FINAL REPORT
OCTOBER 1991

REPORT NO. 91-20

U.S. NAVY (USN)
ALPHA MINE ROAD TEST

Prepared for:
Commanding Officer
Naval Weapons Station, Earle
ATTN: Code 8024
Colts Neck, NJ 07722-5000

Distribution Unlimited

U.S. ARMY
ARMAMENT
MUNITIONS
CHEMICAL COMMAND

U.S. ARMY DEFENSE AMMUNITION
CENTER AND SCHOOL

VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639

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William R. Meyer

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FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by Naval Weapons Station, Earle (NWS-Earle) to perform road transportability tests on the U.S. Navy (USN) Alpha Quickstrike/DST-41 mines. The following report contains test results and successful completion of all road transportability tests.

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U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
VALIDATION ENGINEERING DIVISION
SAVANNA, IL 61074-9639

REPORT NO. 91-20
U.S. NAVY (USN) ALPHA MINE ROAD TEST

TABLE OF CONTENTS

PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by Naval Weapons Station, Earle (NWS-Earle) to perform road transportability tests on the U.S. Navy (USN) Alpha Quickstrike/DST-41 mines.

B. AUTHORITY. Testing was accomplished in accordance with mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL.

C. OBJECTIVE. The objective of this test is to determine if the MK84 bombs can be assembled with MK-165-0 mine kits, MK32 arming devices, and MK-42-7 firing mechanisms at a remote site and safely transported to the flight line for aircraft uploading. Previous procedures required assembly on the flight line resulting in delays and slow turnaround of the aircraft.

PART 2

U.S. NAVY (USN) ALPHA MINE ROAD TEST

OCTOBER 1991

ATTENDEES

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PART 3

ROAD TEST PROCEDURES

Five separate road testing steps are required as identified herein:

A. Step No. 1. This step provides for the specimen load to be driven over a 200-foot-long segment of concrete-paved road which consists of two series of railroad ties projecting 6 inches above the level of the road surface. This hazard course was traversed two times and repeated per step no. 4.

(1) The first series of ties is spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

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

(3) The second series of ties is alternately positioned similiarly to the first, but spaced on 10-foot centers for a distance of 50 feet.

(4) The specimen load was driven across the hazard course at speeds that would produce the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 miles per hour [mph]).

B. Step No. 2. This step consists of 30 miles of travel over available rough roads consisting of gravel, concrete and asphalt, curves, cattle gates, and stops and starts.

C. Step No. 3. This step provides for the specimen load to be subjected to three full air brake stops while traveling in the forward direction, and one in the reverse direction down a

7 percent grade. The first three stops are at speeds of 5, 10, and 15 mph while the stop in the reverse direction is at approximately 5 mph.

D. Step No. 4. This step consists of a repeat of that identified in step no. 1.

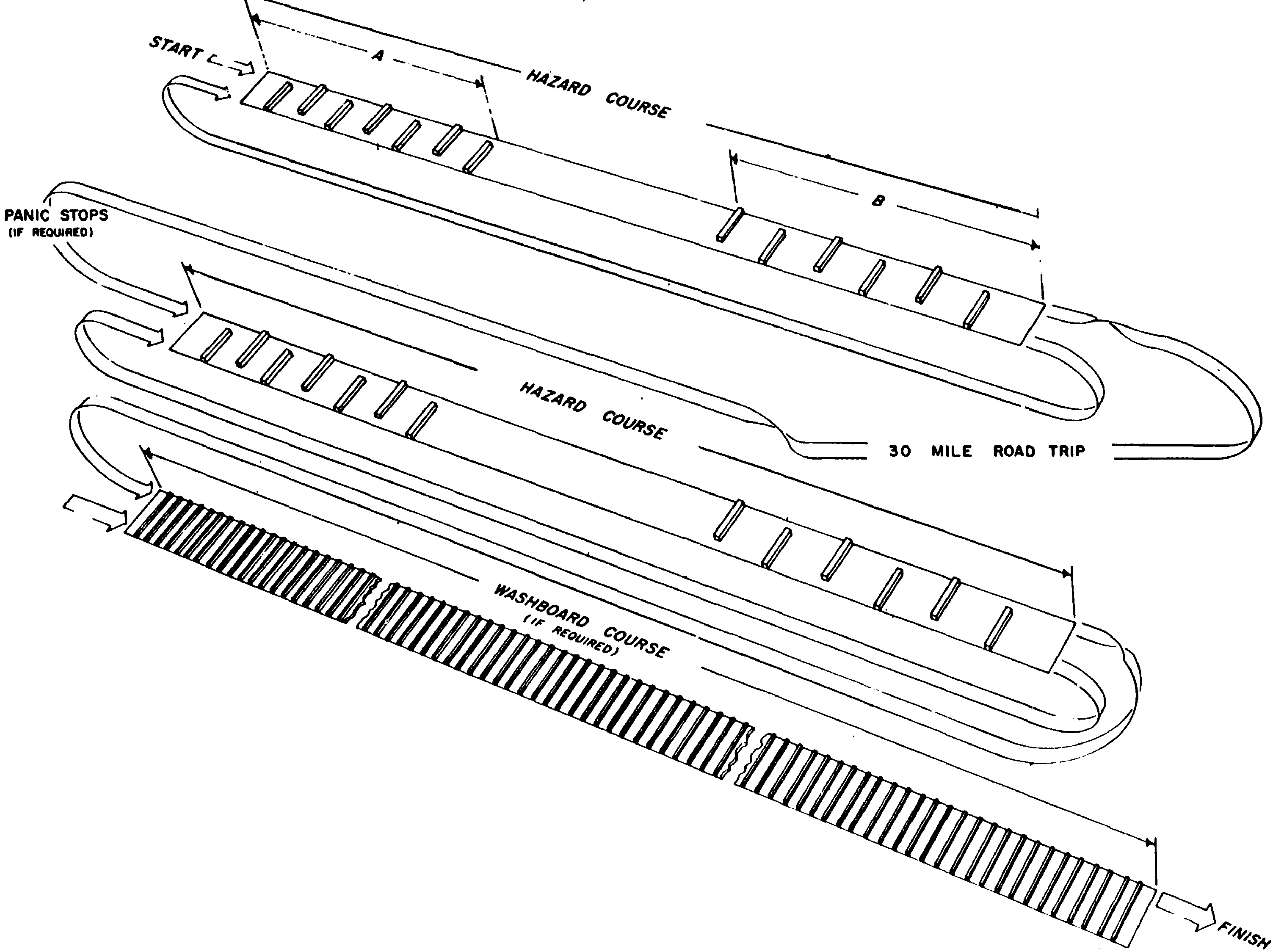
E. Step No. 5. This step provides for the specimen load to be driven over a 300-foot-long segment of concrete-paved road which has rails spaced in 26 1/2-inch centers and protruding 2 inches above the road surface. The specimen load was driven at the speed which will produce the most violent response.

NOTE: Steps nbs. 3 and 5 may be deleted at the discretion of the test engineer.

INSPECTION AND DATA COLLECTION. 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. The data are recorded in part 5 of this report.

US ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

TRANSPORTABILITY ROAD COURSE



PART 4

ITEMS TESTED

A. U.S. Navy (USN) Alpha Quickstrike/DST-41 Mines.

(1) MK 32 Mod 3 Arming Device

(2) MK 42 Mod 7 Firing Mechanism.

(3) MK 160-0 Mine Flight Gear.

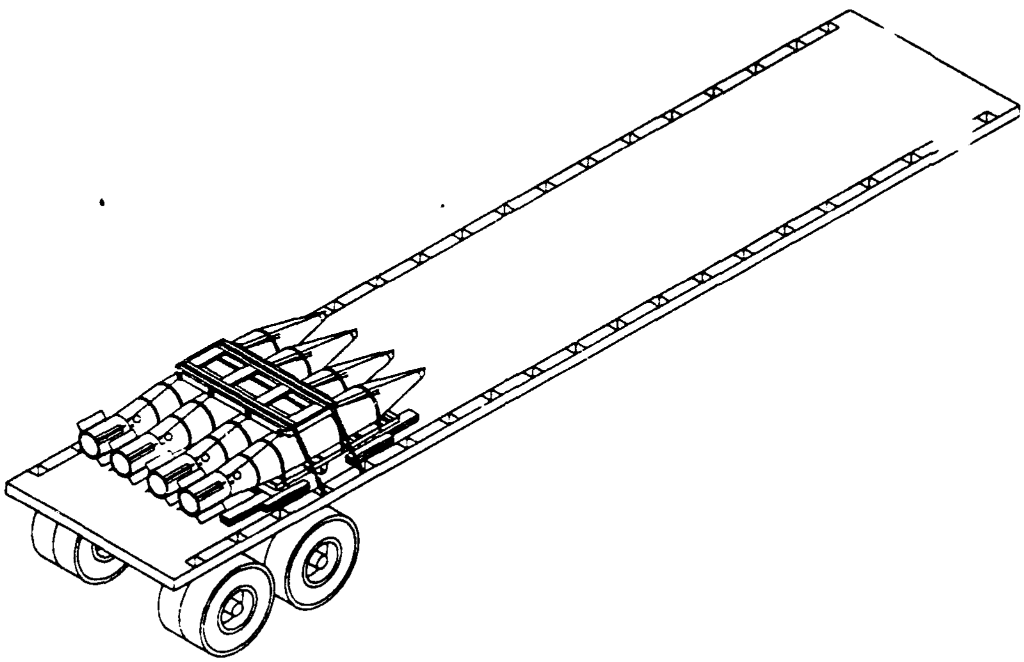
(4) MK 165-0 Arming Hardware.

(5) MK 84 2,000-Pound Bombs.

(6) MK 79 Lower Pallet Adapter.

B. Test Weight: 8,530 pounds.

ALPHA MINE ROAD TEST



NOTES:

1. TEST CONDUCTED ON A 40 FT COMMERCIAL TRAILER

FOR INFORMATION ONLY

TITLE	DWG NO	
U.S. NAVY ALPHA MINE ROAD TEST	91-020-0-T00045	
	VALIDATION ENGINEERING DIVISION	SHEET 1 OF 1

PART 5

TEST RESULTS

A. Prior to testing, the USN Alpha Quickstrike/DST-41 mines had the MK 79 top metal adapter removed with the MK 84 bombs fastened to the lower pallet adapter with three 1 1/2-inch metal bands. Also, prior to testing, both test pallets were readjusted to eliminate tail fin contact on two bombs, and bomb misalignment of 1-inch on a third. Both pallets were tested on the rear of a commercial 40-foot flatbed trailer, which generated the greatest amount of shock in the test samples. Floor line blocking, restricted longitudinal movement, and a wooden top pallet adapter, chains, and load binders restricted the vertical movement (see the appendix for details).

B. After the first pass over the railroad tie course and in all subsequent tests, the forward most metal bands restraining the bombs were loose. This was due to the projectiles sliding to the rear of the pallet and trailer. This rear movement, noted during most phases of testing, was longitudinal movement to the rear of the trailer of less than 2 inches (see table 1). This movement and loose bands did not have an adverse effect on test results.

Table 1

Longitudinal Bomb Movement

	Bomb Position			
	Far Right (Inches)	Center Right (Inches)	Center Left (Inches)	Far Left (Inches)
After 1st Rail Tie Pass	0.75	0.375	0.125	0.50
After 2nd Rail Tie Pass	0.875	0.25	0.125	0.625
After 30-Mile Road Course	1.125	0.25	0.50	0.75
After 5 MPH Panic Stop	1.25	0.125	0.50	0.625
After 10 MPH Panic Stop	1.25	0.125	0.375	0.625
After 15 MPH Panic Stop	1.25	0.125	0.375	0.625
After 5 MPH Rev. Panic Stop	1.75	0.75	0.875	1.50
After 3rd Rail Tie Pass	1.375	0.375	0.50	0.875
After 4th Rail Tie Pass	1.375	0.875	0.50	0.875
After Washboard Course	1.375	0.75	0.50	0.875

Note: Measurements of bomb movement rearward in relation to the pallet.

C. During all phases of testing, slight bomb rotation was noted with the clearances between tail fin assemblies being recorded (see table 2). This rotation did not have an adverse effect on the test results; however, the geometry of the tail fin assemblies could result in tail fin contact and damage if several adjacent bombs rotated in opposite directions at the same time. However, this was not observed during testing.

Table 2

Bomb Rotation

	Rightside Bombs (Inches)	Center Bombs (Inches)	Leftside Bombs (Inches)
Before Testing	0.75	1.75	0.625
After 1st Rail Tie Pass	0.625	1.625	0.375
After 2nd Rail Tie Pass	0.50	1.75	0.25
After 30-Mile Road Course	0.50	1.75	0.25
After 5 MPH Panic Stop	0.50	1.75	0.25
After 10 MPH Panic Stop	0.50	1.75	0.25
After 15 MPH Panic Stop	0.50	1.75	0.25
After 5 MPH Rev. Panic Stop	0.50	1.75	0.187
After 3rd Rail Tie Pass	0.50	1.75	0.062
After 4th Rail Tie Pass	0.50	1.75	0.125 (1)*
After Washboard Course	0.50	1.625	0.125 (1)*

Note: Measurements taken from right to left facing the rear of the trailer.

*(1) Indicates absolute clearance between fins, all other figures indicate horizontal clearance.

D. The following times and speeds were recorded during testing over the railroad tie and washboard courses with no problems encountered (see table 3).

Table 3

Railroad Tie And Washboard Course Speeds

	Seconds	MPH
Railroad Tie Course (Pass 1)	25.71	4.64
Railroad Tie Course (Pass 2)	25.64	4.65
Railroad Tie Course (Pass 3)	25.37	4.70
Railroad Tie Course (Pass 4)	25.59	4.66
Washboard Course	109.02	1.88

PART 6

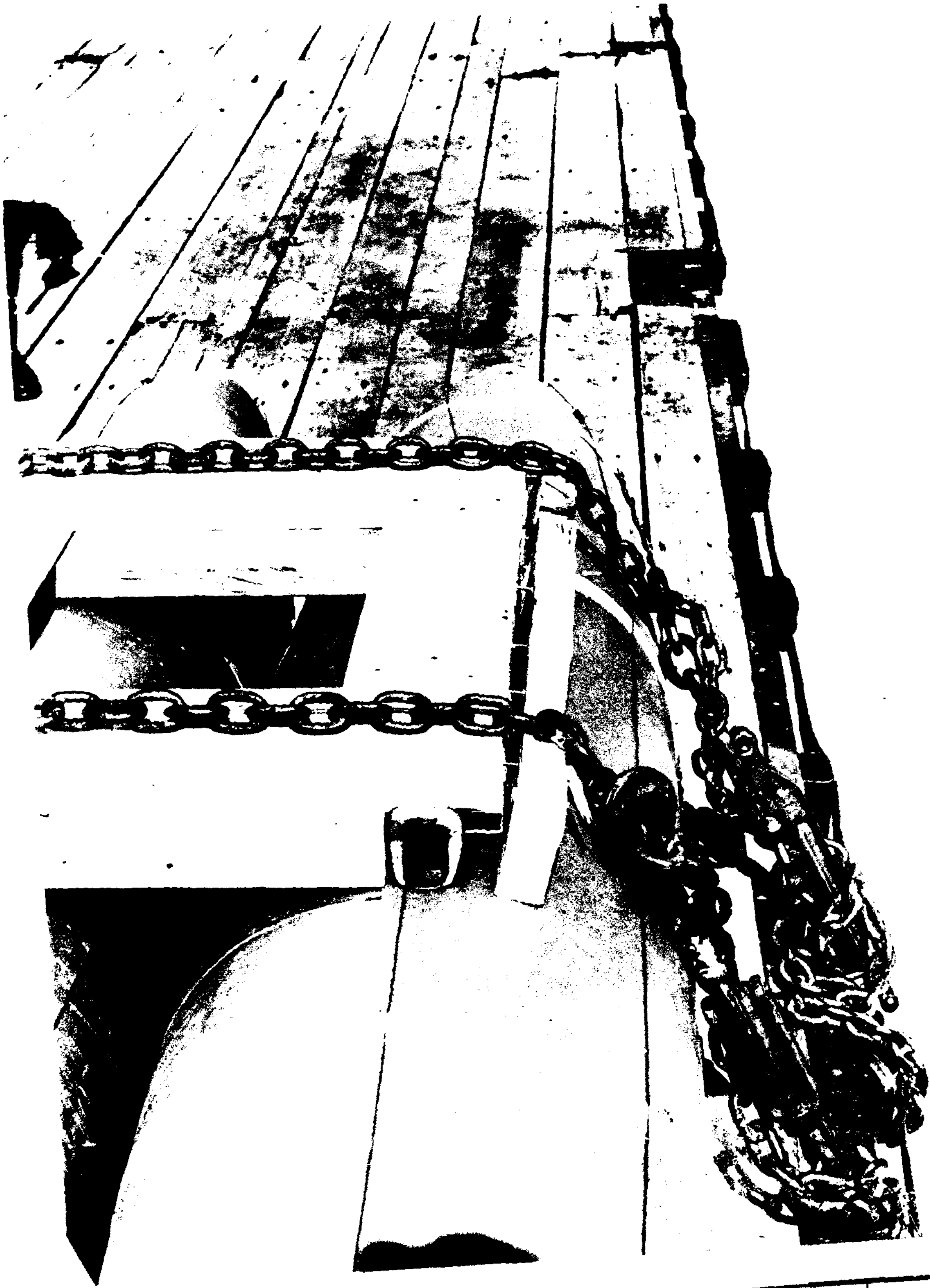
CONCLUSION

As tested, the items identified above passed all phases of transportability tests. The rotation and longitudinal movement of the bombs was not severe enough to have an adverse effect on test results.

PART 7

PHOTOGRAPHS

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL
Photo No. AO317-SON-91-297-4890. This photo shows an overall view of the test load.

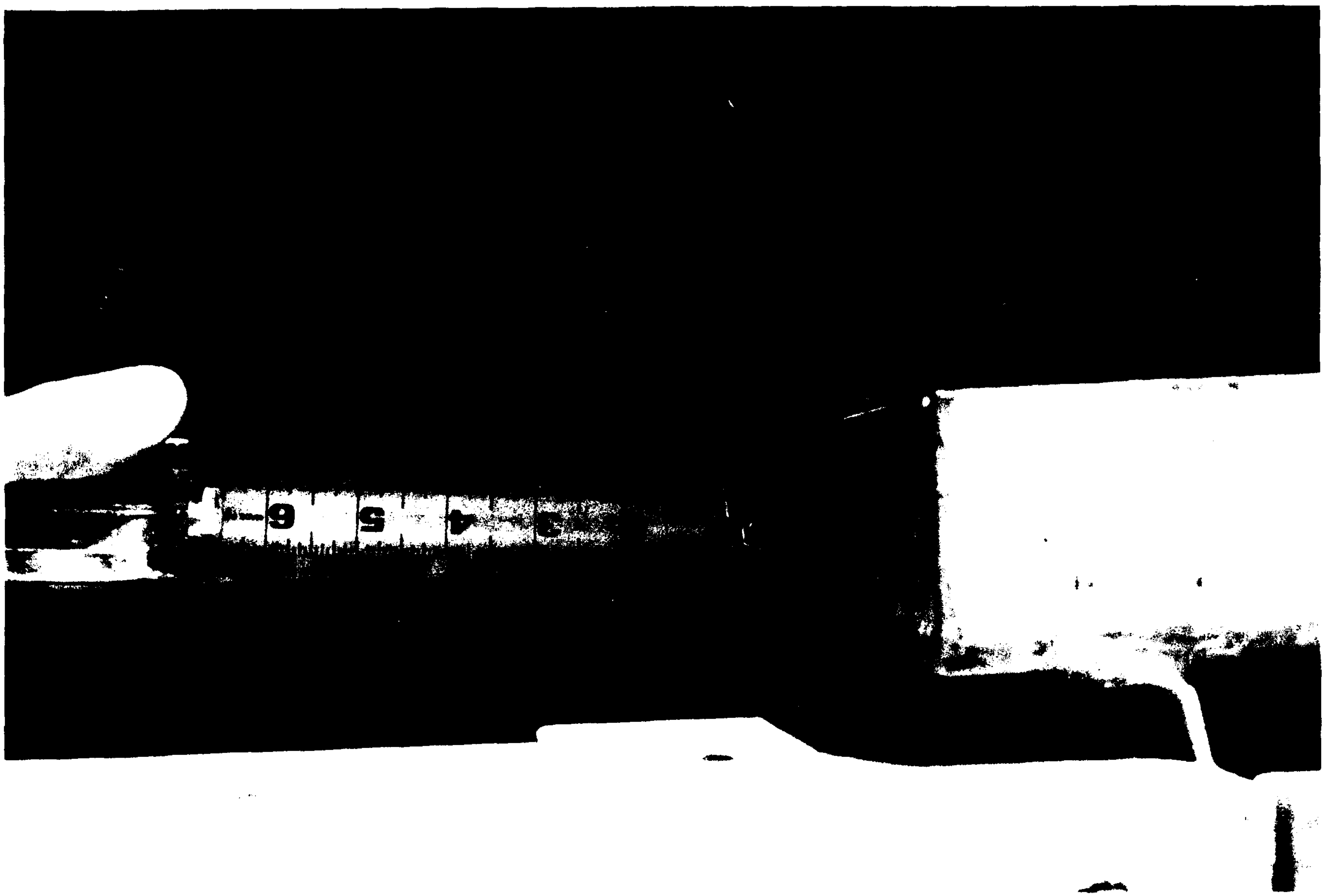


U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. AO317-SEN-91-297-4989. This photo shows the damage to dunnage prior to testing by chain load binders.

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

Photo No. AO317-SPN-91-297-4891. After testing, the 2,000-pound bombs moved rearward resulting in loose bands (as shown in this photo).

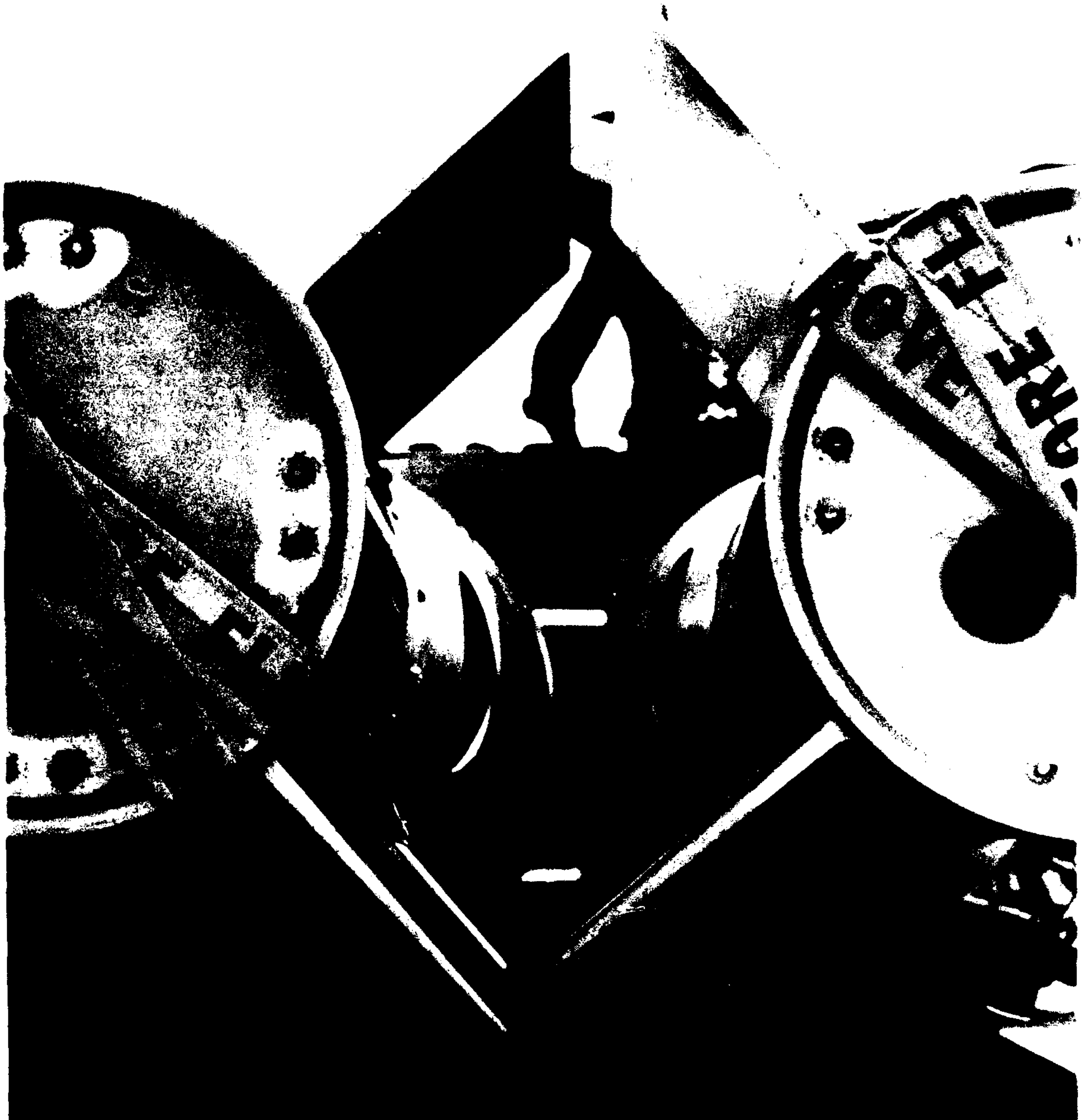


U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. AO317-SPN-91-297-4892. This photo shows a 1 1/2-inch rearward movement of bombs after testing.

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

Photo No. AO317-SPN-91-297-4899. This photo shows the rotational movement of bombs. Note, this movement can result in laterally adjacent fins coming in contact.



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

Photo No. AO317-SPN-91-297-4900. This photo indicates the rotational movement of one bomb. Note, the tail fin clearances.

PART 8

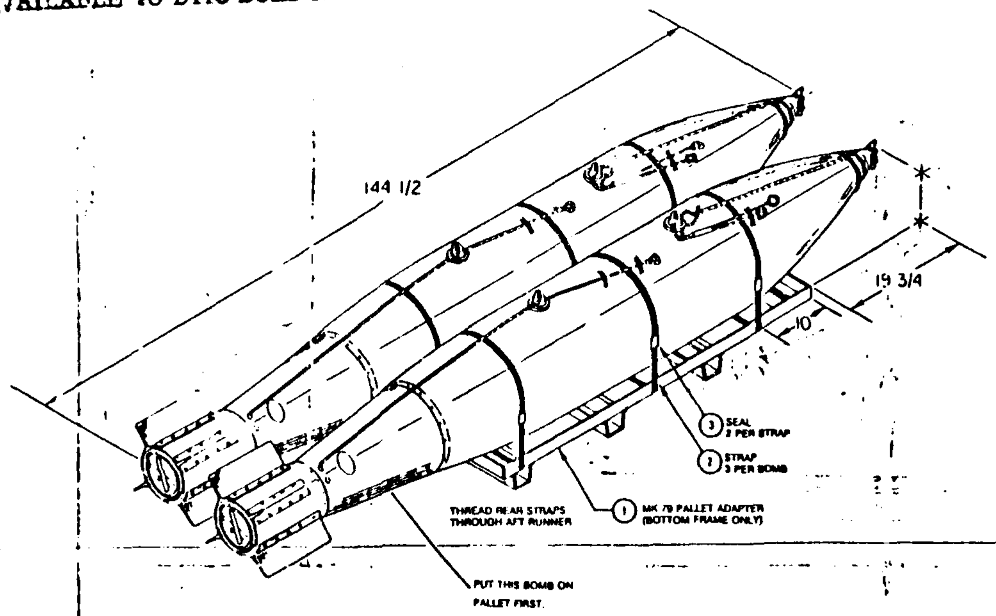
APPENDIX

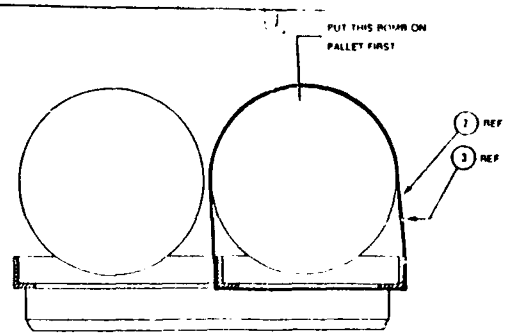
PALLETIZING PROCEDURE:

1. POSITION ONE BOMB ON RIGHT HAND SIDE OF PALLET
2. THREAD STRAPPING (THREE STRAPS PER BOMB) UNDERNEATH PALLET AND AROUND BOMB AS SHOWN IN MAIN DRAWING AND SECTION A-A
3. TENSION AND DOUBLE NOTCH STRAP SEALS
4. PREPOSITION STRAPS FOR LEFT HAND BOMB AND PLACE BOMB ON PALLET
5. TENSION AND SEAL STRAPS AS SHOWN IN SECTION B-B
6. ALL STRAPS MUST BE THREADED UNDERNEATH ARMING WIRES

UNIT LOAD DATA

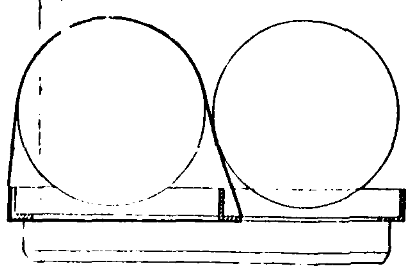
NUMBER OF DESTRUCTORS PER UNIT LOAD	2
WEIGHT OF ONE DESTRUCTOR (APPROX)	1989 LBS
WEIGHT OF MK 79 ADAPTER BOTTOM FRAME (APPROX)	175 LBS
WEIGHT OF STEEL STRAPPING (APPROX)	7 LBS
GROSS WEIGHT OF UNIT LOAD (APPROX)	4160 LBS
CUBE	78.5 CU FT





SECTION A-A

STRAPPING ROUTE FOR RIGHT HAND BOMB



SECTION B-B

STRAPPING ROUT[illegible] OR LEFT HAND BOMB

NOTES:

1. UNLESS OTHERWISE SPECIFIED, MATERIAL SHALL BE IN ACCORDANCE WITH MIL STD 1373 (NAVY)
2. COLD ROLLED, HEAT TREATED 0.031 STRAPPING MAY BE SUBSTITUTED

REQ'D	ITEM	DESCRIPTION	MAT'L/DWG	DIMENSIONS
12	3	STRAP SEAL	SEE NOTE 1	1 1/4 INCH SIZ
6	2	STEEL STRAP	SEE NOTES 1 & 2	1 1/4 X .035 X 8 FT
1	1	MK 79 ADAPTER (BOTTOM)	2642647	

LIST OF MATERIALS

ITEM OR FIND NO	QTY REQ	FSCM NO	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	MATERIAL OR NOTE

PARTS LIST

INTERPRET DRAWING IN ACCORDANCE WITH DOD STD 100

DO NOT SCALE THE DRAWING. DIMENSIONS ARE IN INCHES

MATERIAL

APPLICATION

NAVAL WEAPONS HANDLING CENTER, COLTS NECK, N.J.

DEPARTMENT OF THE NAVY, NAVAL SEA SYSTEMS COMMAND, WASHINGTON, D.C.

SIZE D | FSCM NO 53711 | DWG NO 10768 | SHEET 1 OF 1

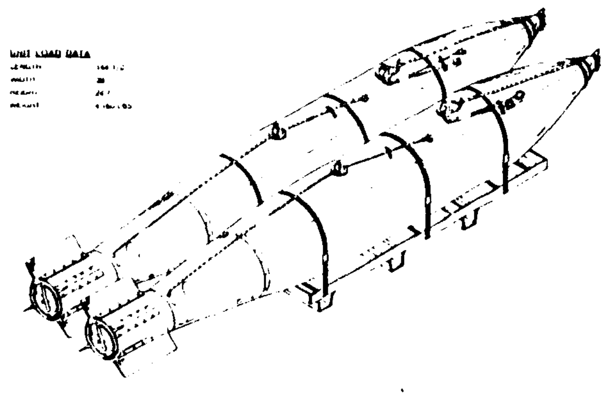
CLASSIFICATION OF CHARACTERISTICS [illegible] STD 2101

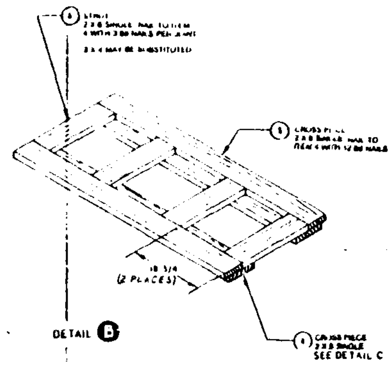
CRITICAL / MAJOR / MINOR

GENERAL NOTES

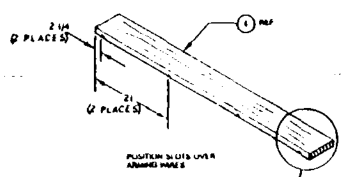
1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. A FULL TRUCKLOAD IS:
   - [illegible] TO [illegible] FT TRAILER — 1 STACK ([illegible] UNIT LOADS)
   - 27 TO 40 FT TRAILER — 2 STACKS ([illegible] UNIT LOADS)
   - 40 FT & LONGER TRAILERS — 3 STACKS ([illegible] UNIT LOADS)
9. THE MAXIMUM GROSS WEIGHT OF THE TRACTOR TRAILER AND THE ALLOWABLE AXLE WEIGHTS ARE THE RESPONSIBILITY OF THE CARRIER. THE CARRIER WILL ADVISE THE SHIPPER OF THESE LIMITATIONS AND THE SHIPPER SHALL LOAD THE TRAILER IN SUCH A MANNER THAT THE TRACTOR TRAILER WILL NOT EXCEED THESE LIMITATIONS.
10. AFTER THE BLOCKING, BRACING AND TIEDOWNS HAVE BEEN INSPECTED THE LOAD SHALL BE COMPLETELY COVERED WITH FIRE RESISTANT WATERPROOF TARPAULINS. THE TARPAULINS MAY BE UNDER THE TIEDOWNS.
11. AFTER THE TARPAULINS ARE IN PLACE ATTACH EXPLOSIVES A PLACARDS TO BOTH SIDES, FRONT AND BACK OF THE TRAILER AND ATTACH THE SHIPPING DOCUMENTS TO AN ACCESSIBLE AREA ON THE BACK DECK OF THE TRAILER.

UNIT LOAD DATA



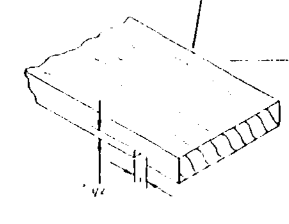


DETAIL B

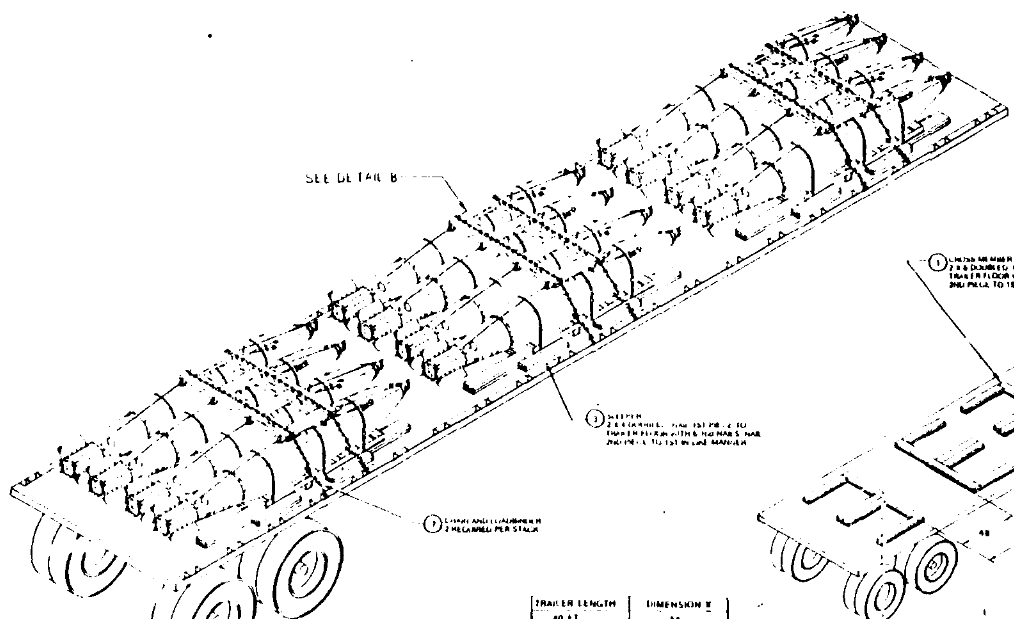


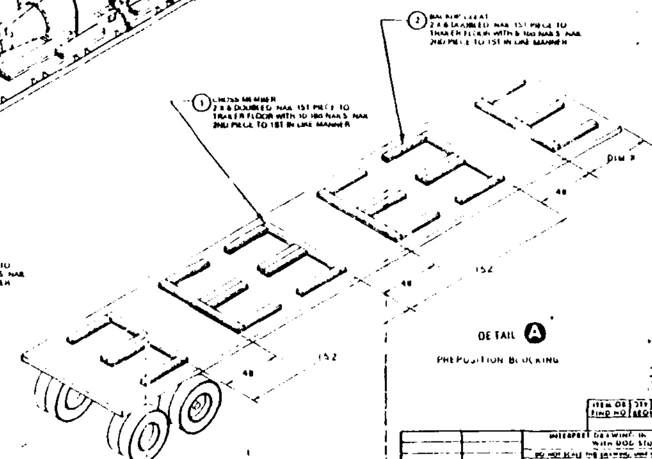
DETAIL C

SEE DETAIL D



DETAIL D





DETAIL A
PREPOSITION BLOCKING

TRAILER LENGTH	DIMENSION X
40 FT	54
42 FT	66
44 FT	78
45 FT	84
48 FT	102

REQ'D	ITEM	DESCRIPTION	MAT'L/DWG	DIMENSIONS
8	7	CHAIN & LOADBINDER	STEEL	
12	6	STRUT	WOOD	2 X 6 X 18 1/2
6	5	CROSS PIECE	WOOD	2 X 6 X 62 1/4
6	4	CROSS PIECE	WOOD	2 X 8 X 62 1/4
24	3	SLEEPER	WOOD	2 X 4 X 24
48	2	BACKUP CLEAT	WOOD	2 X 6 X 24
12	1	CROSS MEMBER	WOOD	2 X 6 X 78

LIST OF MATERIALS

PARTS LIST

F 53711 10763

CLASSIFICATION OF CHARACTERISTICS

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION