAD ON PAGES 24 AND 25.

4. THE PALLET SHOWN IS TYPICAL ONLY. IF LOADING PALLETTIZED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

5. PRIOR TO LOADING THE 7.62MM CARTRIDGE PALLETS ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. LOSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.


7. EACH PALLET UNIT MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW.

8. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FALL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

9. A TOTAL OF ELEVEN WEB STRAP TIE-DOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

<table>
<thead>
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<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.62MM PALLET</td>
<td>-10</td>
<td>31,810 LBS</td>
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LOAD AS SHOWN

7.62MM CARTRIDGE (CHIMNEY PATTERN LOAD)

PROJECT CAP-TV 4-93
**ISOMETRIC VIEW**

**TYPICAL AMMUNITION ITEMS**

<table>
<thead>
<tr>
<th>DACIC</th>
<th>ITEM</th>
<th>ITEM QUANTITY</th>
<th>LOAD QUANTITY</th>
<th>TOTAL WEIGHT</th>
</tr>
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<tr>
<td>C659</td>
<td>61MM CARTRIDGE 31.00 L X 42.00 W X 44.87 H</td>
<td>180</td>
<td>2 PALLETS</td>
<td>3,596 LBS</td>
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<tr>
<td>A072</td>
<td>5.56MM CARTRIDGE 31.00 L X 43.50 W X 39.00 H</td>
<td>30,640</td>
<td>1 Pallet</td>
<td>3,401 LBS</td>
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<tr>
<td>C955</td>
<td>84MM, AT4 ROCKET 45.87 L X 36.50 W X 39.00 H</td>
<td>20</td>
<td>1 Pallet</td>
<td>559 LBS</td>
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<tr>
<td>A576</td>
<td>25MM CTG, M721 CNTR 53.00 L X 43.00 W X 21.37 H</td>
<td>810</td>
<td>1 Pallet</td>
<td>1,515 LBS</td>
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<tr>
<td>H557</td>
<td>81MM ROCKET, LAW 41.25 L X 33.50 W X 36.87 H</td>
<td>90</td>
<td>2 PALLETS</td>
<td>759 LBS</td>
</tr>
<tr>
<td>A131</td>
<td>7.62MM CARTRIDGE 46.00 L X 35.00 W X 46.12 H</td>
<td>32,000</td>
<td>1 Pallet</td>
<td>3,181 LBS</td>
</tr>
<tr>
<td>G881</td>
<td>HAND GRENADES 45.75 L X 37.87 W X 39.25 H</td>
<td>720</td>
<td>1 Pallet</td>
<td>1,309 LBS</td>
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</tbody>
</table>

**MIXED BOXED AMMUNITION**

**PAGE 18**

**PROJECT CAP-TV 4-93**
SPECIAL NOTES:

1. A TYPICAL LOAD OF MIXED BOXED AMMUNITION IS SHOWN LOADED ON THE M1 FLATTRACK HAVING CARGO DECK DIMENSIONS OF 7'-6-1/2" WIDE BY 10'-6" LONG AND A MAXIMUM LOAD WEIGHT OF 28,750 POUNDS.

2. THE LOAD SHOWN ON PAGE 18 MAY ALSO BE LOADED ON AN A-FRAME FLATTRACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE LOAD SHOWN IS TYPICAL ONLY. IF LOADING PALLETTIZED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES. NOTE: THE PALLET LENGTH PLUS THE PALLET WIDTH CAN NOT EXCEED 7'-6-1/2".

4. PRIOR TO LOADING THE PALLETS, ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.

5. WHEN LOADING THE FLATTRACK, POSITION THE LOAD TIGHT AGAINST THE FORWARD END WALL AND CENTERED ACROSS THE WIDTH OF THE FLATTRACK.

6. EACH LATERAL ROW OF TWO PALLETS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW.

7. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. Voids SPACES BETWEEN PALLETS UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPING TO BECOME LOOSE.

8. ONLY A PARTIAL AFT END WALL IS SHOWN ON THE ISOMETRIC VIEW TO PREVENT DISTRACTION OF THE LOADING AND TIEDOWN PROCEDURES AND TO IMPROVE THE CLARITY OF THE DEPICTED PROCEDURES.

9. A TOTAL OF ELEVEN WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
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</thead>
<tbody>
<tr>
<td>MIXED PALLETS</td>
<td>9</td>
<td>14,327 LBS</td>
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</table>

MICED BOXED AMMUNITION
Indicates 4 MB13 Demo Charge Containers.

Indicates 4 J143 Rocket Motor Containers.

53.75"

Isometric View

Key Numbers

1. Web strap tie-down assembly (8 reqd). Install each strap to extend from a tie-down anchor on side of flatrack, over top of container, to a tie-down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See General Notes "F" and "G" on page 2 and Special Note 4 on page 21.

2. Web strap tie-down assembly (4 reqd). Install strap to extend from a tie-down anchor on side of flatrack, around rear container, as shown, to a tie-down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See General Notes "F" and "G" on page 2.

3. Web strap tie-down assembly (4 reqd). Install each strap to extend from a tie-down anchor on side of flatrack, over top of rocket motor box, to a tie-down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See General Notes "F" and "G" on page 2.

4. Web strap tie-down assembly (2 reqd). Install each strap to extend from a tie-down anchor on side of flatrack, diagonally over aft end of box, to a tie-down anchor on opposite side of flatrack. Position strap scuff sleeves at sharp edges. Take up excess slack in strap and then ratchet tight. See General Notes "F" and "G" on page 2.

<table>
<thead>
<tr>
<th>DODIC</th>
<th>ITEM</th>
<th>LOAD QUANTITY</th>
<th>TOTAL WEIGHT</th>
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</thead>
<tbody>
<tr>
<td>MB13</td>
<td>69.25 L X 53.75 W X 24.75 H</td>
<td>4</td>
<td>4 CMTS</td>
</tr>
<tr>
<td>J143</td>
<td>62.50 L X 22.50 W X 13.50 H</td>
<td>4</td>
<td>4 BOXES</td>
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</table>

MSBA3 Linear Demolition Charge (Miclic) Combat Configured Load for Engineers

PROJECT CAP-TV 4-93
SPECIAL NOTES:

1. A TYPICAL MICLIC DEMOLITION CHARGE COMBAT CONFIGURED LOAD FOR ENGINEERS IS SHOWN LOADED ON THE M1 FLATTRACK HAVING CARGO DECK DIMENSIONS OF 7'-6"-1/2" WIDE BY 18'-8" LONG AND A MAXIMUM LOAD WEIGHT OF 28,750 POUNDS.

2. THE LOAD SHOWN ON PAGE 20 MAY ALSO BE LOADED ON AN A-FRAME FLATTRACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. WHEN LOADING THE FLATTRACK, POSITION THE LOAD RIGHT AGAINST THE FORWARD END WALL AND CENTERED ACROSS THE WIDTH OF THE FLATTRACK.

4. EACH CONTAINER MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP.

5. ALL CONTAINERS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN CONTAINERS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

6. ONLY A PARTIAL AFT END WALL IS SHOWN ON THE ISOMETRIC VIEW TO PREVENT DISTRACTION OF THE LOADING AND TIE-DOWN PROCEDURES AND TO IMPROVE THE CLARITY OF THE DEPICTED PROCEDURES.

7. A TOTAL OF FIFTEEN WEB STRAP TIE-DOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
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<tbody>
<tr>
<td>DEMO CHARGE</td>
<td>-4</td>
<td>11,800 LBS</td>
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<tr>
<td>ROCKET MOTOR</td>
<td>-4</td>
<td>800 LBS</td>
</tr>
<tr>
<td>TOTAL WEIGHT</td>
<td>-</td>
<td>12,600 LBS</td>
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</table>
KEY NUMBERS

1. WEB STRAP TIEDOWN ASSEMBLY (2 REQD.). HOOK TWO STRAPS TOGETHER AND ENCIRCLE ALL FOUR STINGER PALLET SETS AT TWO PLACES. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 23.

2. WEB STRAP TIEDOWN ASSEMBLY (2 REQD.). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIEDOWN ANCHOR ON SIZE OF FLATPACK, OVER TOP OF TWO HIGH PALLETS, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF FLATPACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 8 ON PAGE 23.

3. WEB STRAP TIEDOWN ASSEMBLY (1 REQD.). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIEOWN ANCHOR ON SIZE OF FLATPACK, AROUND PALLETS BASES IN SECOND LAYER, TO A TIEOWN ANCHOR ON OPPOSITE SIDE OF FLATPACK Position STRAP SCUFF SLEEVES AT SHARP EDGES, TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

4. WEB STRAP TIEDOWN ASSEMBLY (6 REQD.). INSTALL EACH STRAP TO EXTEND FROM A TIEOWN ANCHOR ON SIZE OF FLATPACK OVER TOP OF ONE HIGH PALLETS, TO A TIEOWN ANCHOR ON OPPOSITE SIZE OF FLATPACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 9 ON PAGE 23.

5. WEB STRAP TIEDOWN ASSEMBLY (1 REQD.). INSTALL STRAP TO EXTEND FROM A TIEOWN ANCHOR ON SIZE OF FLATPACK, AROUND PALLETS BASE OF REAR PALLET, TO A TIEOWN ANCHOR ON OPPOSITE SIDE OF FLATPACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.
1. A TYPICAL COMBAT CONFIGURED LOAD FOR AIR DEFENSE ARTILLERY IS SHOWN LOADED ON THE A1 FLATPACK HAVING CARDED DECK DIMENSIONS OF 7'-6"-1/2" WIDE BY 10'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 28,750 POUNDS.

2. THE LOAD AS SHOWN ON PAGE 22 MAY ALSO BE LOADED ON THE A-FRAME FLATPACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE PALLET/SKIDDED UNITS SHOWN ARE TYPICAL ONLY. IF LOADING UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

4. PRIOR TO LOADING THE PALLET/SKIDDED UNITS, ASSURE THAT ALL STEEL STRAPPING IS IN POSITION AND IS TIGHT. MISSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.

5. WHEN LOADING THE FLATPACK, POSITION THE LOAD TIGHT AGAINST THE FORWARD END WALL AND CENTERED ACROSS THE WIDTH OF THE FLATPACK. ASSURE THAT THE TOP LAYER PALLET/SKIDDED UNITS ARE IN VERTICAL ALIGNMENT WITH THE BOTTOM LAYER PALLET/SKIDDED UNITS.

6. ALL PALLET/SKIDDED UNITS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUdinally. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET/SKIDDED UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

7. EACH LATERAL ROW OF TWO HIGH PALLET/SKIDDED UNITS MUST BE UNITIZED AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED (1) AND SECURED TO THE FLATPACK AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED (2).

8. EACH LATERAL ROW OF ONE, TWO, OR FOUR PALLETS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW.

9. ONLY A PARTIAL AFT END WALL IS SHOWN ON THE ISOMETRIC VIEW TO PREVENT DISTRACTION OF THE LOADING AND TIEDOWN PROCEDURES AND TO IMPROVE THE CLARITY OF THE DEPICTED PROCEDURES.

10. A TOTAL OF SEVENTEEN WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Col.</td>
<td>1</td>
<td>9,007 LBS</td>
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</table>

COMBAT CONFIGURED LOAD FOR AIR DEFENSE ARTILLERY

PROJECT CAP-TV 4-93
INDICATES 10 C445 105MM CARTRIDGE PALLETS.

36.37"}

48.00"

ISOMETRIC VIEW

AFT END.

KEY NUMBERS

1. WEB STRAP TIE DOWN ASSEMBLY (12 REQD). INSTALL EACH STRAP TO EXTEND FROM A TIE DOWN ANCHOR ON SIDE OF FLATRACK OVER TOP OF PALLETS. TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SLEEVE AT SHARP EDGES, TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 25.

2. WEB STRAP TIE DOWN ASSEMBLY (1 REQD). INSTALL STRAP TO EXTEND FROM A TIE DOWN ANCHOR ON SIDE OF FLATRACK. AROUND PALLETS BASE OF REAR ROW AS SHOWN. TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SLEEVE AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

TYPICAL AMMUNITION ITEM

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<td>C445</td>
<td>105MM CARTRIDGE</td>
<td>48.00 L X 35.37 W X 36.75 H</td>
<td>10 PALLETS</td>
<td>21,111 LBS</td>
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PROJECT CAP-TV 4-93
SPECIAL NOTES:

1. A TYPICAL LOAD OF 10 PALLETS OF 105MM CARTRIDGES IS SHOWN LOADED ON THE A-FRAME FLATTRACK HAVING CARGO DECK DIMENSIONS OF 7'-6-1/2" WIDE BY 18'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. THE LOAD AS SHOWN ON PAGE 24 MAY ALSO BE LOADED ON AN M1 FLATTRACK. SEE GENERAL NOTE "C" ON PAGE 2.


4. THE PALLET SHOWN IS TYPICAL ONLY. IF LOADING PALLETED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

5. PRIOR TO LOADING THE 105MM PALLETS, ASSURE THAT ALL STEEL STRAPPING IS IN POSITION AND IS TIGHT. MISSED AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.


7. EACH PALLET MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW, BECAUSE THE PALLETS ARE OFFSET LATERALLY, SOME PALLETS WILL HAVE THREE STRAPS OVER THE TOP.

8. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET/SCREWED UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

9. A TOTAL OF THIRTEEN WEB STRAP TIES/SPANS ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

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<tr>
<th>ITEM</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>105MM PALLET</td>
<td>-10</td>
<td>21,111 LBS</td>
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</tbody>
</table>

105MM CARTRIDGES IN WOODEN BOXES

PROJECT CAP-TV 4-93
INDICATES 15 C445 105mm CARTRIDGE PALLETS.

KEY NUMBERS

1. WEB STRAP TIE-DOWN ASSEMBLY (6 PEO). HOOK TWO STRAPS TOGETHER AND ENCIRCLE EACH STACK OF FOUR PALLETS AT TWO PLACES. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 27.

2. WEB STRAP TIE-DOWN ASSEMBLY (6 PEO). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIE-DOWN ANCHOR ON SIDE OF FLATTRACK, OVER TOP OF LOAD, TO A TIE-DOWN ANCHOR ON OPPOSITE SIDE OF FLATTRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 27.

3. WEB STRAP TIE-DOWN ASSEMBLY (6 PEO). INSTALL EACH STRAP TO EXTEND FROM A TIE-DOWN ANCHOR ON SIDE OF FLATTRACK, OVER TOP OF ONE HIGH PALLET, TO A TIE-DOWN ANCHOR ON OPPOSITE SIDE OF FLATTRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 8 ON PAGE 27.

4. WEB STRAP TIE-DOWN ASSEMBLY (1 PEO). INSTALL STRAP TO EXTEND FROM A TIE-DOWN ANCHOR ON SIDE OF FLATTRACK, AROUND PALLET BASE OF REAR PALLET, TO A TIE-DOWN ANCHOR ON OPPOSITE SIDE OF FLATTRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

5. WEB STRAP TIE-DOWN ASSEMBLY (2 PEO). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIE-DOWN ANCHOR ON SIDE OF FLATTRACK, AROUND PALLET BASES AT FRONT AND REAR END OF SECOND LAYER, TO A TIE-DOWN ANCHOR ON OPPOSITE SIDE OF FLATTRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

TYPICAL AMMUNITION ITEM

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<th>LOT QUANTITY</th>
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<tbody>
<tr>
<td>C445</td>
<td>105mm CARTRIDGE</td>
<td>46.00 L X 35.37 W X 44.87 H</td>
<td>800</td>
<td>15 PALLETS</td>
</tr>
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</table>

PROJECT CAP-TV 4-93
SPECIAL NOTES:

1. A TYPICAL PARTIAL LOAD OF 15 PALLETS OF 105MM CARTRIDGES IS SHOWN LOADED ON THE A-FRAME FLATTRACK HAVING CARGO DECK DIMENSIONS OF 7'-6"-1/2" WIDE BY 18'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 36,000 POUNDS.

2. IF LOADING AN R1 FLATTRACK HAVING A MAXIMUM LOAD WEIGHT OF 26,750 POUNDS, Omit THE REARMOST TWO PALLETS FROM THE TOP LAYER. THIS WILL REDUCE THE QUANTITY FROM 15 PALLETS TO 13 PALLETS AND THE LOAD WEIGHT FROM 31,885 POUNDS TO 27,443 POUNDS. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE PALLETS SHOWN IS TYPICAL ONLY. IF LOADING PALLETTIZED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

4. PRIOR TO LOADING THE PALLETS, ASSURE THAT ALL STEEL STRAPPING ON EACH PALLETS IS IN POSITION AND IS TIGHT. MISSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.

5. WHEN LOADING THE FLATTRACK, POSITION THE LOAD TIGHT AGAINST THE A-FRAME AND CENTERED ACROSS THE WIDTH OF THE FLATTRACK. ASSURE THAT THE TOP LAYER PALLETS ARE IN VERTICAL ALIGNMENT WITH THE BOTTOM LAYER PALLETS.

6. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPS TO BECOME LOOSE.

7. EACH LATERAL ROW OF FOUR PALLETS MUST BE UNITIZED AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED (1) AND SECURED TO THE VEHICLE AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED (2). STRAPS MARKED (2) MAY BE CROSSED AND/OR POSITIONED STRAIGHT OVER THE TOP OF A ROW.

8. EACH LATERAL ROW OF ONE OR TWO PALLETS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW.

9. A TOTAL OF THIRTY-THREE WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

<table>
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<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
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<tbody>
<tr>
<td>105MM PALLET</td>
<td>15</td>
<td>31,885 LBS</td>
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105MM CARTRIDGES IN WOODEN BOXES (TWO HIGH)
WEB STRAP TIEDOWN ASSEMBLY (5 REDD). HOOK TWO STRAPS TOGETHER AND ENCIRCLE EACH STACK OF FOUR PALLETS AT TWO PLACES. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 29.

WEB STRAP TIEDOWN ASSEMBLY (5 REDD). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIEEDOWN ANCHOR ON SIDE OF FLATRACK, OVER TOP OF LOAD, TO A TIEEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 29.

WEB STRAP TIEDOWN ASSEMBLY (4 REDD). INSTALL EACH STRAP TO EXTEND FROM A TIEEDOWN ANCHOR ON SIDE OF FLATRACK, OVER TOP OF ONE HIGH PALLETS, TO A TIEEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 8 ON PAGE 29.

WEB STRAP TIEDOWN ASSEMBLY (1 REDD). INSTALL STRAP TO EXTEND FROM A TIEEDOWN ANCHOR ON SIDE OF FLATRACK, AROUND PALLETS BASES OF REAR PALLETS IN BOTTOM LAYER, TO A TIEEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WEB STRAP TIEDOWN ASSEMBLY (2 REDD). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIEEDOWN ANCHOR ON SIDE OF FLATRACK, AROUND PALLETS BASES AT FORWARD AND REAR END OF SECOND LAYER, TO A TIEEDOWN ANCHOR ON OPPOSITE SIDE OF FLATRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

**TYPICAL AMMUNITION ITEM**

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<tr>
<td>105MM CARTRIDGE IN PA117 CONTAINER (TWO HIGH)</td>
<td>480</td>
<td>30,128 LBS</td>
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**KEY NUMBERS**

1. INDICATES TIEEDOWN ANCHOR.
2. INDICATES 16 CS24 105MM CARTRIDGE PALLETS.
3. ISOMETRIC VIEW.
4. AFT END.
SPECIAL NOTES:

1. A TYPICAL PARTIAL TWO HIGH LOAD OF 18 PALLETS OF 105MM CARTRIDGE IS SHOWN LOADED ON THE A-FRAME FLATTRACK HAVING CARD DECK DIMENSIONS OF 7'-6-1/2" WIDE BY 18'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 32,000 POUNDS.

2. IF LOADING AN MIL FLATTRACK HAVING A MAXIMUM LOAD WEIGHT OF 26,750 POUNDS, ONLY ONE OF THE REARPOST TWO PALLETS AND TURN THE REMAINING PALLETS 90 DEG THE 42.00" DIMENSION II PARALLEL TO THE SIDES OF THE FLATTRACK IN LIEU OF THE 44.50" DIMENSION. THIS WILL REDUCE THE QUANTITY FROM 18 PALLETS TO 15 PALLETS AND THE LOAD WEIGHT FROM 32,120 POUNDS TO 26,245 POUNDS. ALSO, IT WILL REDUCE THE LOAD LENGTH FROM 18'-6-1/2" TO 18'-4". SEE GENERAL NOTE "C" ON PAGE 2.

3. THE PALLET SHOWN IS TYPICAL ONLY. IF LOADING PALLETTIZED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

4. PRIOR TO LOADING THE PALLETS, ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.

5. WHEN LOADING THE FLATTRACK, POSITION THE LOAD TIGHT AGAINST THE A-FRAME AND CENTERED ACROSS THE WIDTH OF THE FLATTRACK. ASSURE THAT THE TOP LAYER PALLETS ARE IN VERTICAL ALIGNMENT WITH THE BOTTOM LAYER PALLETS.

6. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDELY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPS TO BECOME LOOSE.

7. EACH LATERAL ROW OF FOUR PALLETS MUST BE UNITIZED AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED 1) AND SECURED TO THE VEHICLE AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED 2). STRAPS MARKED 2) MAY BE CROSSED AND/OR POSITIONED STRAIGHT OVER THE TOP OF A ROW.

8. EACH LATERAL ROW OF TWO PALLETS MUST BE SECURED WITH TWO WEB STRAPS OVER THE TOP AS SHOWN. THESE TWO STRAPS MAY BE CROSSED AND/OR POSITIONED STRAIGHT ACROSS THE TOP OF A ROW.

9. A TOTAL OF THIRTY-THREE WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

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<td>-- -- --</td>
<td>16 -- -- -- -- 30,120 LBS</td>
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105MM CARTRIDGE IN PALLET CONTAINER (TWO HIGH)

PROJECT CAP-TV 4-93
INDICATE STRAP TIE DOWN ANALOR.

ISOMETRIC VIEW

KEY NUMBERS

1. WEB STRAP TIE DOWN ASSEMBLY (8 REQD). HOOK TWO STRAPS TOGETHER AND ENCIRCLE EACH STACK OF FOUR PALLETS AT TWO PLACES. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 31.

2. WEB STRAP TIE DOWN ASSEMBLY (8 REQD). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIE DOWN ANCHOR ON SIDE OF FLAT TRACK, OVER TOP OF LOAD, TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLAT TRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2 AND SPECIAL NOTE 7 ON PAGE 31.

3. WEB STRAP TIE DOWN ASSEMBLY (1 REQD). INSTALL STRAP TO EXTEND FROM A TIE DOWN ANCHOR ON SIDE OF FLAT TRACK, AROUND PALLETS IN BOTTOM LAYER, TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLAT TRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

4. WEB STRAP TIE DOWN ASSEMBLY (2 REQD). HOOK TWO STRAPS TOGETHER AND INSTALL TO EXTEND FROM A TIE DOWN ANCHOR ON SIDE OF FLAT TRACK, AROUND PALLETS BASED IN SECOND LAYER AT FORWARD AND REAR END OF LOAD, TO A TIE DOWN ANCHOR ON OPPOSITE SIDE OF FLAT TRACK. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

TYPICAL AMMUNITION ITEM

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<td>155MM PROP CHARGE</td>
<td>800</td>
<td>16 PALLETS</td>
<td>26,296</td>
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PROJECT CAP-TV 4-93
SPECIAL NOTES:

1. A TYPICAL TWO HIGH LOAD OF 18 PALLETS OF 155MM PROPELLING CHARGE CONTAINERS IS SHOWN LOADED ON THE A-FRAME FLATTRACK HAVING CARGO DECK DIMENSIONS OF 7-6-1/2" WIDE BY 19'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. THE LOAD AS SHOWN ON PAGE 30 MAY ALSO BE LOADED ON AN M1 FLATTRACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE PALLET SHOWN IS TYPICAL ONLY. IF LOADING PALLETTIZED UNITS OF OTHER ITEMS, SIZES, OR QUANTITIES, FOLLOW THESE SAME PROCEDURES.

4. PRIOR TO LOADING THE 155MM PALLETS, ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.

5. WHEN LOADING THE FLATTRACK, POSITION THE LOAD TIGHT AGAINST THE A-FRAME AND CENTERED ACROSS THE WIDTH OF THE FLATTRACK. ASSURE THAT THE TOP LAYER PALLETS ARE IN VERTICAL ALIGNMENT WITH THE BOTTOM LAYER PALLETS.

6. ALL PALLETS MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY. THIS WILL REDUCE LOAD MOVEMENT AND THE QUANTITY OF WEB STRAPS REQUIRED TO SECURE THE LOAD. VOID SPACES BETWEEN PALLET UNITS WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPS TO BECOME LOOSE.

7. EACH LATERAL ROW OF FOUR PALLETS MUST BE UNITIZED AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED (1) AND SECURED TO THE VEHICLE AT TWO LOCATIONS WITH WEB STRAP TIEDOWN ASSEMBLIES MARKED (2). STRAPS MARKED (1) MAY BE CROSSED AND/OR POSITIONED STRAIGHT OVER THE TOP OF A ROW.

8. A TOTAL OF THIRTY-SEVEN WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD AS SHOWN.

LOAD AS SHOWN

<table>
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<th>ITEM</th>
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<tbody>
<tr>
<td>155MM PC PALLET</td>
<td>15</td>
<td>28,258 LBS</td>
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155MM PROPELLING CHARGE CONTAINERS (TWO HIGH)

PROJECT CAP-TV 4-93
SPECIAL NOTES:

1. TYPICAL METHODS OF SECURING LOOSE PROPPELLING CHARGE CONTAINERS ON TOP OF A PALLETIZED UNIT, ON THE FLOOR OF THE FLATrack, AND ON A PALLET ARE SHOWN LOADED ON THE 8-FOOT FLATrack HAVING CARRIAGE ON 20"-0" WIDE BY 18'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. THE PROCEDURES FOR SECURING LOOSE PROPPELLING CHARGE CONTAINERS SHOWN ON PAGE 32 MAY ALSO BE USED ON THE MI FLATrack. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE PROPPELLING CHARGE CONTAINER SHOWN IS TYPICAL ONLY AND THESE METHODS MAY BE USED FOR SECURING CHARGE CONTAINERS OF DIFFERENT SIZES AND WEIGHTS.

4. ONE METHOD SHOWN ON PAGE 32 DEPICTS SECUREMENT OF NINE LOOSE 0676 8-INCH MID SERIES PROPellan CHARGE CONTAINERS ON TOP OF A FULL PALLET OF SIXTEEN CONTAINERS WHICH IS SECURED TO THE FLATrack. HOLD-DOWN STRAPS MARKED (b) ARE POSITIONED OVER TOP OF THE PALLETIZED UNIT AND MAY BE POSITIONED OVER TOP OF THE LOOSE PROPPELLING CHARGE CONTAINERS ON TOP OF A PALLETIZED UNIT. SEE KEY NUMBERS (a) AND (b) ON PAGE 2 FOR GUIDANCE WHEN LOADING THE LOOSE PROPPELLING CHARGE CONTAINERS ON TOP OF PALLETIZED UNITS.

5. WHEN LOADING LOOSE PROPPELLING CHARGE CONTAINERS ON TOP OF A PALLETIZED UNIT ASSURE THAT ALL LOOSE CONTAINERS ARE SECURED BY MANually GUIDING CONTAINERS INTO A TIGHT CONFIGURATION AS THE TWO HOLD-DOWN STRAPS MARKED (b) ARE BEING TIGHTENED. CHECK BUNDLE TO MAKE SURE ALL LOOSE CONTAINERS ARE SECURED. NOTE: WHEN USING THIS METHOD, POSITION ONE THROUGH ONE ROW OF LOADS CONTAINERS ON THE FIRST LAYER OF THE BUNDLE. IF THERE ARE NOT ENOUGH CONTAINERS FOR A FULL SECOND LAYER, THEY MUST BE POSITIONED ON TOP OF A DIFFERENT PALLET OR PALLETIZED UNIT. A FULL SECOND LAYER CONSISTS OF FIVE LOOSE CONTAINERS. THE SECOND FULL LAYER WOULD HAVE TO CONSIST OF FOUR CONTAINERS.

6. ALL LOOSE CONTAINERS POSITIONED ON TOP OF A PALLETIZED UNIT MUST FORM A TIGHT BUNDLE AFTER STRAPS MARKED (b) ARE TIGHTENED. TIGHTENING ON THE FIRST LAYER AND MIGHT CONSTITUTE OF FOUR CONTAINERS, TWO ADDITIONAL WEB STRAP ASSEMBLIES WHICH ENCLOSE ALL LOOSE CONTAINERS WITHIN THE BUNDLE ARE REQUIRED.

7. A SECOND METHOD SHOWN ON PAGE 32 DEPICTS SECUREMENT OF TWENTY LOOSE 0676 8-INCH MID SERIES PROPellan CHARGE CONTAINERS AS SHOWN ON THE FLOOR OF THE FLATrack. THE QUANTITY OF CONTAINERS WITHIN A BUNDLE MAY BE A MINIMUM OF FIVE, UP TO A QUANTITY THAT CAN BE ENCLOSED WITH ONE WEB STRAP TIEDOWN ASSEMBLY MARKED (a). IF LOADING CONTAINERS OF OTHER DIMENSIONS AND QUANTITIES, FOLLOW THESE SAME PROCEDURES.

8. LOOSE PROPPELLING CHARGE CONTAINERS OF DIFFERENT LENGTHS AND DIAMETERS MAY BE MIXED WITHIN THE SAME BUNDLE, AS LONG AS THEY ARE POSITIONED IN SUCH A MANNER THAT ALL THE CONTAINERS WITHIN THE COMPLETED BUNDLE ARE HELD TIGHT. IN GENERAL, IT IS BEST TO POSITION THE LARGER CONTAINERS ON THE BOTTOM AND THE SMALLER CONTAINERS ON THE TOP. SHORT CONTAINERS SHOULD BE CENTERED ON LONG CONTAINERS AND, WHEN POSSIBLE, POSITIONED IN SUCH A MANNER THAT THE ROLLING FLANGES AND BELL ENDS WILL "LOCK" IN ON OTHER CONTAINERS AND HELP SECURE THE BUNDLE. NOTE: AFTER A BUNDEL OF MIXED PROPPELLING CHARGE CONTAINERS HAS BEEN SECURED IT MAY BE POSSIBLE TO MANUALLY "MIDGEL" A CONTAINER WITHIN THE BUNDLE. THIS IS ACCEPTABLE AS LONG AS THE CONTAINER CANNOT BE MANUALLY PULLED OUT OF THE BUNDLE AND IT STAYS IN PLACE DURING TRANSPORT.

9. A THIRD METHOD SHOWN ON PAGE 32 DEPICTS SECUREMENT OF NINE LOOSE 0676 8-INCH MID SERIES PROPellan CHARGE CONTAINERS POSITIONED ON A PALLET AS SHOWN. THE QUANTITIES CONTAINERS ON ONE PALLET MAY BE ONE UP TO A QUANTITY THAT CAN BE ENCLOSED WITH ONE WEB STRAP TIEDOWN ASSEMBLY MARKED (a).

10. ALL LOOSE CONTAINERS POSITIONED ON TOP OF A PALLET MUST FORM A TIGHT BUNDLE AFTER STRAPS MARKED (b) ARE TIGHTENED. IF CONTAINERS DO NOT FORM A TIGHT BUNDLE OR IF CONTAINERS OF DIFFERENT SIZES ARE BEING POSITIONED ON TOP OF THE SAME PALLET, TWO ADDITIONAL WEB STRAP TIEDOWN ASSEMBLIES MARKED (a) ON THE LOAD ON PAGE 32 ARE REQUIRED. SEE KEY NUMBERS (a), (b), AND (c) ON THIS PAGE FOR ADDITIONAL GUIDANCE.

WEB STRAP TIEDOWN ASSEMBLY (TWO REQUIRED FOR EACH BUNDLE OF LOOSE PROPPELLING CHARGE CONTAINERS). INSTALL EACH STRAP FROM A TIEDOWN ANCHOR ON SIDE OF FLATrack TO A TIEDOWN ANCHOR OPPOSITE SIDE OF FLATrack. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL EACH STRAP FROM A TIEDOWN ANCHOR ON SIDE OF FLATrack, TO A TIEDOWN ANCHOR OPPOSITE SIDE OF FLATrack. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL EACH STRAP FROM A TIEDOWN ANCHOR ON SIDE OF FLATrack, TO A TIEDOWN ANCHOR OPPOSITE SIDE OF FLATrack. ATTACH WEB STRAP TIEDOWN ASSEMBLY MARKED (a) TO THE TIEDOWN ANCHOR PRIOR TO RATCHETING WEB STRAP TIEDOWN ASSEMBLIES MARKED (b) TIGHT. THE TWO BUNDLE MARKED (b) AT THE SAME TIME. NO: THESE STRAPS SHOULD ALWAYS BE POSITIONED BETWEEN THE BELL END OF A CONTAINER AND THE ROLLING FLANGE ON THE OPPOSITE END OF THE SAME CONTAINER, DUE TO LOCATION OF TIEDOWN ANCHORS, IT MAY BE NECESSARY TO ANGLE THE STRAPS AT ANGLE TO MEET THIS REQUIREMENT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL EACH STRAP FROM A TIEDOWN ANCHOR ON SIDE OF FLATrack, TO A TIEDOWN ANCHOR OPPOSITE SIDE OF FLATrack. TAKE UP SLACK IN STRAP AND RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WEB STRAP TIEDOWN ASSEMBLY (2 REQD). INSTALL EACH STRAP FROM A TIEDOWN ANCHOR ON SIDE OF FLATrack, TO A TIEDOWN ANCHOR OPPOSITE SIDE OF FLATrack. TAKE UP SLACK IN STRAP AND RATCHET TIGHT. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.

WOOD PALLETS 40" X 48" (1 REQD). SEE KEY NUMBER (a) ABOVE.

(Advertisement for 8-INCH PROPPELLING CHARGE CONTAINERS)
INDICATES NINE LOOSE CS24 CARTRIDGES PACKED IN PA104 SERIES CONTAINERS, POSITIONED ON TOP OF A FULL Pallet UNIT OF CS24 CARTRIDGES IN PA104 CONTAINERS.

INDICATES ELEVEN LOOSE CS24 105MM CARTRIDGES PACKED IN PA104 SERIES CONTAINERS ON A 40" X 48" Pallet.

INDICATES FIVE LOOSE CS24 105MM CARTRIDGES PACKED IN PA104 SERIES CONTAINERS.

AFT END.

SPECIAL NOTES:

1. TYPICAL METHODS OF SECURING LOOSE CARTRIDGE CONTAINERS ON TOP OF A PALLETED UNIT, ON THE FLOOR OF THE FLATTRACK, AND ON A 40" X 48" Pallet, ARE SHOWN LOADED ON THE FLATTRACK HAVING CARGO DECK DIMENSIONS OF 7'-6-1/2" WIDE BY 19'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 Pounds.

2. THE PROCEDURES FOR SECURING LOOSE 105MM AND/OR 120MM CARTRIDGE CONTAINERS SHOWN ON THIS PAGE MAY ALSO BE USED FOR THE M1 FLATTRACK. SEE GENERAL NOTE "C" ON PAGE 2.

3. THE 105MM CARTRIDGE PACKED IN THE PA104 SERIES CONTAINER HAVING DIMENSIONS OF 45-5/8" LONG BY 7-1/8" WIDE BY 7-1/8" HIGH WITH STACKING LUGS LOCATED ON THE BELL AT THE OPENING END AND THE COLLAR AT THE OPPOSITE END IS SHOWN. THESE PROCEDURES MAY BE USED FOR SIMILAR CONTAINERS OF DIFFERENT SIZES AND WEIGHTS.

4. GUIDANCE FOR LOADING LOOSE CONTAINERS THAT HAVE STACKING LUGS LOCATED ON THE BELL AT THE OPENING END AND THE COLLAR AT THE OPPOSITE END, SUCH AS THE PA104 SERIES CONTAINER:

A. WHEN LOADING TWO CONTAINERS, SIDE-BY-SIDE, POSITION THE STACKING LUG ON THE SIDE SO IT LOCKS INTO THE STACKING LUG RETAINING HOLE ON THE ADJACENT CONTAINER. USE THIS PROCEDURE WHEN LOADING TWO CONTAINERS SIDE-BY-SIDE ON THE FLATTRACK FLOOR, ON A Pallet, OR ON TOP OF A PALLETED UNIT.


STACING LUGS ON THE CONTAINERS IN THE SECOND LAYER SO THEY LOCK INTO THE STACKING LUG RETAINING HOLE ON THE ADJACENT CONTAINER. POSITION THE CONTAINERS IN THE SECOND LAYER TO CENTER ON THE JOINTS BETWEEN THE CONTAINERS IN THE BOTTOM LAYER. USE THIS METHOD WHEN LOADING CONTAINERS ON ALL PALLETS, ON THE FLATTRACK FLOOR, OR ON TOP OF A PALLETED UNIT.

5. WOOD PALLETS HAVING DIMENSIONS OF 40" X 48" ARE SHOWN IN THE LOAD ABOVE. HOWEVER, THE METHODS SHOWN MAY BE USED FOR WOOD PALLETS OF OTHER DIMENSIONS AND/OR METAL PALLETS.

6. THE QUANTITY OF CONTAINERS WITHIN A BUNDLE IS LIMITED TO THE QUANTITY THAT CAN BE ENCIRCLED WITH ONE WEB STRAP TIE-DOWN ASSEMBLY, SHOWN AS KEY NUMBER 6 ABOVE.

7. IF THE BUNDLE OF CONTAINERS LOADED ON A 40" X 48" PALLET DOES NOT OVERHANG THE PALLET ON EACH SIDE, TEC ADDITIONAL STRAPS ARE REQUIRED. INSTALL THESE TWO STRAPS TO ENCIRCLE THE LOOSE CONTAINERS AT TWO LOCATIONS. SEE KEY NUMBER 7 ON PAGE 35 FOR GUIDANCE.

8. HOLD-DOWN STRAPS MARKED 8 ARE POSITIONED OVER TOP OF THE PALLETIZED UNIT AND MUST NOT BE POSITIONED OVER TOP OF THE LOOSE CONTAINERS ON TOP OF A PALLETIZED UNIT. SEE KEY NUMBERS 8 THRU 10 ON PAGE 35 FOR GUIDANCE WHEN LOADING LOOSE CONTAINERS ON TOP OF PALLETED UNITS.

9. THE QUANTITY OF LOOSE CONTAINERS POSITIONED ON TOP OF A PALLETIZED UNIT IS ONE CONTAINER UP TO A MAXIMUM OF TWO FULL LAYERS OF CONTAINERS. SEE SPECIAL NOTE 10 ON THIS PAGE.

10. WHEN LOADING LOOSE CONTAINERS ALWAYS POSITION ALL CONTAINERS WITH THE OPENING ENDS POINTING IN THE SAME DIRECTION.

11. IF LOADING ONE THRU FIVE CONTAINERS ON TOP OF A PALLET UNIT, OMIT STRAPS MARKED 6.
KEY NUMBERS

1. Web Strap Tiedown Assembly (2 required for each bundle of 6 or more loose containers). Install each strap to encircle all containers in the bundle. Pre-position these two straps on the side of the flatrack in line with the tie-down anchors to be used, prior to loading the containers. Make sure the straps are laid flat across the floor, with the ratchet handle facing down, and draped over the side of the flatrack. Position both strap ratchets on the opposite side of the flatrack. Position both strap ratchets on the same side of the flatrack. Position two eight-five-loose containers on the floor, centered over top of both straps. While holding containers in position, bring each end of strap up, cross ends over top of bundle, and attach ends of strap to tiedown anchors on opposite sides of the flatrack. Take up slack in strap and then ratchet tight both straps at the same time. As the straps are being tightened, make position adjustments to the containers, if necessary so they form a compact tight bundle. See general notes “F” and “G” on page 2.

2. Web Strap Tiedown Assembly (2 required for each bundle of six or more loose containers). Install each strap to encircle all containers and top deck of pallet, prior to positioning containers on pallet, thread straps marked “G” under top deck of pallet with both ratchet ends on same side of pallet. Make sure straps lay flat with no twists in them. Position the containers are positioned on the pallet, bring ends of straps up over top of containers and hook ends of strap together. Adjust straps so that they lay flat close to the bell on one end and the collar on the opposite end of containers. Take up excess slack in straps and ratchet tight both straps at the same time. See general notes “F” and “G” on page 2.

3. Web Strap Tiedown Assembly (2 required for each bundle of containers secured on a pallet). Install each strap from a tiedown anchor on side of flatrack, over top of containers, to a tiedown anchor on opposite side of flatrack. Position both strap ratchets on the same side of the flatrack. Attach web strap tiedown assemblies marked “G” to the opposite side of the flatrack. Position both strap ratchets on the opposite side of the pallet, thread straps marked “G” under top deck of the pallet with both ratchet ends on the same side of the pallet. Make sure that the straps lay flat with no twists in them. Position the containers are positioned on the pallet, bring ends of straps up over top of containers and hook ends of strap together. Adjust straps so that they lay flat close to the bell on one end and the collar on the opposite end of containers. Take up excess slack in straps and ratchet tight both straps at the same time. See general notes “F” and “G”, and “M” on page 2.

4. Web Strap Tiedown Assembly (2 required for each pallet). Install each strap from a tiedown anchor on side of flatrack, around end of pallet at each location anchor and on the opposite side of the flatrack. If these straps are being attached to the same tiedown anchors as straps marked “G”, do not attach to the same tiedown anchors that the non-ratchet ends of straps marked “G” are attached to. Take up slack in straps and ratchet tight. See general notes “F”, “G”, and “N” on page 2.

5. Web Strap Tiedown Assembly (2 required). Install each strap to extend from a tiedown anchor on side of flatrack, around end of pallet, to a tiedown anchor on opposite side of flatrack. Take up excess slack in strap and then ratchet tight. Note: Straps marked “G” must be installed over top of the palletized unit prior to positioning the loose containers on top of the palletized unit. See general notes “F” and “G” on page 2.

(continued at right)

105MM CARTRIDGE CONTAINERS

PROJECT CAP-TV 4-93

PAGE 35
9. When loading loose complete round containers always position ALL containers on top of a palletized unit with the openings ends pointing in the same direction.

10. If loading one thru five containers on top of a pallet unit only strap marked 

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**SPECIAL NOTES:**

1. Typical methods of securing loose cartridge containers on top of a palletized unit on the floor of the flatrack, and on a 40" X 48" pallet, are shown loaded on the A-frame flatrack having cargo deck dimensions of 7-5/8" wide by 18'-0" long and a maximum load weight of 33,000 pounds.

2. The procedures for securing loose 120mm cartridge containers shown on this page may also be used on the M1 flatrack. See general note "A" on page 2.

3. The 120mm cartridge packed in the PALL SERIES Containers having dimensions of 44-1/2" long by 7-3/4" wide by 7-3/4" high with stacking lugs located on the bell at the opening end and the collar at the opposite end and also having ring interlocks located on the center collar and the collar on the non-opening end, is shown. These procedures may be used for similar complete round containers of different sizes and weights.

4. Guidance for loading loose containers that have stacking lugs located on the bell at the opening end and the collar at the opposite end, and ring interlocks located on the center collar and the collar on the non-opening end, such as the PALL SERIES CONTAINERS follows:

   A. When loading two or three containers side-by-side, position the stacking lugs on the sides so it locks into the stacking lug retaining hole on the adjacent container. Use this procedure when loading two or three containers on the flatrack floor, on a pallet, or on top of a palletized unit.

   B. When loading an even number of containers such as four, six or twenty-four, position in even rows and stack as shown for the twenty container bundle of PALL SERIES CONTAINERS on this page. Position in even number layers with the stacking lugs on top so they lock into the stacking lug container hole on the top container. Also, the ring interlocks must be engaged with the ring interlocks on adjacent containers. Use this method when loading an even number of containers on a pallet, on the flatrack floor, or on top of a palletized unit.

(Continued at right)

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**ISOMETRIC VIEW**

**INDICATES TWENTY-SEVEN LOOSE C787 120MM CARTRIDGES PACKED IN PALL SERIES CONTAINERS.**

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**INDICATES TWENTY LOOSE C787 120MM CARTRIDGES PACKED IN PALL SERIES CONTAINERS, ON A 40" X 48" Pallet.**

**INDICATES TIEDOWN ANCHOR.**

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**NOTE:** Sometimes an even number of containers will not divide into an even number of layers that are practical to load, such as twenty-six. It may be necessary to fabricate one bundle of eighteen containers (three layers of six containers each) and one bundle of eight containers (two layers of four containers each).

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**C.** When loading an uneven number of containers such as twenty-seven, fabricate a bundle having at least four layers of which the bottom three layers would have the same quantity of containers per each layer and the top layer would have one less container, as shown on this page. Note: When fabricating a bundle having an uneven number of containers, the top layer can only have one less container than the bottom layers. Follow the instructions in special note 3 B on this page when loading the first three layers of seven containers each. When loading the top layer of six containers position the second layer to center on the joints between the containers in the third layer and in such a manner that the bell is located behind and butted against the bells on the third layer containers. This will prevent the top layer container bells from slipping off the first layer container bells during transit. Position the stacking lugs on the side of the containers in the top layer so they lock into the stacking lug retaining hole on adjacent containers. Use this method when loading an uneven number of containers on a pallet, on the vehicle floor, or on top of a palletized unit.

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**5.** Wood pallets having dimensions of 40" X 48" are shown in the load above. However, the methods shown may be used for wood pallets of other dimensions and/or metal pallets.

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**6.** The quantity of containers within a bundle is limited to the quantity that can be enclosed with one web strap tiedown assembly, as shown for key number 4 above.

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**7.** Hold-down straps marked 5 are positioned over top of the palletized unit and must not be positioned over top of the loose containers on top of a palletized unit. See key numbers 5 thru 9 on page 2 for guidance when loading loose containers on top of palletized units.

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**8.** The quantity of loose containers positioned on top of a palletized unit is one container up to a maximum of two full layers of containers.

(Continued above left)

WEB STRAP TIE-DOWN ASSEMBLY (TWO REQUIRED FOR EACH BUNDLE OF SIX OR MORE LOOSE CONTAINERS). INSTALL EACH STRAP FROM A TIE-DOWN ANCHOR ON THE SIDE OF CONTAINERS, TO A TIE-DOWN ANCHOR ON THE OPPOSITE SIDE OF FLATRACK. POSITION BOTH STRAP RATCHETS ON THE SAME SIDE OF THE FLATRACK, AND ADJUST THE TWO STRAPS SO THEY WILL BE CLOSE TO THE BELL ON ONE END AND THE COLLAR ON THE OPPOSITE END OF THE CONTAINER. MAKE SURE THE STRAPS ARE BEING TIGHTENED, MAKE POSITION ADJUSTMENTS TO THE CONTAINERS IF NECESSARY, SO THEY FORM A COMPACT TIGHT BUNDLE. SEE GENERAL NOTES "F" AND "G" ON PAGE 2.
ISOMETRIC VIEW

SPECIAL NOTES:

1. TYPICAL METHODS OF SECURING LOOSE BOXES ON THE FLOOR OF THE FLATRACK ARE SHOWN LOADED ON THE A-FRAME FLATRACK HAVING CARGO DECK DIMENSIONS OF 7'-0-1/2" WIDE BY 15'-0" LONG AND A MAXIMUM LOAD WEIGHT OF 33,000 POUNDS.

2. THE PROCEDURES FOR SECURING LOOSE 7.62MM OR 105MM CARTRIDGES IN WOODEN BOXES SHOWN ON THIS PAGE MAY ALSO BE USED ON THE M1 FLATRACK. SEE GENERAL NOTE "C" ON PAGE 40.

3. THE 105MM CARTRIDGE, PACKED TWO PER WOODEN BOX HAVING DIMENSIONS OF 45-3/4" LONG BY 14-1/4" WIDE BY 8-3/4" HIGH AND THE 7.62MM CARTRIDGE, PACKED 800 PER WOODEN BOX AND HAVING DIMENSIONS OF 17-1/2" LONG BY 11-1/2" WIDE BY 8-1/8" HIGH, ARE SHOWN. THESE PROCEDURES MAY BE USED FOR BOXES OF DIFFERENT SIZES AND WEIGHTS.

4. THE QUANTITY OF BOXES WITHIN A BUNDLE IS LIMITED TO THE QUANTITY THAT CAN BE ENCRUCED WITH ONE WEB STRAP TIEDOWN ASSEMBLY, SHOWN AS KEY NUMBERS 2 AND 35 ABOVE.

5. FOR ALTERNATIVE METHODS OF SECURING LOOSE BOXES, SEE PAGES 40 AND 41.