REPORT NO. 94-23

2,000-POUND MK84 BOMBS
IN A COMMERCIAL ISO
SIDE-OPENING CONTAINER
TRANSPORTABILITY TESTS

Prepared for:
U.S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DET
Savanna, IL 61074-9639

Distribution Unlimited
The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by USADACS, Transportation Engineering Division (SMCAC-DET), to test a reduced wooden dunnage loading and bracing procedure for 2,000-pound MK84 bombs with fins on metal pallets in a commercial International Organization for Standardization (ISO) side-opening container. Rail impact, road, and container tilt tests were performed on a loaded commercial ISO side-opening container. The container was rail impact tested on a Trailer-on-Flatcar (TOFC). Road tests were performed with the container mounted on the M871 semitrailer (with the gross weight of the load exceeding transportation chassis limits.) Due to the Shipboard Transportation Simulator (STS) being inoperable, the container was tilted 80 degrees to the back wall with a crane. There was no damage to the load or the container as a result of these tests; therefore, this load is acceptable for transportation in all surface modes.
# 2,000-Pound Mk84 Bombs in a Commercial ISO Side-Opening Container Transportability Tests

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by USADACS, Transportation Engineering Division (SMCAC-DET), to test a reduced wooden dunnage loading and bracing procedure for 2,000-pound MK84 bombs as a complete round in a commercial International Organization for Standardization (ISO) side-opening container.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-6000. Reference is made to AR-700, 15 April 1979, DARCOM Supplement 1, 4 September 1979; and AMCCOM-R 10-17, 13 January 1986, Mission and Major Functions of USADACS.

C. OBJECTIVE. The objective of these tests was to determine if the loading and bracing procedure with wooden dunnage in a commercial ISO side-opening container of 2,000-pound MK84 bombs, complete round would satisfy the transportation requirements of Transportability Testing Procedure, TP-91-01. The following tests were conducted: rail, road hazard course, washboard course, and container tilt test.

D. CONCLUSION. This loading and bracing procedure satisfactorily retained the 2,000-pound MK84 bombs and prevented damage to the container.

E. RECOMMENDATION. This procedure is recommended for approval for transportation of 2,000-pound MK84 bombs and fins in all surface modes.
PART 2

7 and 17 July 1994

ATTENDEES

A. C. McIntosh, Jr.
General Engineer
DSN 585-8989
815-273-8989

Dan Healy
Senior Inspector
708-392-6846
800-826-4662 (Answering Service)

Jerome H. Krohn
Supervisory General Engineer
DSN 585-8908
815-273-8908

Quinn D. Hartman
General Engineer
DSN 585-8992
815-273-8992

David V. Valant
Electronics Technician
DSN 585-8988
815-273-8988

Richard S. Haynes
Industrial Engineering Technician
DSN 585-8225
815-273-8225

Director
U.S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

Association of American Railroads
Bureau of Explosives
309 N. Douglas
Arlington Heights, IL 60004

Director
U. S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

Director
U. S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

Director
U. S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

Director
U. S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DET
Savanna, IL 61074-9639
PART 3

TEST PROCEDURES

These procedures were extracted from TP-91-01, Transportability Testing Procedures, July 1991, for tactical vehicles used for shipping munitions by tactical truck.

A. The test load was prepared using the outloading procedure specified for the munitions (see part 6). The 2,000-pound MK84 bombs used in the load were inert (nonexplosive). The weight and physical characteristics of the load configuration were identical to the live (explosive) ammunition provided for in part 6; i.e., weights, physical dimensions, center of gravity (CG), etc. The ammunition packages duplicated live ammunition.

B. Tests for this load configuration are as follows:

1. Rail Impact (Test Method No. 1).
2. Road Hazard Course (Test Method No. 2).
3. Road Trip (Test Method No. 3).
4. Road Hazard Course (Test Method No. 2).
5. Washboard Course (Test Method No. 6).
6. Tilt Test (Test Method No. 5).

C. The test methods are as follows:

1. Test Method No. 1 (Rail Impact Test). The container load of 2,000-pound MK84 bombs was positioned on a container chassis and securely locked in place using the twist locks at each corner. The container chassis was secured to a Trailer-on-flatcar (TOFC). Equipment needed to perform the test included the TOFC (hammer) railcar, five empty railroad cars connected together to serve as the anvil, and a railroad locomotive. These anvil cars were...
positioned on a level section of track with air and hand brakes set with draft gears compressed. The locomotive unit pulled the TOFC several hundred yards away from the anvil cars, pushed the TOFC toward the anvil at a predetermined speed, then disconnected from the TOFC approximately 50 yards away from the anvil cars, which allowed it to roll freely along the track until it struck the anvil. This constituted an impact. Impacting is accomplished at speeds of 4, 6, and 8.1 mph in the forward direction and at 8.1 mph in reverse. The 4 and 6 mph impact speeds are approximate; the 8.1 mph speed is a minimum. Impact speeds are determined by using an electronic counter to measure the time required for the TOFC to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1, page 3-4).

2. Test Method No. 2 (Road Hazard Course). This step required the container load of 2,000-pound MK84 bombs transported on the M871 semitrailer be pulled over a 200-foot-long segment of concrete road which consists of two series of railroad ties projecting 6-inches above the level or the road surface. The load traversed the course two times (see Figure 2, page 3-5).

3. Test Method No. 3 (Road Trip). The M871 semitrailer and container of 2,000-pound MK84 bombs 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 load traveled at the maximum speed suitable for the particular road being traversed, except as limited by legal restrictions. No panic stops were performed since the test load was subjected to rail impact testing.

4. Test Method No. 6 (Washboard Course). A suitable tractor was used to pull the M871 semitrailer with the container load of 2,000-pound MK84 bombs over the 300-foot-long washboard course at a speed which produced the most violent response in the container load. The washboard course is constructed as shown in Figure 3, page 3-5.
5. Test Method No. 5 (80 Degree Tilt Test). The container load of 2,000-pound MK84 bombs was positioned on level terrain with the corner fittings resting on timbers so the entire container was supported by the corner fittings. The timbers were oriented parallel to the end rails of the container and extended 2 feet beyond the corner fittings on each side. Using one mobile crane and appropriate rigging, the container was rotated (tilted) using the bottom corner fittings as a fulcrum. The rigging (sling) was attached to the top corner fittings of the long side of the container. Tilting was accomplished by lifting the top corner fittings directly above the fulcrum. The crane boom was then positioned over the center of the container and the container was allowed to complete rotation to 80 degrees from where it started. The container was allowed to remain at the 80 degree tilt position for at least 1 minute, then the container was uprighted by reversing this procedure.
ASSOCIATION OF AMERICAN RAILROADS (AAR)
STANDARD TEST PLAN

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

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

FIGURE 1
PART 4

TEST RESULTS
RAIL IMPACT DATA

Test No.: 1  
Date: 7 July 1994

Specimen Load: 2,000-pound MK84 bombs on metal pallets and associated complete round components, loaded and braced with wooden dunnage in a commercial ISO side-opening container, chassis mounted on a TOFC.

<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>4.21</td>
<td>No load movement in either container.</td>
</tr>
<tr>
<td>2</td>
<td>Forward</td>
<td>6.52</td>
<td>No load movement in either container.</td>
</tr>
<tr>
<td>3</td>
<td>Forward</td>
<td>8.33</td>
<td>No longitudinal load movement in either container. Observed 1/2-inch vertical movement in center gate of 2,000-pound MK84 bombs.</td>
</tr>
<tr>
<td>4</td>
<td>Reverse</td>
<td>8.41</td>
<td>No Load movement. No additional vertical gate movement.</td>
</tr>
</tbody>
</table>

Total Specimen Wt.: 176,548
Buffer Car (five cars) Wt.: 250,000
ROAD TEST DATA

Test No.: 2  Date: 17 July 1994

Specimen Load: 2,000-pound MK84 bombs in an ISO side-opening container mounted on an M871 semitrailer.

ROAD HAZARD COURSE:

PASS 1-A OVER FIRST SERIES OF TIES: 5.62 SEC  6.1 MPH
PASS 1-B OVER SECOND SERIES OF TIES: 5.72 SEC  5.7 MPH
REMARKS: No damage to trailer or load movement.

PASS 2-A OVER FIRST SERIES OF TIES: 6.45 SEC  5.2 MPH
PASS 2-B OVER SECOND SERIES OF TIES: 6.19 SEC  5.3 MPH
REMARKS: No damage or load movement.

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

PANIC STOP TEST: No panic stops were performed since the container load was previously subjected to four rail impact tests.

PASS 3-A OVER FIRST SERIES OF TIES: 5.82 SEC  5.6 MPH
PASS 3-B OVER SECOND SERIES OF TIES: 5.67 SEC  5.7 MPH
REMARKS: No damage or load movement.

PASS 4-A OVER FIRST SERIES OF TIES: 5.81 SEC  5.9 MPH
PASS 4-B OVER SECOND SERIES OF TIES: 6.13 SEC  5.4 MPH
REMARKS: No lateral or visual vertical load or dunnage movement.

WASHBOARD COURSE: No visual damage to the load or container.

80 DEGREE TILT TEST: No visual damage to the load or container.
PART 5

PHOTOGRAPHS
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

PHOTO NO.
SCN-94-186-2974. This photo shows a TOFC with two side-opening containers. The first container is loaded with 2,000-pound Mk-84 bomb complete rounds and the second container is loaded with 500-pound Mk-82 bombs.
PHOTO NO. SCN-94-186-2981. This photo shows the container loaded with 2,000-pound MK84 bomb complete rounds being subjected to the 80 degree rotational tilt test. This test was performed after rail and road transportation tests. No shifting of the load occurred during this test.
PHOTO NO. SCN-94-186-2980. This photo shows the test setup used to rotate containers 80 degrees in the rotational test. The crane has a capacity of 40 tons. The container is tilted 80 degrees from its upright position. No load movement was observed after the test.
PHOTO NO. SCN-94-186-2982. This photo shows the load of 2,000-pound MK84 bomb complete rounds. The bombs are on the lower layer and the other complete round components (fins, etc.) are located in the containers stowed above.
LOADING AND BRACING * WITH WOODEN DUNNAGE IN SIDE OPENING ISO CONTAINERS OF MK-84 (2,000 POUND) BOMBS, COMPLETE ROUND

* LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (TC/COFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS.

U.S. ARMY MATERIEL COMMAND DRAWING

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

R. HAYNES

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

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

REVISION NO. 1       JUNE 1994

SEE THE REVISION LISTING ON PAGE 2

DO NOT SCALE

CLASS  DIVISION  DRAWING  FILE
19  48  7107  SP15M3

PROJECT SP 155-88
A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1 AND AUGMENTS TM 743-200-1 (CHAPTER 5).

B. THE SPECIFIED OUTLOADING PROCEDURES ARE APPLICABLE TO LOADS OF MK-94 (2,000 POUND) BOMBS, COMPLETE ROUND. SEE PAGE 3 FOR DETAILS OF THE ITEMS TO BE SHIPPED. CAUTION: REGARDLESS OF THE QUANTITY OF CONTAINERS TO BE SHIPPED, THE "MAXIMUM GROSS WEIGHT" OF THE SIDE OPENING ISO CONTAINER MUST NOT BE EXCEEDED.

C. THE LOAD AS SHOWN IS BASED ON A 6,050 POUND 20' LONG BY 8' WIDE BY 8'-6" HIGH SIDE OPENING INTERMODAL CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 8'-9" WIDE BY 8'-6" HIGH. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLAT-CAR (T/COFC) SHIPMENT, HOWEVER, THE LOAD AS DESIGNED CAN ALSO BE MOVED BY OTHER SURFACE MODES OF TRANSPORT. NOTICE: OTHER CONTAINERS OF THE SAME DESIGN CONFIGURATION CAN BE USED.

D. WHEN LOADING CONTAINERS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE A TIGHT LOAD (TIGHT AGAINST THE DUNNAGE ASSEMBLIES). ALTHOUGH A TOTAL OF 1-1/2" OF UNBLOCKED SPACE ACROSS THE WIDTH OF A LOAD BAY IS PERMITTED, LATERAL VOIDS WITHIN THE LOAD ARE TO BE HELD TO A MINIMUM. EXCESSIVE SLACK CAN BE ELIMINATED FROM A LOAD BY LAMINATING ADDITIONAL PIECES OF APPROPRIATE THICKNESS TO THE HORIZONTAL PIECES ON THE CENTER GATE ASSEMBLY. NAIL EACH ADDITIONAL PIECE WITH APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS AND/OR QUANTITY OF THE VERTICAL AND HORIZONTAL PIECES IN THE CENTER GATE ASSEMBLY MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE CONTAINER SIZE.

E. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 4" MATERIAL IS ACTUALLY 3/4" THICK BY 3-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" BY 5-1/2" WIDE.

F. A STAGGERED NAILING PATTERN WILL BE USED WHENEVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH OR RIGHT BesIDE A NAIL IN A LOWER PIECE.

G. IN SOME CONTAINERS THERE IS A SLOT AT THE CORNERS OF THE ENDWALLS. PIECES OF DUNNAGE MATERIAL MUST BE LAMINATED TO THE BUFFER PIECES ON THE END BLOCKING ASSEMBLIES TO PROVIDE A FLAT SURFACE FOR THE BUFFER PIECES. A PIECE OF 2" X 4", 2" X 3" OR A SPECIAL WIDTH PIECE CUT-TO-FIT CAN BE USED. THIS FILL PIECE WILL BE NAILED WITH ONE APPROPRIATELY SIZED NAIL EVERY 12". THIS PIECE IS NOT REQUIRED WHEN THE CORNER PORTIONS OF THE CONTAINER ENDWALLS ARE SMOOTH AND FLAT.

H. CAUTION: DO NOT NAIL DUNNAGE MATERIAL TO THE CONTAINER WALLS OR FLOOR. ALL NAILING WILL BE WITHIN THE DUNNAGE.

J. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS THE SIDE DOORS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

LUMBER ---- - : SEE TM 743-200-1 (DUNNAGE LUMBER) AND FED SPEC MM-L-791.

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

PLYWOOD ---- - : COMMERCIAL ITEM DESCRIPTION A-A-55057, TYPE A, CONSTRUCTION AND INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED.

WIRE, CARBON STEEL : ASTM A455, ANNEALED AT FINISH, BLACK OXIDE FINISH, .0800" DIA, GRADE 1005 OR BETTER.

REVISION

REVISION NO. 1, DATED JUNE 1994 CONSISTS OF:

1. ADDING PROCEDURES FOR A 16-UNIT LOAD.

PAGE 2

PROJECT SP 155-88
2000 POUND, MK84

BOMB - - - - - 2 EACH @ 1,930 LBS (APPROX)
CUBE - - - - - 55.5 CU. FT. (APPROX)
GROSS WEIGHT - - - 4,133 LBS (APPROX)

HUMIDITY INDICATOR.
DESICCANT PORT CAP.
PRESSURE RELIEF VALVE.

ISOMETRIC VIEW

TYPICAL COMPONENT BOXES
VARIOUS SIZES AND WEIGHTS.

(CNU-335 A/E CNTR) - - 1,038 LBS (APPROX)
CUBE - - - - - - - 45.4 CU FT (APPROX)
END BLOCKING ASSEMBLY (2 REQD). SEE THE "END BLOCKING ASSEMBLY A" DETAIL ON PAGE 6, AND GENERAL NOTE "F" ON PAGE 2.

SIDEWALL LINER, PLYWOOD, 3/8" THICK (AS REQD). POSITION SO AS TO BE BETWEEN THE LADING AND THE CONTAINER SIDEWALL OR THE CONTAINER DOORS, AS APPLICABLE.

CRIB FILL (2 REQD). SEE THE "CRIB FILL A" DETAIL ON PAGE 6. POSITION BETWEEN THE PALLETS OF BOMBS. SEE GENERAL NOTE "D" ON PAGE 2.

CENTER GATE (2 REQD). SEE THE "CENTER GATE A" DETAIL ON PAGE 7. POSITION BETWEEN THE PALLETS OF BOMBS.

STRUT "A", 4" X 4" BY CUT TO FIT (REF: 12'-3/4") (8 REQD). POSITION SO AS TO BE BETWEEN THE CENTER GATES, PIECES MARKED (4). TOENAIL TO THE CENTER GATES W/2-16D NAILS AT EACH END.

DECKING, 2" X 6" BY LENGTH TO SUIT (REF: 7'-4") (4 REQD). WIRE TIE TO THE TOP FRAME OF THE BOMB PALLET UNITS.

CRIB FILL (2 REQD). SEE THE "CRIB FILL B" DETAIL ON PAGE 6. POSITION BETWEEN THE CONTAINERS IN THE SECOND LAYER.

CENTER GATE (2 REQD). SEE THE "CENTER GATE B" DETAIL ON PAGE 7. POSITION AS SHOWN AGAINST THE CONTAINERS IN THE SECOND LAYER.

STRUT "B", 4" X 4" BY CUT TO FIT (REF: 9'-0-1/4") (8 REQD). POSITION SO AS TO BE BETWEEN THE CENTER GATES, PIECES MARKED (3). TOENAIL TO THE CENTER GATES W/2-16D NAILS AT EACH END.

FILLER, 1" X 4" X 12" (AS REQD). POSITION ON TOP OF AND NAIL TO THE STRUT W/2-6D NAILS. SEE SPECIAL NOTE 2 ON PAGE 5.

HOLD DOWN, 2" X 4" X 30" (AS REQD, 1 PER BOX). CENTER ON BOX AND NAIL THROUGH PIECE MARKED (4) INTO STRUT W/2-16D NAILS AT EACH END.

(CONTINUED ON PAGE 5)
(KEY NUMBERS CONTINUED FROM PAGE 4)

12. Cross blocking, 2" x 4" by cut to fit between struts (1 reqd per box).

13. Cleat, 2" x 4" x 12" (2 reqd per box). Position as shown and nail to the strut, pieces marked ©, w/4-10d nails. toenail to cross blocking w/1-12d nail.

14. Vertical strut bracing, 2" x 4" by length to suit (4 reqd). Nail to the struts, pieces marked ©, w/2-10d nails at each joint.

15. Horizontal strut bracing, 2" x 4" by length to suit (2 reqd). Nail to the struts, pieces marked ©, w/2-10d nails at each joint.

SPECIAL NOTES:
1. The load as shown on page 4 depicts a complete round load of 2,000 pound Mk-84 bombs, including 4 pallets of bombs, 4 CNU 355-A/E containers with BSU-50/B fins, 4 boxes containing miscellaneous items such as fuzes, adaptors, and couplers.

2. When installing the dunnage that applies to the miscellaneous boxes, adjustments to the quantity and size of material may be adjusted as necessary.

SECUREMENT OF MISCELLANEOUS BOXES

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
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<tbody>
<tr>
<td>1&quot; x 4&quot;</td>
<td>44</td>
<td>15</td>
</tr>
<tr>
<td>2&quot; x 2&quot;</td>
<td>41</td>
<td>14</td>
</tr>
<tr>
<td>2&quot; x 6&quot;</td>
<td>179</td>
<td>115</td>
</tr>
<tr>
<td>2&quot; x 4&quot;</td>
<td>282</td>
<td>292</td>
</tr>
<tr>
<td>4&quot; x 4&quot;</td>
<td>81</td>
<td>108</td>
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<table>
<thead>
<tr>
<th>NAILS</th>
<th>NO. REQD</th>
<th>POUNDS</th>
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<tbody>
<tr>
<td>6d (2&quot;)</td>
<td>464</td>
<td>2-3/4</td>
</tr>
<tr>
<td>10d (3&quot;)</td>
<td>376</td>
<td>5-3/4</td>
</tr>
<tr>
<td>12d (3-1/4&quot;)</td>
<td>8</td>
<td>NIL</td>
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<tr>
<td>16d (3-1/2&quot;)</td>
<td>64</td>
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<thead>
<tr>
<th>WIRE, NO. 14 GAGE</th>
<th>12' REQD</th>
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<tbody>
<tr>
<td>PLYWOOD. 3/4&quot;</td>
<td>96</td>
<td>118 LBS</td>
</tr>
<tr>
<td>PLYWOOD. 3/8&quot;</td>
<td>277</td>
<td>285 LBS</td>
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LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
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<tbody>
<tr>
<td>Mk 84 bomb pallet</td>
<td>4</td>
<td>16,532 LBS</td>
</tr>
<tr>
<td>BSU-50/B fin</td>
<td>8</td>
<td>2,235 LBS</td>
</tr>
<tr>
<td>Miscellaneous items</td>
<td>4 boxes</td>
<td>200 LBS</td>
</tr>
<tr>
<td>Container</td>
<td></td>
<td>1,500 LBS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6,050 LBS</td>
</tr>
<tr>
<td>TOTAL WEIGHT</td>
<td></td>
<td>26,518 LBS</td>
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</tbody>
</table>

PROJECT SP 155-88
BUFFER PIECE, 2" X 6" BY INSIDE CONTAINER HEIGHT MINUS 1" (REF: 7'-1") (2 REQD). NAIL THRU PLYWOOD INTO THE BEAMS W/2-10d NAILS AT EACH JOINT.

BEAM, 2" X 6" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-4") (9 REQD).

SEE GENERAL NOTE "G" ON PAGE 2.

PLYWOOD, 3/4" X 7-7/8' X BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-4") (6 REQD). NAIL TO THE BEAMS W/1-5d NAIL EVERY 8".

HORIZONTAL PIECE, 1" X 4" X 48" (2 REQD). NAIL TO THE 2" X 4" HORIZONTAL PIECE W/6-6d NAILS.

END BLOCKING ASSEMBLY A

VERTICAL PIECE, 2" X 6" X 42" (2 REQD).

HORIZONTAL PIECE, 2" X 4" X 69" (DOUBLED) (4 REQD). NAIL THE FIRST PIECE TO THE VERTICAL PIECES W/2-10d NAILS AT EACH END. LAMINATE THE SECOND PIECE TO THE FIRST W/7-10d NAILS.

VERTICAL PIECE, 2" X 6" X 22-1/2" (2 REQD).

HORIZONTAL PIECE, 1" X 4" X 69" (4 REQD). LAMINATE TO THE 2" X 4" HORIZONTAL PIECES W/7-6d NAILS.

CRIB FILL A

CRIB FILL B
VERTICAL PIECE, 2" X 6" X 23" (4 REQD).

HORIZONTAL PIECE, 2" X 6" X 7'-4" (1 REQD). NAIL TO THE VERTICAL PIECES W/3-10d NAILS AT EACH JOINT.

STRUT LEDGER, 2" X 2" X 7'-4" (1 REQD). NAIL TO THE VERTICAL PIECES W/2-10d NAILS AT EACH JOINT.

CENTER GATE A

VERTICAL PIECE, 2" X 6" X 36' (4 REQD).

HORIZONTAL PIECE, 2" X 6" X 7'-4" (2 REQD). NAIL TO THE VERTICAL PIECES W/3-10d NAILS AT EACH JOINT.

STRUT LEDGER, 2" X 2" X 8'-9" (2 REQD). NAIL TO THE VERTICAL PIECES W/2-10d NAILS AT EACH JOINT.

CENTER GATE B

PROJECT SP 155-BB
INDICATES BSU-50/B FIN CONTAINER.

INDICATES MK94 BOM8 PALLET.

MISCELLANEOUS BOXES MAY BE LOCATED IN THIS AREA. SEE SPECIAL NOTES 2 AND 3 ON PAGE 9 AND THE DETAIL ON PAGE 5.

DOOR OPENING SIDE OF CONTAINER.

KEY NUMBERS

1 END BLOCKING ASSEMBLY (2 REQD). SEE THE "END BLOCKING ASSEMBLY B" DETAIL ON PAGE 12, AND GENERAL NOTE "F" ON PAGE 2.

2 SIDEWALL LINER, PLYWOOD, 3/8" THICK (AS REQD). POSITION SO AS TO BE BETWEEN THE LADING AND THE CONTAINER SIDEWALL OR THE CONTAINER DOORS, AS APPLICABLE.

3 CRIB FILL (2 REQD). SEE THE "CRIB FILL C" DETAIL ON PAGE 11. POSITION BETWEEN THE PALLETS OF BOMBS. SEE GENERAL NOTE "D" ON PAGE 2.

4 CENTER GATE (4 REQD). SEE THE "CENTER GATE C" DETAIL ON PAGE 10. POSITION BETWEEN THE PALLETS OF BOMBS.

5 STRUT, 4" X 4" BY CUT TO FIT (REF: 12-3/4") (6 REQD). POSITION SO AS TO BE BETWEEN THE CENTER GATE PIECES MARKED ©. TOENAIL TO THE CENTER GATE WITH 2-16d NAILS AT EACH END.

6 DECKING, PLYWOOD, 1/2" THICK BY 44" WIDE BY 48" LONG (4 REQD). POSITION ON TOP OF THE BOMB PALLET UNITS. NOTE THAT HOLES MAY BE DRILLED OR CUT TO ALLOW FOR THE PALLET STACKING PINS.

7 CENTER GATE (4 REQD). SEE THE "CENTER GATE D" DETAIL ON PAGE 10. POSITION BETWEEN THE CONTAINERS IN THE THIRD LAYER.

8 SOLID FILL, 6" WIDE MATERIAL BY 36" LONG BY THICKNESS AS REQUIRED SO AS TO PROVIDE FOR A TIGHT LOAD. SEE GENERAL NOTE "D" ON PAGE 2.

9 CRIB FILL (4 REQD). SEE THE "CRIB FILL C" DETAIL ON PAGE 11. POSITION BETWEEN THE CNU-335 A/E CONTAINERS.
SPECIAL NOTES:

1. THE LOAD AS SHOWN ON PAGE 8 DEPICTS A COMPLETE ROUND LOAD OF 2,000 POUND MK-84 BOMBS, INCLUDING 8 PALLETS OF BOMBS, 8 CNU-335 A/E CONTAINERS WITH BSU-50 FINs, 5 BOXES CONTAINING MISCELLANEOUS ITEMS SUCH AS FUSES, ADAPTORS, COUPLERS, ETC. SEE THE CHARTS BELOW FOR TYPICAL ITEMS.

2. MISCELLANEOUS BOXES MAY BE PLACED IN THE AREA BETWEEN THE CENTER GATES "C" AND SECURED AS SHOWN IN THE "SECUREMENT OF MISCELLANEOUS BOXES" DETAIL ON PAGE 5.

3. WHEN INSTALLING THE DUNNAGE THAT APPLIES TO THE MISCELLANEOUS BOXES, ADJUSTMENTS TO THE QUANTITY AND SIZE OF MATERIAL MAY BE ADJUSTED AS NECESSARY.

<table>
<thead>
<tr>
<th>TYPICAL ITEMS AS DEPICTED ON PAGE 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>DODIC</td>
</tr>
<tr>
<td>F275</td>
</tr>
<tr>
<td>G726</td>
</tr>
<tr>
<td>G836</td>
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<tr>
<td>F119</td>
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<td>F372</td>
</tr>
<tr>
<td>G212</td>
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<table>
<thead>
<tr>
<th>TYPICAL ITEMS FOR MK 84 AIR BURST (NOT SHOWN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DODIC</td>
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<tr>
<td>F275</td>
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<td>G726</td>
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<td>F898</td>
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<td>B129</td>
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<td>F691</td>
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<td>F491</td>
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<tr>
<td>F387</td>
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<tr>
<td>G212</td>
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</table>

* MK 84 AIR BURST LOAD WILL BE LOADED USING THE PROCEDURES SHOWN ON PAGE 8. ADDITIONAL COMPONENTS WILL BE SECURED BETWEEN THE CENTER GATES AND/OR IN VOID AREA BETWEEN LATERALLY ADJACENT PALLET UNITS.

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; X 4&quot;</td>
<td>101</td>
<td>34</td>
</tr>
<tr>
<td>2&quot; X 2&quot;</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>2&quot; X 4&quot;</td>
<td>202</td>
<td>135</td>
</tr>
<tr>
<td>2&quot; X 6&quot;</td>
<td>419</td>
<td>419</td>
</tr>
<tr>
<td>4&quot; X 4&quot;</td>
<td>9</td>
<td>12</td>
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<table>
<thead>
<tr>
<th>NAILS</th>
<th>NO. REO</th>
<th>POUNDS</th>
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<tbody>
<tr>
<td>6d (2&quot;)</td>
<td>594</td>
<td>3-1/2</td>
</tr>
<tr>
<td>10d (3&quot;)</td>
<td>408</td>
<td>6</td>
</tr>
<tr>
<td>18d (3-1/2&quot;)</td>
<td>32</td>
<td>3/4</td>
</tr>
</tbody>
</table>

PLYWOOD, 3/8" | 320 SQ FT REQD | 330 LBS
PLYWOOD, 1/2" | 118 SQ FT REQD | 152 LBS
PLYWOOD, 3/4" | 77 SQ FT REQD | 159 LBS

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
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<tbody>
<tr>
<td>MK 84 BOMB PALLET</td>
<td>8</td>
<td>33,054 LBS</td>
</tr>
<tr>
<td>BSU-50 FIN</td>
<td>16</td>
<td>8,304 LBS</td>
</tr>
<tr>
<td>MISCELLANEOUS ITEMS</td>
<td>5 BOXES</td>
<td>300 LBS</td>
</tr>
<tr>
<td>DUNNAGE</td>
<td></td>
<td>1,875 LBS</td>
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<tr>
<td>CONTAINER</td>
<td></td>
<td>6,050 LBS</td>
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<tr>
<td>TOTAL WEIGHT</td>
<td></td>
<td>49,593 LBS</td>
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</table>

PROJECT SP 155-BB
1. Center Gate C

   Horizontal piece, 2" x 6" x 44" (2 ROED). Nail to the vertical pieces w/3-10d nails at each joint.

2. Center Gate D

   Horizontal piece, 2" x 6" x 44" (2 ROED). Nail to the vertical pieces w/3-10d nails at each joint.

   Vertical piece, 2" x 6" x 36" (2 ROED).
NAIL THE FIRST PIECE TO THE VERTICAL PIECES W/2-10d NAILS AT EACH END.
LAMINATE THE SECOND PIECE TO THE FIRST W/7-10d NAILS.

CRIB FILL C

NAIL TO THE 2" X 4" HORIZONTAL PIECES W/6-5d NAILS

CRIB FILL D

NAIL TO THE VERTICAL PIECES W/2-10d NAILS AT EACH END.
BUFFER PIECE, 2" X 6" BY INSIDE CONTAINER
HEIGHT MINUS 1" (REF: 7'-1"') (12 REO). NAIL THRU PLYWOOD INTO THE BEAMS W/2-10d NAILS AT EACH JOINT.

BEAM, 2" X 6" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-4"') (12 REO).

PLYWOOD, 3/4" X 7-7/8" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-4"') (8 REO). NAIL TO THE BEAMS W/1-6d NAIL EVERY 8".

SEE GENERAL NOTE "G" ON PAGE 2.

END BLOCKING ASSEMBLY B