FINAL REPORT
APRIL 1997

REPORT NO. 97-12

M117, 750-POUND BOMBS, LOADED ON M871 AND M872 SEMITRAILERS TRANSPORTABILITY TESTS

Prepared for:
U.S. Army Defense Ammunition Center
ATTN: SIOAC-DET
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VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639
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The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by DAC, Transportation Engineering Division (SIOAC-DET), to perform transportability tests on palletized M117, 750-pound bombs loaded on M871 and M872 semitrailers.
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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by DAC, Transportation Engineering Division (SIOAC-DET), to perform transportability tests on palletized M117, 750-pound bombs loaded on M871 and M872 semitrailers.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, Illinois.

C. OBJECTIVE. The objective of these tests was to assess the ability of M871 and M872 semitrailers to safely transport palletized M117, 750-pound bombs. These procedures will be used to support planned FY 97 shipments during Operation Golden Cargo.

D. CONCLUSION. A validated restraint method for on/off-highway transport of pallets of M117, 750-pound bombs on M871 and M872 semitrailers has been developed.
PART 2

27 March - 4 April 1997

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PART 3

TEST PROCEDURES

TRANSPORTABILITY TESTS: The test procedures outlined in this section were extracted from TP-94-01. This standard identifies six steps that a load must undergo if it is considered to be acceptable. The four tests that were conducted on the test specimen are synopsized below.

A. ROAD HAZARD COURSE. The test load was subjected to the road hazard course. Using a suitable tractor/trailer, the test load was driven over the hazard course two times prior to the road trip and two times following the road trip. The specimen load was driven at a speed approximately 5 mph. The speed may be increased or decreased, as deemed appropriate, to produce the most violent load response (see Figure 1).

---

FIGURE 1
3-1
B. ROAD TRIP. Using a suitable tractor/trailer, the specimen load was driven for a total distance of at least 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. The test route included curves, corners, railroad crossings, cattle guards, stops, and starts. The test vehicle traveled at the maximum speed suitable for the particular road being traversed, except as limited by legal restrictions.

C. PANIC STOPS. This step provides for the specimen load to be subjected to three full air brake stops while travelling 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 at approximately 5 mph.

D. WASHBOARD COURSE. Using a tractor/trailer, the specimen load was driven over the washboard course at a speed which produced the most violent response in the test load (see Figure 2).
E. INSPECTIONS AND DATA COLLECTIONS. At selected intervals during testing, thorough inspections of the specimen loads were made by technically proficient personnel to collect data on the specimen load and equipment resulting from above load test steps. This data is recorded in Part 5.
PART 4

TEST EQUIPMENT

A. M117, 750-POUND BOMB PALLET

1. Quantity: 18 pallets - one layer load
2. Bombs Per Pallet: 28 pallets - two layer load
   2
3. Pallet Weight: 1,500 pounds
4. Width: 32 inches
5. Length: 55 inches
6. Height: 22-7/8 inches

B. M872 SEMITRAILER

1. Capacity: 34 tons
2. Length: 489-1/2 inches
3. Width: 96 inches

C. M871 SEMITRAILER

1. Capacity: 22-1/2 tons
2. Length: 358 inches
3. Width: 96 inches
PART 5

TEST RESULTS

TRANSPORTABILITY TESTS:

A. Two Layers:

(1) An M871 semitrailer was loaded with 28 pallets of 750-pound bombs (2 pallets wide by 2 pallets high by 7 pallets long). The bombs were loaded in two columns, with the nose end butted against the base end and the nose end of the initial row against the forward bulkhead of the trailer. A separator gate was placed between the rows of pallets. Side blocking was nailed to the floor of the trailer along the base of the pallet. Each row of the pallets had two web straps extended over the top attached to removable tiedown anchors to secure them in place. The bombs were also secured longitudinally by a retainer gate at the aft end, with two web straps attached to removable tiedown anchors holding the load in place (see photo in part 6).

(2) The loaded trailer, towed by a semitractor, completed the hazard course; the 30-mile road course; the 5, 10, and 15 mph panic stops, and reverse 5 mph panic stops; and the washboard course as shown below. No physical damage was noticed on the loads. This load passed the transportability test parameters

<table>
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<tr>
<th>COURSE</th>
<th>TIME (min:sec)</th>
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<td>HAZARD COURSE NO. 2</td>
<td>00:27.0</td>
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<tr>
<td>30-MILE ROAD TRIP</td>
<td>52:00.0</td>
<td>34.6</td>
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<tr>
<td>PANIC STOPS</td>
<td></td>
<td>5, 10, 15 and reverse 5</td>
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<tr>
<td>HAZARD COURSE NO. 3</td>
<td>00:25.2</td>
<td>4.7</td>
</tr>
<tr>
<td>HAZARD COURSE NO. 4</td>
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<td>5.0</td>
</tr>
<tr>
<td>WASHBOARD COURSE</td>
<td>00:48.0</td>
<td>4.3</td>
</tr>
</tbody>
</table>

5-1
B. One Layer:

(1) An M872 semitrailer was loaded with 18 pallets of 750-pound bombs (2 pallets wide by 9 pallets long). The bombs were loaded in two columns, with the nose end butted against the base end and the nose end of the initial row against the forward bulkhead of the trailer. The bombs were secured by separator gates that were placed between the rows of the pallets. Side blocking was nailed to the floor of the trailer along the base of the pallet. Each row of the pallets had two web straps extended over the top attached to removable tiedown anchors to secure them in place. The bombs were also secured longitudinally by a retainer gate at the aft end, with two web straps attached to removable tiedown anchors holding the load in place (see photos in part 6 and the load shown on page 4 in part 7).

(2) The loaded trailer, towed by a semitractor, completed the hazard course; the 30-mile road course; the 5, 10, and 15 mph panic stops, and reverse 5 mph panic stop; and the washboard course as shown below. No physical damage was noticed on the loads at the end of the test. This load passed the transportability test parameters.

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<th>COURSE</th>
<th>TIME (min:sec)</th>
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<tr>
<td>HAZARD COURSE NO. 2</td>
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<tr>
<td>30-MILE ROAD TRIP</td>
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<tr>
<td>PANIC STOPS</td>
<td></td>
<td>5, 10, 15 and reverse 5</td>
</tr>
<tr>
<td>HAZARD COURSE NO. 3</td>
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<td>HAZARD COURSE NO. 4</td>
<td>00:24.0</td>
<td>5.0</td>
</tr>
<tr>
<td>WASHBOARD COURSE</td>
<td>00:49.5</td>
<td>4.1</td>
</tr>
</tbody>
</table>
C. **Two Layers:**

(1) An M871 semitrailer was loaded with 28 pallets of 750-pound bombs (14 pallets in the bottom layer and 14 pallets in the top layer). The bombs were loaded in two columns with the nose end butted against the forward endwall. A separator gate was placed between the rows of pallets. Side blocking was nailed to the floor of the trailer along the base of the pallet. Each row of the pallets had two web straps extended over the top attached to removable tiedown anchors to secure them in place. The bombs were also secured longitudinally by a retainer gate at the aft end, with two web straps attached to removable tiedown anchors holding the load in place.

(2) The loaded trailer, towed by a semitractor, completed the hazard course; the 30-mile road hazard course; the 5, 10, and 15 mph panic stops, and reverse 5 mph panic stop; and the washboard course as shown below. No physical damage was noticed on the loads after the test. This load passed the transportability test parameters.

<table>
<thead>
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<th>COURSE</th>
<th>TIME (min:sec)</th>
<th>SPEED (mph)</th>
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<td>HAZARD COURSE NO. 2</td>
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<td>30-MILE ROAD TRIP</td>
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<td>HAZARD COURSE NO. 3</td>
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<td>HAZARD COURSE NO. 4</td>
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<tr>
<td>WASHBOARD COURSE</td>
<td>00:49.5</td>
<td>4.1</td>
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PART 6

PHOTOGRAPHS
AO317-SCN97-1524. This photo shows a 28 pallets of 750-pound bombs loaded on the M871 semitrailer.
AO317-SCN97-1504. This photo shows 18 pallets of 750-pound bombs loaded on the M872 semitrailer.
<table>
<thead>
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<th>U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL</th>
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</table>

AO317-SCN97-1505. This photo shows the aft end of the 28-pallet load of 750-pound bombs loaded on the M872 semitrailer.
PART 7

DRAWING
OPERATION GOLDEN CARGO

LOADING AND TIEDOWN PROCEDURES • FOR THE M117 750 LB BOMB AND THE MK84 2,000 LB BOMB LOADED ON THE 34-TON M872 SEMITRAILER

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<td>LOADING, TIEDOWN, AND UNLOADING PROCEDURES AND PALLET UNIT DETAILS</td>
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<tr>
<td>ONE PALLET HIGH LOAD OF 750 LB BOMBS</td>
<td>4.5</td>
</tr>
<tr>
<td>TWO PALLET HIGH LOAD OF 750 LB BOMBS</td>
<td>6.7</td>
</tr>
<tr>
<td>ONE PALLET HIGH LOAD OF 2,000 LB BOMBS</td>
<td>8.9</td>
</tr>
<tr>
<td>TWO PALLET HIGH LOAD OF 2,000 LB BOMBS</td>
<td>10.11</td>
</tr>
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<td>15</td>
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• THE PROCEDURES DEPICTED WITHIN THIS DRAWING ARE FOR ON-OFF HIGHWAY USE ONLY.

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Chief, Transportation Engineering Division

PROJECT DET 26
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 THE M117 750 LB BOMB AND M84 2,000 LB BOMB, LOADED ON THE 34- 1/2 TON M872 SEMITRAILER EQUIPPED WITH THE 10,000 POUND TYPE T (MICKEY) TIEDOWN ANCHORS AND HAVING AN EMPTY WEIGHT OF 16,800 LBS. WHEN TIED, THE MAXIMUM LOAD ON THE KING PIN IS 27,000 LBS AND THE MAXIMUM LOAD WEIGHT ON THE THREE REAR AXLES IS 56,400 LBS. NOTE: THE LOADS SHOWN DO NOT EXCEED THE AVERAGE HIGHWAY WEIGHT LIMIT OF 42,000 POUNDS ON THE THREE M872 TRAILER AXLES.

C. FOR DETAIL OF THE M117 750 LB BOMB PALLETT UNIT, AND THE M84 2,000 LB BOMB PALLETT UNIT, SEE PAGE 3 OF THIS DRAWING.

D. ALL LOADS SHOWN HEREIN ARE TYPICAL AND ARE BASED ON TESTED PROCEDURES FOR ON AND/OR OFF HIGHWAY TRANSPORT OF FULL AND/OR LESS THAN FULL PALLETT UNITS. COMBINATIONS OF PROCEDURES MAY BE USED. HOWEVER, THE APPROVED METHODS SPECIFIED HEREIN MUST BE FOLLOWED AS CLOSELY AS POSSIBLE.


F. ADJUSTABLE SCUFF SLEEVES PROVIDED ON WEB STRAP TIEDOWN ASSEMBLIES WILL BE LOCATED TO PROVIDE A PAD WHERE STRAPS PASS OVER SHARP EDGES, OR RATCHETS AND HOOPS ON PREVIOUSLY INSTALLED WEB STRAP TIEDOWN ASSEMBLIES.

G. IF THE SIDE RACKS FOR A SEMITRAILER ARE TO BE TRANSPORTED ON THE LOADED TRAILER, THEY WILL BE STACKED ON THE TRAILER AND SECURED WITH A SUFFICIENT QUANTITY OF WEB STRAP TIEDOWN ASSEMBLIES TO PREVENT LOSS DURING TRANSPORT. NOTE: IF DESIRED, THE SIDE RACKS FOR THE M871 AND M872 SEMITRAILERS MAY BE POSITIONED IN PLACE AFTER THE LOAD HAS BEEN SECURED. AFTER ALL SIDE PANELS AND REAR PANELS ARE IN POSITION, THE STACKS MUST BE SECURED "PINNED" OR "WIRE- TIED" TO THE STAKE POCKETS TO PREVENT VERTICAL MOVEMENT DURING TRANSPORT. ALSO, THE SIDE PANELS MUST BE SECURED AT THE TOP WITH THE CROSS-CHAINS WHICH ARE PROVIDED WITH THE VEHICLE.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

LUMBER - - - - - - : SEE TM 743-200-I (DUNNAGE LUMBER) AND FED SPEC ML-751.

NAILS - - - - - - : FED SPEC FF-N-105; COMMON.

STRAP - - - - - - : WEBBING, UNIVERSAL TIEDOWN, NSN 5340-01-204-3005, PNS398419; OR, NSN 5340-01-089-4897, PN169958; OR, NSN 5340-01-225-1427, 07670-000-011-013; OR, NSN 5340-00-980-5277, PN16202080.

STRAPPING, STEEL - - - : ASTM D3953; FLAT STRAPPING, TYPE 1. HEAVY DUTY, FINISH A, B (GRADE 2), OR C.

SEAL, STRAP - - - - : ASTM D3953; CLASS H, FINISH A, B (GRADE 2), OR C, DOUBLE NOTCH TYPE, STYLE I, II, OR IV.

PAGE 2

PROJECT DET 26
LOADING, TIEDOWN, AND UNLOADING PROCEDURES:

1. PRIOR TO LOADING AND/OR UNLOADING, SET BRAKES ON TACTICAL VEHICLE AND REMOVE SIDE RACKS AND/OR TARP, IF INSTALLED. ASSURE THAT THE TRAILER FLOOR IS FREE OF EXCESSIVE AMOUNTS OF DIRT, SAND AND GRAVEL.

2. PRIOR TO LOADING THE TRAILER, DETERMINE THE QUANTITY OF PALLETS TO BE LOADED AND SELECT THE BEST METHOD TO SECURE THE ITEMS FROM THE METHODS SHOWN WITHIN THIS DRAWING. NOTE: A COMBINATION OF THE METHODS SHOWN WITHIN THIS DRAWING MAY BE USED IN/ON THE SAME TRAILER.

3. ALL PALLETS OF BOMBS MUST BE BLOCKED AT EACH END TO KEEP THE BOMBS FROM "INCHING" OUT OF POSITION DURING TRANSPORT. DO NOT POSITION PALLETS OF 750 LB BOMBS WITH THE NOSE END POINTING TOWARD THE SIDE OF THE TRAILER.

4. ASSURE THAT ALL STEEL STRAPPING ON EACH PALLET IS IN POSITION AND IS TIGHT. MISSING AND/OR LOOSE STEEL STRAPPING SHOULD BE REPLACED.

5. NOTE THAT AFTER THE SIDE BLOCKING HAS BEEN NAILED TO PLACE ON EACH SIDE OF THE LOAD. THE PALLET UNITS CAN BE REMOVED AND/OR LOADED WITHOUT REMOVAL OF THE SIDE BLOCKING.

6. ASSURE THAT ALL PALLET UNITS ARE POSITIONED TIGHTLY AGAINST EACH OTHER AND IN THE TRAILER, ORIENTATION 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 LINER IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

7. AFTER ALL LOADING PROCEDURES ARE COMPLETE, CHECK ALL WEB STRAP TIEDOWN ASSEMBLIES FOR MAXIMUM TIGHTNESS AND HATCHET TIGHTER, IF REQUIRED, PRIOR TO FOLDING UP AND SECURING THE LOOSE ENDS OF STRAP. SEE GENERAL NOTE "E" ON PAGE 2.

KEY NUMBERS

1. SEPARATOR GATE A (1 REEO). SEE THE DETAIL ON PAGE 12.

2. SIDE BLOCKING, 2" x 6" x 16" (DOUBLED) (18 REEO). CENTER ON PALLET SKIDS. NAIL THE FIRST PIECE TO THE TRAILER FLOOR WITH 1-16 NAILS. NAIL THE SECOND PIECE TO THE FIRST PIECE IN A LIKE MANNER. SEE SPECIAL NOTE 3 ON PAGE 5.


5. WEB STRAP TIEDOWN ASSEMBLY (18 REEO). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF TRAILER, OVER TOP OF PALLET UNITS, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF TRAILER. POSITION STRAP SCUFF SLEEVES AT SIDE OF BOMBS. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE SPECIAL NOTE 4 ON PAGE 5 AND GENERAL NOTES "E" AND "F" ON PAGE 2.

6. WEB STRAP TIEDOWN ASSEMBLY (1 REEO). INSTALL STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF TRAILER, AROUND RESTRAINT ASSEMBLY A, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF TRAILER. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE GENERAL NOTES "E" AND "F" ON PAGE 2.
A typical load of 18 pallets of M117 750 lb bombs is shown on the 34-ton 8672 semitrailer having dimensions of 480 X 1/2" long by 96" wide.

Position the load against the forward bulkhead of the trailer. All pallets must be positioned tightly against each other laterally and longitudinally to reduce load movement. Void spaces between pallets will fill in during transport causing web strapping to become loose. If loading less than 18 pallets, omit pallets from the aft end of the load.

Position the side blocking pieces approximately 1/4" away from the sides so the pallets can be removed and/or loaded without removing the side blocking.

Each lateral load unit 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, depending on the location of the tie-down anchors. Avoid positioning the straps over the ogive at the nose end of the bomb. However, if it is necessary for a strap to be positioned over the ogive, the straps must be crossed.

A total of 19 web strap tie-down assemblies are required for the load shown.

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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>2&quot; X 4&quot;</td>
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<tr>
<td>2&quot; X 6&quot;</td>
</tr>
<tr>
<td>NAILS</td>
</tr>
<tr>
<td>6d (2&quot;)</td>
</tr>
<tr>
<td>10d (3&quot;)</td>
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<td>WEB STRAP</td>
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LOAD AS SHOWN (SEE NOTE BELOW)

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<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
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<tr>
<td>Pallet Unit</td>
<td>18</td>
<td>28,350 LBS</td>
</tr>
<tr>
<td>Dunnage</td>
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<td>TOTAL WEIGHT</td>
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NOTE: The load weight on the kingpin, including the trailer weight, is 10,555 LBS (APPROX); and the load weight on the three rear axles, including the trailer weight, is 18,144 LBS (APPROX). See General Note "B" on page 2.

18-Pallet units of M117 750 lb bombs loaded on the M872 semitrailer.

PROJECT DET 26
32-PALLET UNITS OF M117 750 LB BOMBS LOADED ON THE M872 SEMI-TRAILER

KEY NUMBERS

1. SIDE BLOCKING, 2" X 8" X 21" (DOUBLED) (18 REQ). CENTER ON PALLET SKIDS. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/10D NAILS. NAIL THE SECOND PIECE TO THE FIRST PIECE IN A LIKE MANNER. SEE SPECIAL NOTE 4 ON PAGE 7.

2. SEPARATOR GATE C (1 REQ). SEE THE DETAIL ON PAGE 12.


5. UNITIZING STRAP, 1-1/4" X .035" OR .031" BY 14'-0" LONG STEEL STRAPPING (26 REQ). 2 PER VERTICAL STACK OF BOMB PALLETS. THREAD STRAPPING THROUGH STRAP SLOTS ON BOTTOM PALLETS. BRING ENDS OF STRAP UP OVER TOP OF BOMBS ON THE TOP PALLET AND SEAL WITH ONE SEAL MARKED 7. SEE SPECIAL NOTE 5 ON PAGE 7.

6. BUNDLING STRAP, 1-1/4" X .035" OR .031" BY 16'-0" LONG STEEL STRAPPING (14 REQ). 2 PER LOAD UNIT OF FOUR BOMB PALLETS. THREAD STRAPPING THROUGH THE OPENING ON EACH SIDE OF THE CENTER SKID ON THE BOTTOM PALLETS. ENCIRCLE ALL FOUR PALLET IN THE STACK AND SEAL WITH ONE SEAL MARKED 7. SEE SPECIAL NOTE 6 ON PAGE 7.

7. SEAL FOR 1-1/4" STEEL STRAPPING (ONE PER STRAP IF DOUBLE NOTCHED AND TWO PER STRAP IF DOUBLE CIRCUIT).

8. WEB STRAP TIEDOWN ASSEMBLY (18 REQ). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF TRAILER, OVER TOP OF PALLETS, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF TRAILER. POSITION STRAP SCUFF SLEEVES AT SIDE OF BOMBS. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. SEE SPECIAL NOTE 8 ON PAGE 7 AND GENERAL NOTES "E" AND "F" ON PAGE 2.

9. WEB STRAP TIEDOWN ASSEMBLY (4 REQ). INSTALL EACH STRAP TO EXTEND FROM A TIEDOWN ANCHOR ON SIDE OF TRAILER, AROUND THE RESTRRAIN ASSEMBLY A, TO A TIEDOWN ANCHOR ON OPPOSITE SIDE OF TRAILER. POSITION STRAP SCUFF SLEEVES AT SHARP EDGES. TAKE UP EXCESS SLACK IN STRAP AND THEN RATCHET TIGHT. GENERAL NOTES "E" AND "F" ON PAGE 2.
SPECIAL NOTES:

1. A TYPICAL LOAD OF 32 PALLETs OF M117 750 LB BOMBS IS SHOWN ON THE 34-TON MB72 SEMITRAILER HAVING DIMENSIONS OF 48'-1/2" LONG BY 95" WIDE.

2. POSITION THE FIRST ROW OF FOUR PALLETs 12" FROM THE FORWARD BULKHEAD AND CENTERED ACROSS THE TRAILER WIDTH. THIS SPACE IS REQUIRED TO AVOID EXCEEDING THE MAXIMUM WEIGHT ALLOWED ON THE KINGPIN. SEE GENERAL NOTE "B" ON PAGE 2.

3. ALL PALLETs MUST BE POSITIONED TIGHTLY AGAINST EACH OTHER LATERALLY AND LONGITUDINALLY TO REDUCE THE LOAD MOVEMENT. VOID SPACES BETWEEN PALLETs WILL FILL IN DURING TRANSPORT CAUSING WEB STRAPPING TO BECOME LOOSE.

4. POSITION THE SIDE BLOCKING PIECES APPROXIMATELY 1/4" AWAY FROM THE PALLET SKIDS SO THE PALLETs CAN BE REMOVED AND/OR LOADED WITHOUT REMOVING THE SIDE BLOCKING.

5. EACH STACK OF TWO HIGH PALLET UNITS MUST BE UNITIZED WITH TWO UNITIZING STRAPS MARKED ©, AND EACH LATERAL LOAD UNIT OF FOUR PALLET UNITS MUST BE BUNDLED WITH TWO BUNDLING STRAPS MARKED ©.


7. IF LOADING A LESSER QUANTITY THAN SHOWN OMIT PALLET UNITS FROM THE AFT END OF THE TOP LAYER. HOWEVER, OMIT TWO PALLET UNITS AT A TIME.

8. A TOTAL OF 22 WEB STRAP TIEDOWN ASSEMBLIES ARE REQUIRED FOR THE LOAD SHOWN.

<table>
<thead>
<tr>
<th>BILL OF MATERIAL</th>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; X 6&quot;</td>
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<td>35</td>
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</tr>
<tr>
<td>2&quot; X 2&quot;</td>
<td>70</td>
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<td></td>
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<tr>
<td>2&quot; X 4&quot;</td>
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<tr>
<td>2&quot; X 6&quot;</td>
<td>95</td>
<td>95</td>
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</tr>
<tr>
<td>NAILS</td>
<td>NO. REQD</td>
<td>POUNDS</td>
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</tr>
<tr>
<td>6d (2&quot;)</td>
<td>152</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10d (3&quot;)</td>
<td>315</td>
<td>5</td>
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</tbody>
</table>

STEEL STRAPPING, 1-1/4" = 650 REQD = 94 LBS
SEAL FOR 1-1/4" STRAPPING = 42 REQD = 2 LBS
WEB STRAP = 22 REQD = 110 LBS

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
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<tbody>
<tr>
<td>PALLETS UNIT</td>
<td>-4-32-</td>
<td>50,400 LBS</td>
</tr>
<tr>
<td>DUNNAGE</td>
<td>-4-32-</td>
<td>584 LBS</td>
</tr>
</tbody>
</table>

TOTAL WEIGHT = 50,984 LBS (APPROX)