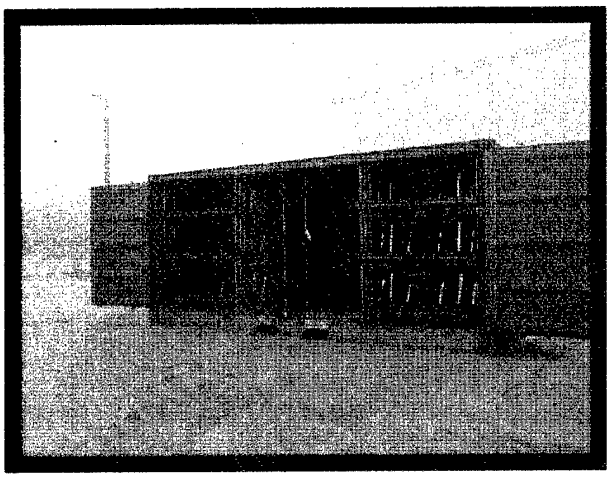
FINAL REPORT
MARCH 2004



REPORT NO. 03-20

TRANSPORTABILITY TESTING OF THE RAPID ISO BRACING SYSTEM (RIBS) IN A SIDE OPENING ISO CONTAINER OF BLU-109 (2,000 POUND) BOMBS, TP-94-01, "TRANSPORTABILITY TESTING PROCEDURES"

Prepared for:

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U.S. Army Defense Ammunition Center
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McAlester, OK 74501

VALIDATION ENGINEERING DIVISION
MCALESTER, OKLAHOMA 74501-9053

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REPORT NO. 03-20 **MARCH 2004**

TRANSPORTABILITY TESTING OF THE RAPID ISO BRACING SYSTEM (RIBS) IN A SIDE OPENING ISO CONTAINER OF BLU-109 (2,000 POUND) BOMBS TP-94-01, REV. 1, JULY 2002 "TRANSPORTABILITY TESTING PROCEDURES"

ABSTRACT

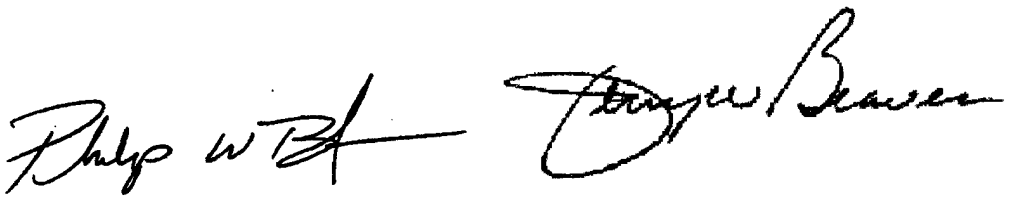
The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Transportation Engineering Division (SJMAC-DET) to conduct transportability testing of the Rapid ISO Bracing System (RIBS) in a side opening ISO container of BLU-109 (2,000 pound) bombs in CNU-417 containers. The testing was conducted in accordance with TP-94-01, Revision 1, July 2002 "Transportability Testing Procedures."

The objective of the testing was to evaluate if the loading and bracing procedures with the Rapid ISO Bracing System (RIBS) in a side opening ISO container with the BLU-109 (2,000) pound bombs in CNU-417 containers and the nose cones and the beam buffers when transportability tested in accordance with TP-94-01, Revision 1, July 2002.

Throughout testing the corner cushions of the RIBS disengaged. This problem did not occur during any previous testing of the RIBS and needs to be corrected. One solution is that the tolerances in the end cushions could be decreased to prevent the corner cushion pieces from separating during transport.

Throughout testing, the load remained safely restrained and no visible damage occurred to the nose cones or beam buffers. Therefore, the loading and bracing procedures, nose cones and beam buffers performed satisfactorily.

Prepared by: Reviewed by:



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REPORT NO. 03-20
Transportability Testing of the Rapid ISO Bracing System (RIBS) in a Side Opening ISO Container of BLU-109 (2,000 pound) Bombs, TP-94-01, Revision 1, July 2002 "Transportability Testing Procedures"

TABLE OF CONTENTS

PART 1 – INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Transportation Engineering Division (SJMAC-DET) to conduct transportability testing of the Rapid ISO Bracing System (RIBS) in a side opening ISO container of BLU-109 (2,000 pound) bombs in CNU-417 containers. The testing was conducted in accordance with TP-94-01, Revision 1, July 2002 "Transportability Testing Procedures."

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Joint Munitions Command (JMC), Rock Island, IL. Reference is made to the following:

1. AR 740-1, 15 June 2001, Storage and Supply Activity Operation.

2. OSC-R, 10-23, Mission and Major Functions of U.S. Army Defense Ammunition Center (DAC) 21 Nov 2000.

C. OBJECTIVE. The objective of the testing was to evaluate the loading and bracing procedures with the and the RIBS nose cones and beam buffers.

D. CONCLUSION. Throughout testing the corner cushions of the RIBS disengaged. This problem did not occur during any previous testing of the RIBS and needs to be corrected. One solution is that the fabrication tolerances of the end cushions could be decreased to prevent the corner cushion pieces from separating during transport.

Throughout testing the load remained safely restrained and no visible damage occurred to the nose cones or beam buffers. Therefore, the loading and bracing procedures, nose cones and beam buffers performed satisfactorily.

PART 2 - ATTENDEES

ATTENDEE	MAILING ADDRESS
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PART 3 - TEST EQUIPMENT

1. Rapid ISO Bracing System (RIBS) with BLU-109 (2,000 Pound) Bombs in CNU-417 Containers, nose cones, and beam buffers.

2. Truck, Tractor
   5 Ton, 6 X 6
   Model #: XM818 with winch
   Manufactured by General Products Division, Jeep Corporation
   ID #: 05A-74971-C124-13529
   Weight: 20,955 pounds

3. Semitrailer, flatbed, breakbulk/container transporter, 22.5 ton
   Model #: M871
   Manufactured by Southwest Truck Body, St. Louis, MO
   ID #: NX03PJ – 0063
   NSN: 2330 00 122 6799
   Weight: 15,630 pounds

4. Intermodal Container
   ID # USAF 0014253
   Date of Manufacture: 08/87
   Manufactured by Containertechnik, Hamburg, GE
   Tare Weight: 6050 pounds
   Maximum Gross Weight: 52,910 pounds

PART 4 - TEST PROCEDURES

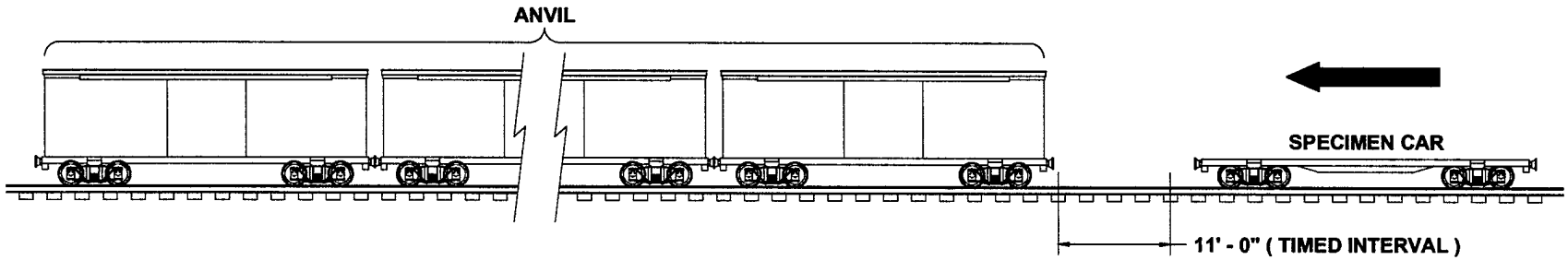
The test procedures outlined in this section were extracted from TP-94-01, Revision 1"Transportability Testing Procedures," dated July 2002, for validating tactical vehicles and outloading procedures used for shipping munitions by tactical or commercial truck, railcar, and ocean-going vessel.

Inert (non-explosive) items will be used to build the load. The test loads will be prepared using the blocking and bracing procedures proposed for use with munitions (***see Part 6 for procedures***). The weight and physical characteristics (weights, physical dimensions, center of gravity, etc.) of the test loads will be similar to live (explosive) ammunition.

A. RAIL TEST. RAIL IMPACT TEST METHOD. The test load or vehicle will be secured to a flatcar. The equipment needed to perform the test will include the specimen (hammer) car, four empty railroad cars connected together to serve as the anvil, and a railroad locomotive. The anvil cars will be positioned on a level section of track with air and hand brakes set and with draft gears compressed. The locomotive unit will push the specimen car toward the anvil at a predetermined speed, then disconnect from the specimen car approximately 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it strikes the anvil. This will constitute an impact. Impacting will be 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 speeds will have a tolerance of plus .5 mph and minus zero mph. The impact speeds will be determined by using an electronic counter to measure the time for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1).

ASSOCIATION OF AMERICAN RAILROADS (AAR)

STANDARD TEST PLAN



4 BUFFER CARS (ANVIL) WITH DRAFT GEAR COMPRESSED AND AIR BRAKES IN A SET POSITION

ANVIL CAR 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. Rail Impact Sketch

B. ON/OFF ROAD TESTS.

1. HAZARD COURSE. The test load or vehicle will be transported over the 200-foot-long segment of concrete-paved road consisting of two series of railroad ties projecting 6 inches above the level of the road surface. The hazard course will be traversed two times (see Figure 2).

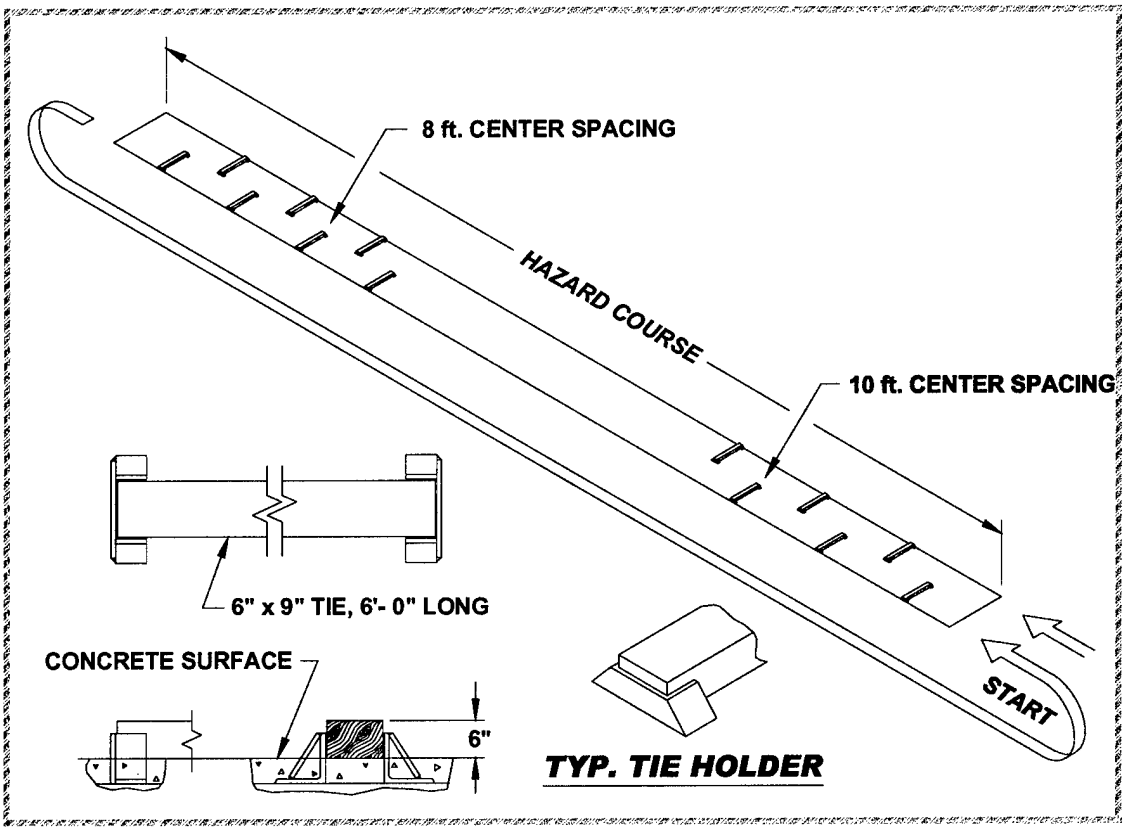


Figure 2. Hazard Course Sketch

a. The first series of 6 ties are spaced on 10-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

b. Following the first series of ties, a paved roadway of 75 feet separates the first and second series of railroad ties.

c. The second series of 7 ties are spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

d. The test load is driven across the hazard course at speeds that will produce the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 mph).

2. ROAD TRIP. The test load or vehicle will be transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. The test route will include curves, corners, railroad crossings and stops and starts. The test load or vehicle will travel at the maximum speed for the particular road being traversed, except as limited by legal restrictions.

3. PANIC STOPS. During the road trip, the test load or vehicle will be subjected to three (3) full airbrake stops while traveling in the forward direction and one in the reverse direction while traveling down a 7 percent grade. The first three stops are at 5, 10, and 15 mph while the stop in the reverse direction is approximately 5 mph. This testing will not be required if the Rail Impact Test is performed.

4. WASHBOARD COURSE. The test load or vehicle will be driven over the washboard course at a speed that produces the most violent response in the vertical direction.

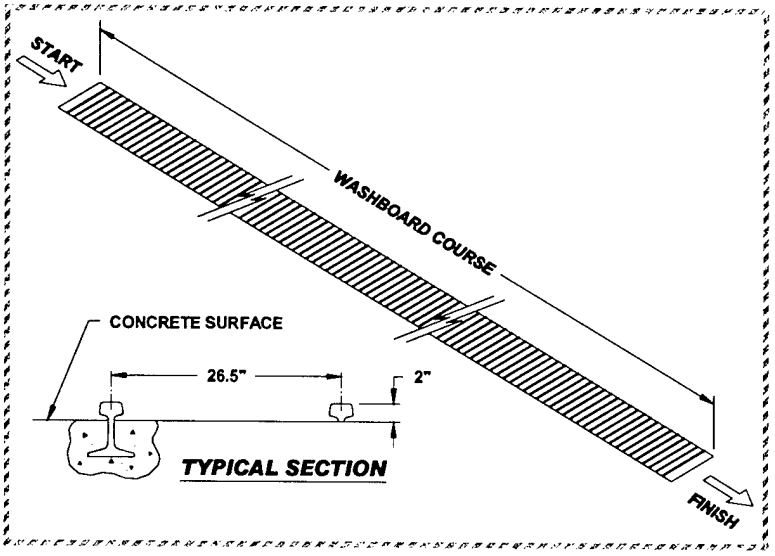


Figure 3. Washboard Course Sketch

PART 5 - TEST RESULTS

Payload: Rapid ISO Bracing System (RIBS) with nose cones and beam buffers with BLU-109 (2,000 pound) bombs in CNU-417 containers, nose cones, and beam buffers.

Testing Date: 13-14 January 2004

Photo 1. Example of Nose Cones

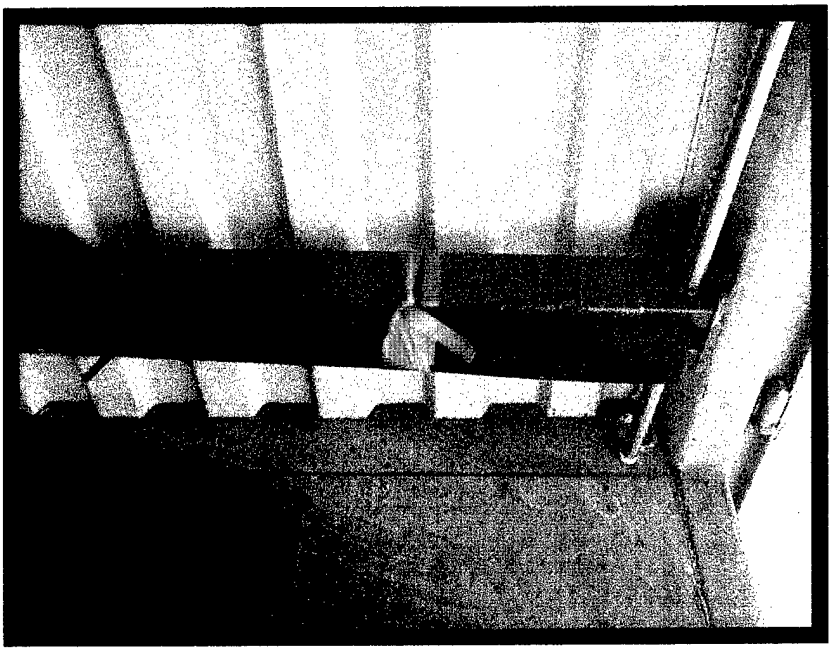


Photo 2. Beam Buffers with Nylon Straps

A. RAIL TEST. SEQUENCE I.

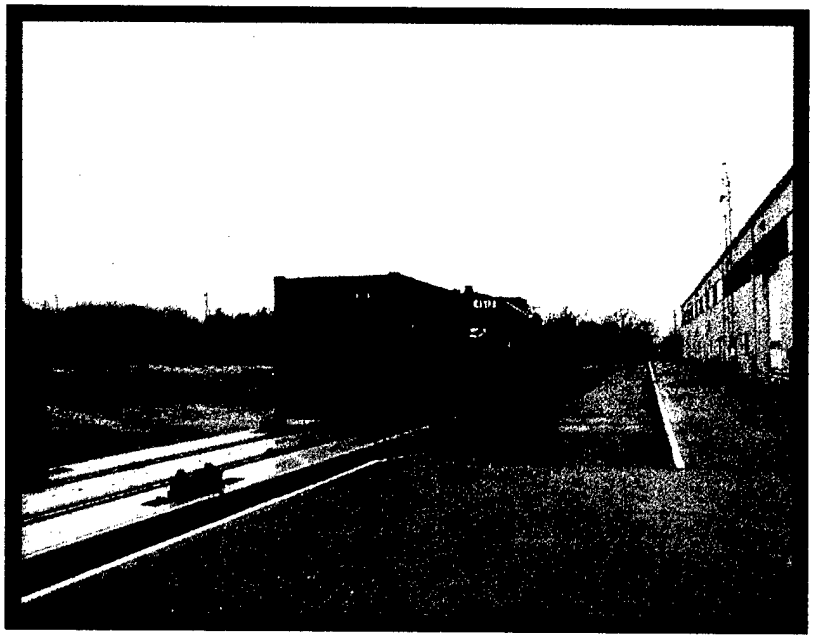


Photo 3. Rail Impact Testing of Test Load (Prior to Testing)

Description	Weight
Flatcar Number: DODX 42353	85,000 lbs.
BLU-109 Payload with Intermodal Side Opening Container	35,320 lbs.
M1 Flatrack with MLRS Pods	28,265 lbs.
Total Specimen Wt.	148,585 lbs.
Buffer Car (four cars)	257,900 lbs.

Figure 4.

Remarks: Figure 4 lists the test components and weights of the items used during the Rail Impact Tests.

Impact Number	Avg. Velocity (mph)
1	3.9
2	5.5
3	5.2
4	6.6
5	9.6
6	9.4

Figure 5.

Remarks:

1. Figure 5 lists the average speeds of the specimen car immediately prior to impact with the anvil. Impact #6 is the reverse impact.
2. Impacts #1 and #3 were determined to be a "no test" due to insufficient velocity at impact. The tests were repeated.
3. Following Impact #2 the cradle assembly, on the door side, non-impact end, moved 2.5-6.5 inches in the direction of impact. The cradle assembly, on the door side, impact end, moved 0-1.5 inches in the direction of impact.
4. Following Impact #3 the bomb pallets moved .25 inches in the direction of impact.
5. Following Impact #4, the cradle assembly, on the door side, non-impact end, moved an additional .5 inches in the direction of impact.
6. Following Impact #5, the cradle assembly, on the door side, non-impact end, moved an additional 1-inch in the direction of impact. The corner cushions came loose on the second beam on the closed side of the container.
7. Following Impact #6, the reverse impact, the following observations were noted: (a) The nose cones on rows 2 and 3 moved .25 inches; (b) Banding on the lower bomb pallets broke; (c) The bombs, on the lower pallet moved .625 inches in the direction of impact; (d) The cradle assembly on the door side, impact end, lodged into the door area, and moved 1.5-4.0 inches, in the direction of impact; (e) The cradle assembly, on the door side, non-impact end, moved

2-7 inches in the direction of impact; (f) Corner cushions disengaged on the non-impact end; and, (g) The center beam on the impact end permanently deflected.

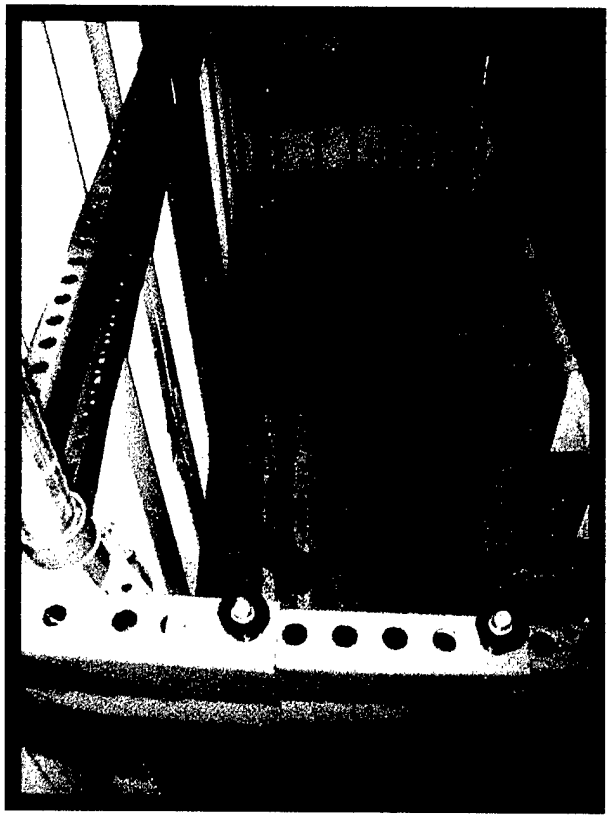


Photo 4. Disengaged Corner Pieces.

8. Testing was stopped due to the excessive impact speeds and movement of the cradles. The container was unloaded and reloaded in accordance with the drawings. Nylon straps were used in place of the wire called out in the drawing to secure the cradles in place. The cradles were secured with nylon straps to the beams instead of the bomb pallets.

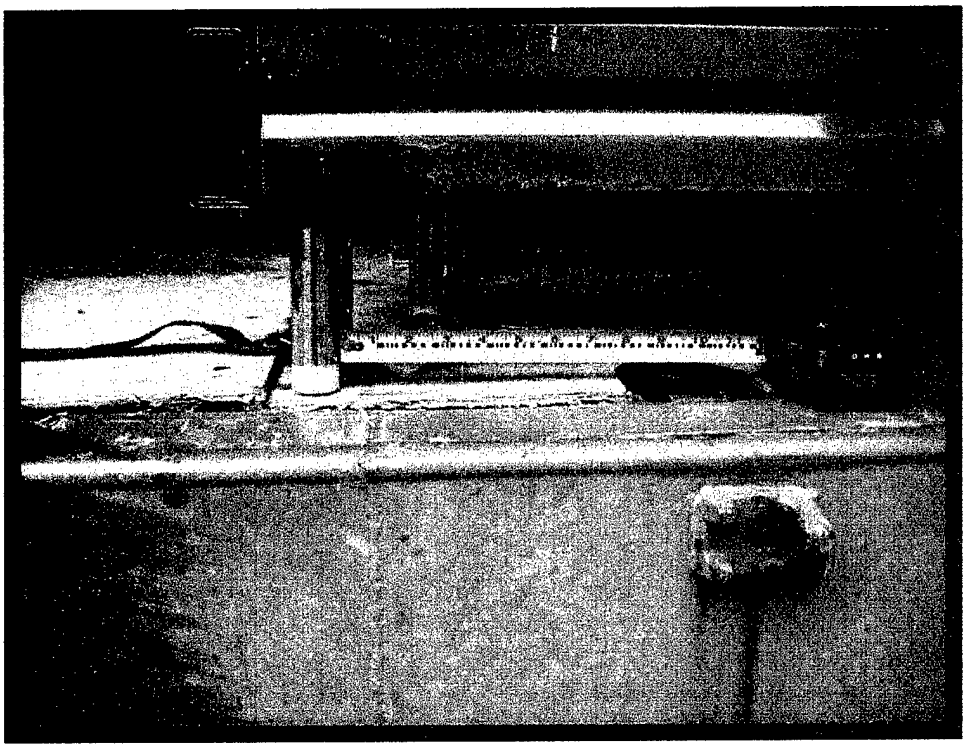


Photo 5. Example of Cradle Movement Following Impact #6.

B. RAIL TEST. SEQUENCE II.

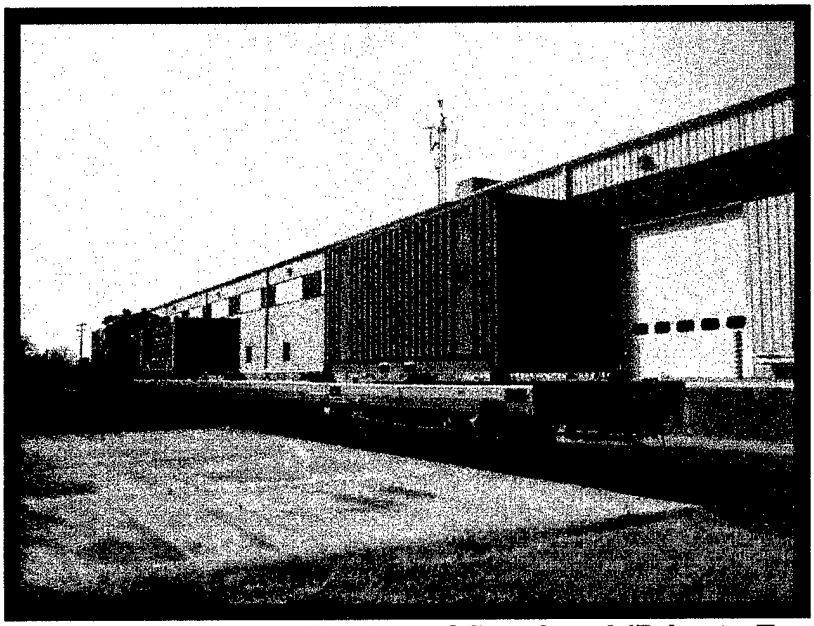


Photo 6. Rail Impact Testing of Test Load (Prior to Testing)

Description	Weight
Flatcar Number: DODX 42353	85,000 lbs.
BLU-109 Payload with Intermodal Side Opening Container	35,320 lbs.
M1 Flatrack with MLRS Pods	28,265 lbs.
Total Specimen Wt.	148,585 lbs.
Buffer Car (four cars)	257,900 lbs.

Figure 6.

Remarks: Figure 6 lists the test components and weights of the items used during the Rail Impact Tests.

Impact Number	Avg. Velocity (mph)
1	4.5
2	6.3
3	9.0
4	8.6

Figure 7.

Remarks:

1. Figure 7 lists the average speeds of the specimen car immediately prior to impact with the anvil. Impact #4 is the reverse impact.
2. Following Impact #1, the cradle assembly, on the door side, non-impact end, moved 1 inch in the direction of impact.
3. Following Impact #2, the cradle assembly, on the door side, non-impact end, moved and additional 1.25-2.5 inches in the direction of impact. The cradle assembly, on the non-door side, non-impact end, moved 1.5 inches in the direction of impact.
4. Following Impact #3: (a) The cradle assembly, on the door side, non-impact end, moved an additional .75-1.25 inches in the direction of impact; (b) The cradle assembly, on the non-door side, non-impact end, moved an additional

0-1.75 inches in the direction of impact; (c) The cradle assembly, on the non-door side, impact end, moved 1 inch in the direction of impact; (d) The main beams moved .5-.75 inches in the direction of impact; (e) The bomb pallets moved .5-.75 inches in the direction of impact; (f) The top corner cushion, on the non-impact end, on the non-door side of the container, loosened, but remained engaged; and, (g) The bottom corner cushion, on the non-impact end, on the non-door side of the container, disengaged and fell to the floor.

5. Following Impact #4: (a) The cradle assembly, on the door side, non-impact end, moved 1.25-2.5 inches in the direction of impact; (b) The cradle assembly, on the door side, impact end, moved 3-4.75 inches in the direction of impact; (c) The cradle assembly, on the non-door side, impact end, moved 1.5-2.5 inches in the direction of impact; (d) The center beams, moved .5-1.25 inches in the direction of impact; (e) The center corner cushion, on the non-door side, impact end, loosened, but remained engaged; and, (f) The tabs on the corner cushion to the bottom beam interface, on the non-door side, impact end, failed. The corner cushion was no longer attached to the beam.

6. The load still remained safely restrained and no visible damage occurred to the nose cones or beam buffer pieces.

Photo 7. Damage and Disengaged Corner Cushions

C. ON/OFF ROAD TESTS.

1. HAZARD COURSE.

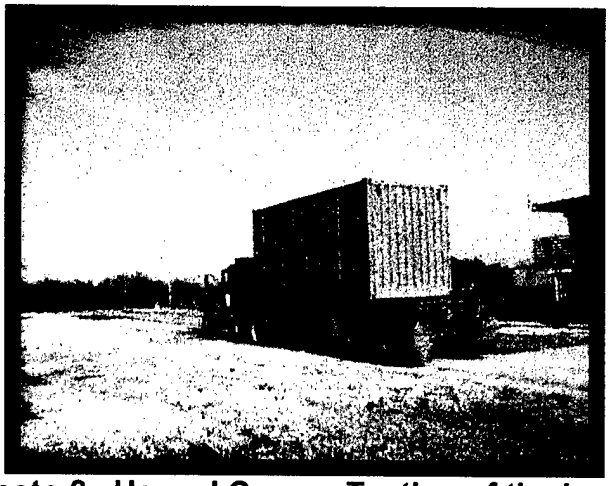


Photo 8. Hazard Course Testing of the Load

Pass No.	Elapsed Time	Avg. Velocity (mph)
1	24 Seconds	6.1
2	24 Seconds	6.1

Figure 8.

Remarks:

1. Figure 8 lists the average speeds of the test load through the Hazard Course.
2. Inspection following Pass # 2 revealed that the nose cones had moved 0-.75 inches toward the closed side of the container.
3. The load still remained safely restrained and no visible damage occurred to the nose cones or the beam buffers pieces.

2. **ROAD TRIP:**

Remarks:

1. The Road Trip was conducted between the Road Hazard Course Passes #2 and #3.
2. Following completion of the Road Trip inspection revealed that the top corner cushion, on the trailer end, non-door side, had disengaged.

3. **PANIC STOPS:** Testing was not required since the load was rail impact tested.

4. **HAZARD COURSE:**

Pass No.	Elapsed Time	Avg. Velocity (mph)
3	24 Seconds	6.1
4	25 Seconds	5.9

Figure 9.

Remarks:

1. Figure 9 lists the average speeds of the test load through the Hazard Course.
2. The load still remained safely restrained and no visible damage occurred to the nose cones or the beam buffer pieces.

5. **WASHBOARD COURSE:**

Remarks:

1. Inspection following the completion of the washboard course revealed that the center beams had moved .75-2 inches toward the door of the container.
2. Four nose cones were loose but safely in place.
3. The load still remained safely restrained and no visible damage occurred to the nose cones or beam buffer pieces.

Photo 9. Washboard Course Testing of the Load.

D. SHIPBOARD TRANSPORTATION SIMULATOR (STS).

Remark: STS Testing was not conducted.

E. FINAL INSPECTION. Three vertical poles permanently deflected during testing. Additionally, when removing some of the cradle lock pins the finger holds on the pins pulled out. Inspection revealed that the finger holds were only glued in place and that the black finger holds were not properly threaded. Photo 10 shows a lock pin with the finger hold installed (right pin) and one pulled loose (left pin). The nylon straps and wire ties did adequately hold the beam buffers in place while the Velcro did not adequately hold the beam buffers in place. Also, caution must be used when loading/unloading the payload to prevent damaging the beam buffers and ties.

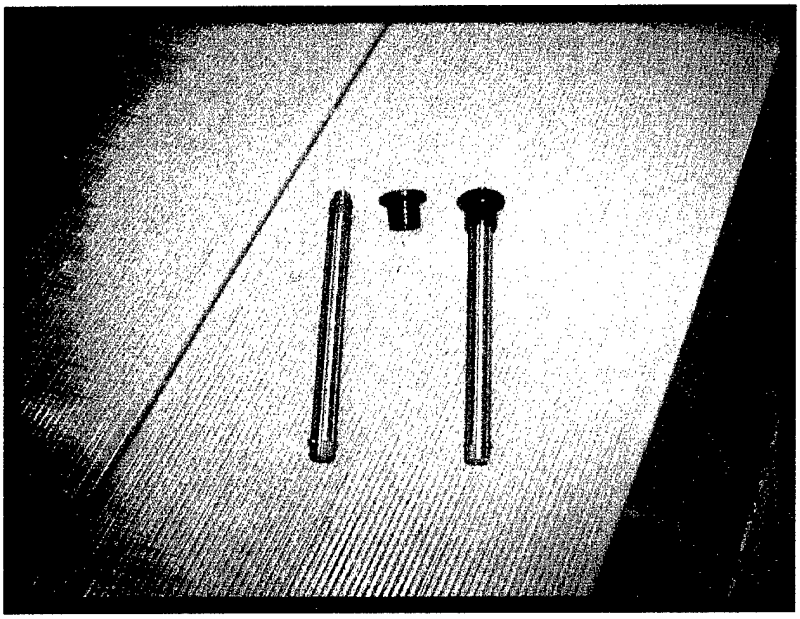


Photo 10. Lock Pins.

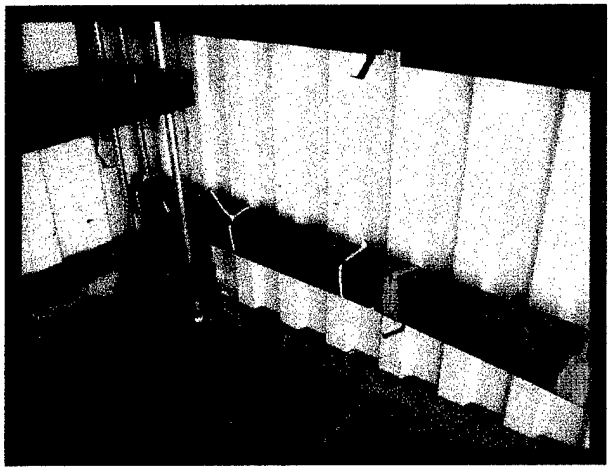


Photo 11. Example of Wire Ties and Nylon Straps Holding the Beam Buffers

F. <u>CONCLUSION</u>: Throughout testing the corner cushions disengaged. This problem did not occur during any previous testing of the RIBS and needs to be corrected. One solution is that the tolerances in the end cushions could be decreased to prevent the corner pieces from separating during transport. This could cause the end beam to move excessively. If this problem is not

corrected it could cause excessive, unsatisfactory, and unsafe movement of the payload.

Throughout testing, the load remained safely restrained and no visible damage occurred to the nose cones or end buffer pieces. Therefore, the loading and bracing procedures, nose cones and beam buffers performed satisfactorily.

PART 6 – DRAWINGS

The following drawing represents the load configuration that was subjected to the test criteria.

APPROVED BY
BUREAU OF EXPLOSIVES

DATE _____

LOADING AND BRACING● WITH RAPID ISO BRACING SYSTEM (RIBS) IN SIDE OPENING ISO CONTAINERS OF BLU-109 (2,000 POUND) BOMBS IN CNU-417 CONTAINERS

INDEX

● LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (T/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
JOINT MUNITIONS COMMAND

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

U.S. ARMY DEFENSE AMMUNITION CENTER

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SEPTEMBER 2003

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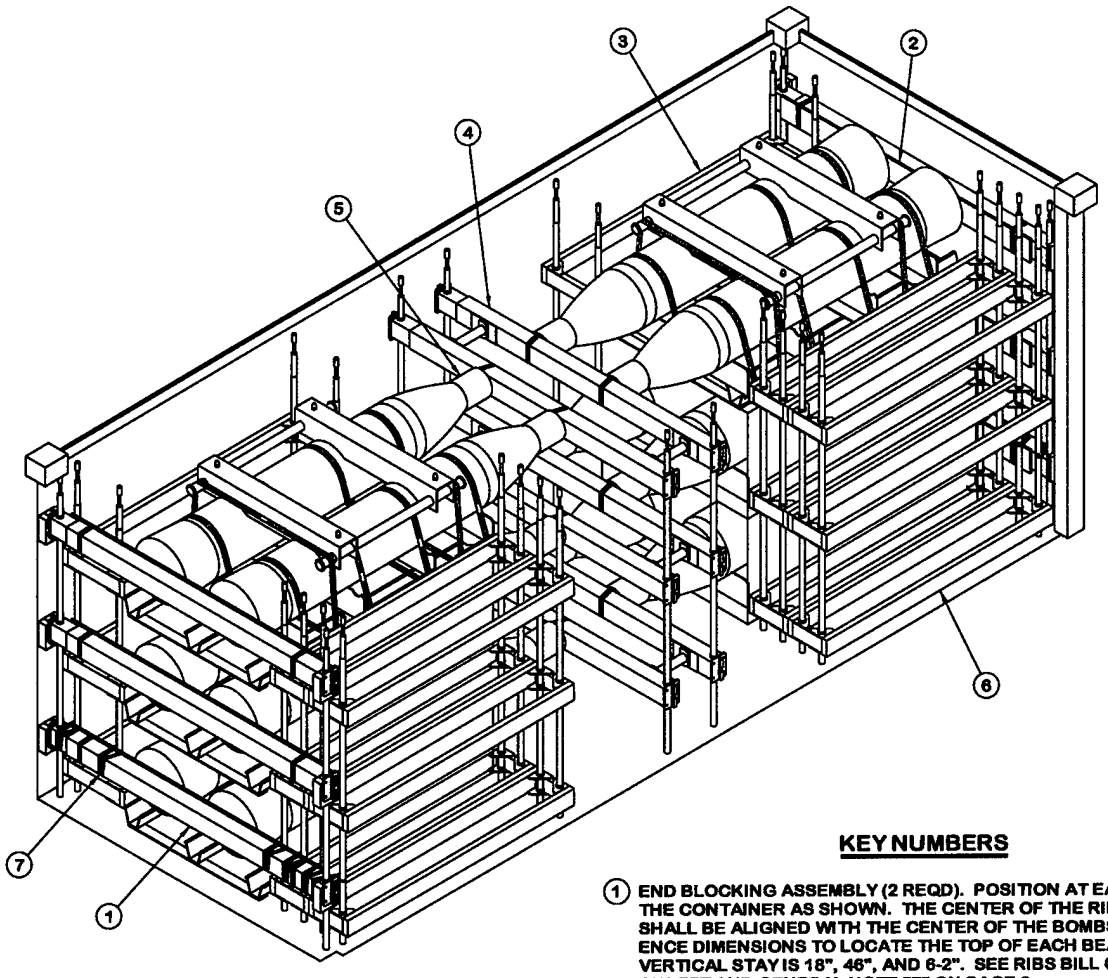


ISOMETRIC VIEW

RIBS BILL OF MATERIAL				
PRT #	EQUIPMENT	END ASSY	CENTER FILL	CRADLE
A010	RIBS BAR	3	6	0
A020	VERTICAL STAY	2	4	4
A050	HDS STAY MED.	0	6	0
A080	CORNER CUSHION	8	0	0
A230	CRADLE BEAM LONG	0	0	6
A210	CRADLE BEAM SHORT	0	0	6
- -	NOSE CONE	0	12	0
- -	BUFFER PIECE	3	0	0
ASSEMBLY QUANTITY		2	1	6

BILL OF MATERIAL	
WEB STRAP, 1" WIDE, NYLON	24 REQD - 1 LB
RIBS COMPONENTS	2,295 LBS

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	6	26,820 LBS
DUNNAGE		2,296 LBS
CONTAINER		6,050 LBS
TOTAL WEIGHT		35,166 LBS (APPROX)

KEY NUMBERS

(1) END BLOCKING ASSEMBLY (2 REQD). POSITION AT EACH END OF THE CONTAINER AS SHOWN. THE CENTER OF THE RIBS BARS SHALL BE ALIGNED WITH THE CENTER OF THE BOMBS. REFERENCE DIMENSIONS TO LOCATE THE TOP OF EACH BEAM ON THE VERTICAL STAY IS 18", 46", AND 6-2". SEE RIBS BILL OF MATERIAL AT LEFT AND GENERAL NOTE "F" ON PAGE 3.

(2) BUFFER PIECE (6 REQD). POSITION AGAINST THE FACE OF EACH RIBS BAR OF THE END BLOCKING ASSEMBLY. BUFFER PIECE SHALL ACT AS A LINER BETWEEN THE BASE OF THE BOMBS AND THE RIBS BARS. SECURE TO THE RIBS BARS WITH NYLON WEB STRAPS IN TWO LOCATIONS. SEE GENERAL NOTE "D" ON PAGE 3.

(3) FAR SIDE CRADLE ASSEMBLY (2 REQD). POSITION AGAINST THE FAR WALL AND THE END BLOCKING ASSEMBLY. THE ASSEMBLY SHALL BE EXPANDED TO APPROXIMATELY 70" LONG BY 19" WIDTH. THE BEARING PIECES SHALL BE LOCATED TO CONTACT THE SIDE OF THE PALLET UNITS ABOVE THE SKIDS. REFERENCE DIMENSIONS TO LOCATE THE TOP OF EACH LONG AND SHORT BEAM ON THE VERTICAL STAY IS 8", 36", AND 64". SECURE EACH ASSEMBLY TO A HORIZONTAL PIECE OF THE END BLOCKING ASSEMBLY WITH NYLON WEB STRAPS IN TWO LOCATIONS. SEE RIBS BILL OF MATERIAL AT LEFT.

(4) CENTER FILL ASSEMBLY (1 REQD). POSITION BETWEEN ROWS OF BOMBS AS SHOWN. THE CENTER OF THE RIBS BARS SHALL BE ALIGNED WITH THE NOSE OF THE BOMBS. REFERENCE DIMENSIONS TO LOCATE THE TOP OF EACH BEAM ON THE VERTICAL STAY IS 18", 46", AND 6-2". SEE RIBS BILL OF MATERIAL AT LEFT.

(5) NOSE CONE (12 REQD). PLACE A NOSE CONE ON THE NOSE OF EACH BOMB. SECURE THE NOSE CONES TO THE RIBS BEAMS.

(6) DOOR SIDE CRADLE ASSEMBLY (4 REQD). POSITION BETWEEN BOMB PALLETS ON THE DOOR SIDE AS SHOWN. THE ASSEMBLY SHALL BE EXPANDED TO APPROXIMATELY 70" LONG BY A WIDTH AS NECESSARY TO FILL THE AREA BETWEEN THE PALLETS AND THE DOOR. THE RIBS CRADLES ARE DOUBLED IN THIS AREA IN ORDER TO FILL THE VOID. THE BEARING PIECES SHALL BE LOCATED TO CONTACT THE SIDE OF THE PALLET UNITS ABOVE THE SKIDS. REFERENCE DIMENSIONS TO LOCATE THE TOP OF EACH LONG AND SHORT BEAM ON THE VERTICAL STAY IS 8", 36", AND 64". SECURE EACH ASSEMBLY TO A HORIZONTAL PIECE OF THE END BLOCKING ASSEMBLY WITH WIRE IN TWO LOCATIONS. SEE RIBS BILL OF MATERIAL AT LEFT.

(7) NYLON WEB STRAP (24 REQD). USE TO SECURE CRADLE ASSEMBLY AND BUFFER PIECE TO THE RIBS BAR.

(GENERAL NOTES CONTINUED)

K. MAXIMUM LOAD WEIGHT CRITERIA:

THE MAXIMUM LOAD WEIGHTS ARE CONTROLLED BY EQUIPMENT CAPABILITY FACTORS. ALTHOUGH THE HEAVIEST MAXIMUM LOADS ARE DELINEATED IN THE LOAD VIEW, PROVISIONS ARE INCLUDED WITHIN THIS DRAWING SO THAT THE BASIC LOADS CAN BE ADJUSTED TO SATISFY A LESSER QUANTITY OF LADING UNITS. DEPENDING ON TRANSPORTATION ROUTING, IT MAY BE NECESSARY TO REDUCE THE LOAD WEIGHT TO SATISFY "WEIGHT LAWS" OF CERTAIN STATES. ALSO, IT MAY BE NECESSARY TO REDUCE THE LOAD WEIGHT TO SATISFY OTHER WEIGHT RESTRICTIONS IMPOSED ON THE INTERMODAL CONTAINER SYSTEM.

L. REQUIREMENTS CITED WITHIN THE ASSOCIATION OF AMERICAN RAILROADS (AAR) INTERMODAL LOADING GUIDE APPLY WHEN THE SHIPMENT MOVES BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC). SPECIAL T/COFC NOTES FOLLOW:

1. A LOADED CONTAINER MUST BE ON A CHASSIS EQUIPPED WITH TWO BOGIE ASSEMBLIES WHEN BEING MOVED IN TOFC SERVICE.

2. THE LOAD LIMIT OF A T/COFC RAILCAR MUST NOT BE EXCEEDED, NOR WILL A CAR BE LOADED SO THAT THE TRUCK UNDER ONE END OF THE CAR CARRIES MORE THAN ONE-HALF OF THE LOAD LIMIT FOR THAT CAR.

M. DURING INTRASTATE AND/OR INTERSTATE MOVES BY MOTOR CARRIER, A PROPER CHASSIS OR MODIFIED FLATBED TRAILER MUST BE USED TO PRECLUDE VIOLATION OF ONE OR MORE "WEIGHT LAWS" APPLICABLE TO THE STATE OR STATES INVOLVED.

N. WHETHER A CONTAINER IS FULL OR IS LOADED WITH A REDUCED QUANTITY OF LADING UNITS, THE LENGTHWISE CENTER OF GRAVITY OF THE LOAD MUST BE WITHIN 12", IN EITHER DIRECTION, OF THE MID-POINT OF THE CONTAINER.

O. THE QUANTITY OF PALLET UNITS SHOWN IN THE LOAD ON PAGE 2 MAY BE REDUCED FOR SHIPMENT, IF DESIRED. THE LOAD MAY BE REDUCED BY TWO OR FOUR PALLET UNITS BY REMOVING LAYERS FROM THE TOP OF THE LOAD. LOADS OF FIVE OR THREE PALLET UNITS WILL UNBALANCE THE CONTAINER AND ARE PROHIBITTED.

GENERAL NOTES

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 THE BLU-109 (2,000 POUND) BOMBS IN CNU-417 CONTAINER. SUBSEQUENT REFERENCE TO THE PALLET UNIT HEREIN MEANS THE CNU-417 CONTAINER WITH THE BLU-109 BOMBS INSTALLED. THIS OUTLOADING PROCEDURE UTILIZES THE RAPID INTERNATIONAL ORGANIZATION FOR STANDARDIZATION BRACING SYSTEM (RIBS) DEVELOPED BY MOBILE SHELTER SYSTEMS. THE RIBS COMPONENTS USED IN THIS OUTLOADING PROCEDURE PROVIDE END BLOCKING, CRADLE FILL, AND CENTER FILL RESTRAINT OF THE LOAD. SEE PAGE 4 FOR DETAIL OF THE PALLET UNIT. CAUTION: REGARDLESS OF THE QUANTITY OF PALLET UNITS 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 ISO CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 89" WIDE BY 88" HIGH AND A MAXIMUM GROSS WEIGHT OF 52,910 POUNDS. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLATCAR (T/COFC) SHIPMENT; HOWEVER, THE LOAD AS DESIGNED CAN ALSO BE MOVED BY MOTOR OR WATER CARRIERS. NOTICE: OTHER CONTAINERS OF THE SAME DESIGN CONFIGURATION CAN ALSO BE USED.

D. WHEN LOADING THE BOMB PALLET UNITS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE A TIGHT LOAD (TIGHT AGAINST THE RIBS COMPONENTS). THE UNBLOCKED SPACE ACROSS THE WIDTH OF A LOAD BAY IS NOT TO EXCEED 1-1/2". EXCESSIVE SLACK CAN BE ELIMINATED FROM A LOAD BY ADJUSTMENT OF THE RIBS COMPONENTS. NOTE: METAL TO METAL CONTACT BETWEEN BOMB BODIES AND/OR RIBS COMPONENTS IS PROHIBITED; THEREFORE, A BUFFER PIECE IS POSITIONED BETWEEN THE BASE OF THE BOMBS AND RIBS COMPONENTS. THE NOSE OF EACH BOMB SHALL BE PROTECTED BY A RIBS NOSE CONE. THE CRADLE ASSEMBLIES DO NOT REQUIRE A LINER BETWEEN THE SIDE OF THE PALLET UNITS AND THE CRADLE ASSEMBLY. INSTALLATION OF RIBS COMPNENTS SHALL BE IN ACCORDANCE WITH THE APPROPRIATE UNITED STATES AIR FORCE TECHNICAL ORDER.

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" THICK BY 5-1/2" WIDE.

F. THE END BLOCKING ASSEMBLIES MUST BE POSITIONED SO THAT THE LOAD WILL TRANSFER TO THE CONTAINER ENDWALLS. THIS MAY BE ACCOMPLISHED BY USE OF THE RIBS CORNER CUSHIONS. DO NOT ALLOW THE RIBS HORIZONTAL PIECES TO CONTACT THE CONTAINER ENDWALLS, ONLY THE CORNER POSTS OF THE CONTAINER SHOULD BE USED FOR LONGITUDINAL BLOCKING.

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

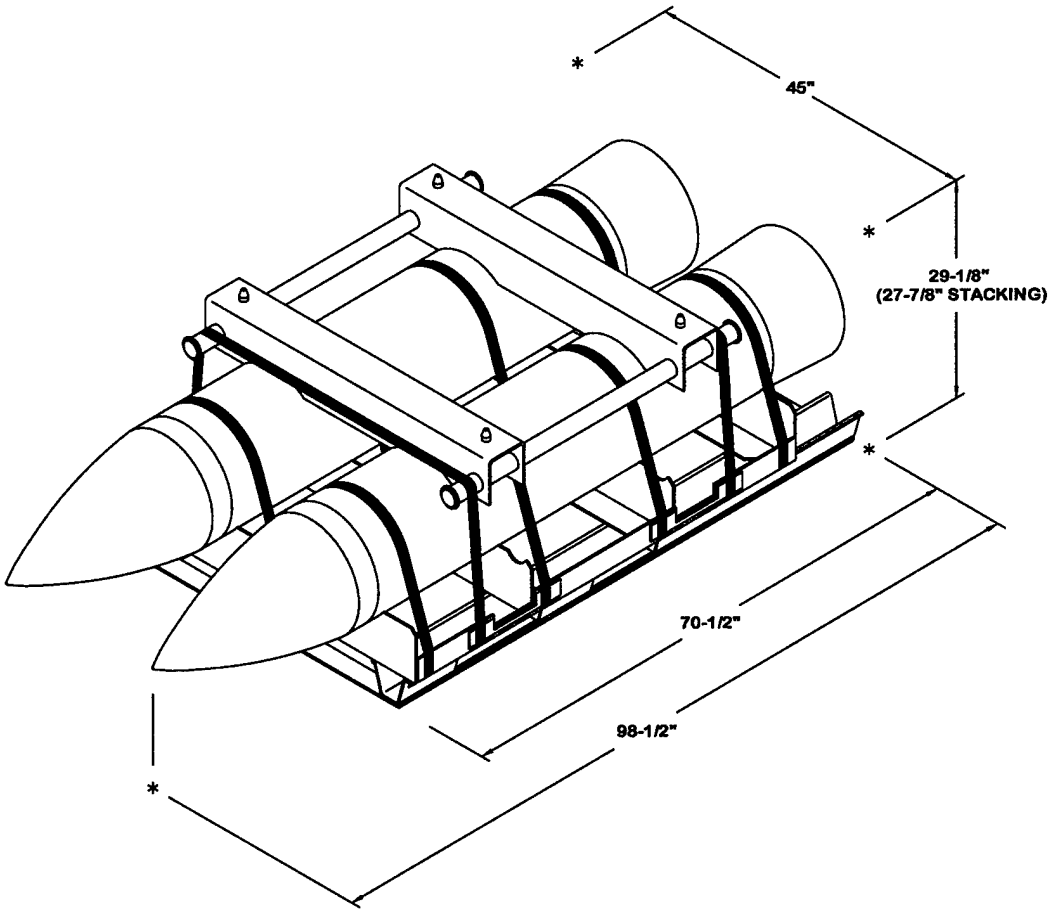
H. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS THE SIDEWALL, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

J. 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.

(CONTINUED AT LEFT)

MATERIAL SPECIFICATIONS

RIBS - - - - - - - -:	SEE TM /RIBS-01015-A1
NAILS - - - - - - -:	ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCMMS).
WIRE, CARBON STEEL -:	ASTM A853; ANNEALED AT FINISH, BLACK OXIDE FINISH, 0.0800" DIA, GRADE 1006 OR BETTER.
STRAP, WEB, COMMERCIAL - - - - -:	WEB SLING AND TIEDOWN ASSOCIATION RECOMMENDED STANDARD SPECIFICATION FOR SYNTHETIC WEB TIEDOWNS, REVISED 1998.



BLU-109 BOMBS IN CNU-417 CONTAINER

GROSS WEIGHT - - - - - - - - - 4,470 LBS (APPROX)
CUBE - - - - - - - - - - - - 74.8 CU FT (APPROX)