

2

Final Report
JANUARY 1989

70 FILE 0791

AD-A215 598

EVT 30-88

ROAD TESTING OF NAVY MINES

DTIC
ELECTE
DEC 20 1989
S D CS D

DECLASSIFICATION STATEMENT A
Approved for public release;
Distribution Unlimited

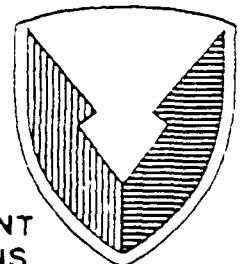
DISTRIBUTION UNLIMITED

PREPARED FOR:

Naval Weapons Station, Earle

Code 2024

Colts Neck, NJ 07722-5000



US ARMY
ARMAMENT
MUNITIONS
CHEMICAL COMMAND

US ARMY DEFENSE AMMUNITION
CENTER AND SCHOOL

EVALUATION DIVISION
SAVANNA, ILLINOIS 61074-9639

89 12 13 106

AVAILABILITY NOTICE

A complimentary copy of this report is furnished each attendee on automatic distribution. Should additional copies be required, authority for reprinting may be obtained by requesting same in writing from Director, U.S. Army Defense Ammunition Center and School, ATTN: SMCAC-DEV, Savanna, IL 61074-6939.

DISPOSITION INSTRUCTIONS

Destroy this report when no longer needed. Do not return.

* * * * *

Use of trade names in this report does not constitute an official endorsement.

* * * * *

The information contained herein will not be used for advertising purposes.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS BEST AVAILABLE COPY		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT UNLIMITED		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE			4. PERFORMING ORGANIZATION REPORT NUMBER(S) EVT 30-88		
5a. NAME OF PERFORMING ORGANIZATION U.S. Army Defense Ammunition Center and School			5b. OFFICE SYMBOL (If applicable) SMCAC-DEV		7a. NAME OF MONITORING ORGANIZATION U.S. Army Armament, Munitions and Chemical Command
5c. ADDRESS (City, State, and ZIP Code) Savanna, IL 61074-6939			7b. ADDRESS (City, State, and ZIP Code) ATTN: AMSMC-TM Rock Island, IL 61299-5000		
6a. NAME OF FUNDING / SPONSORING ORGANIZATION Naval Weapons Station, Earle			6b. OFFICE SYMBOL (If applicable) Code 8024		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
6c. ADDRESS (City, State, and ZIP Code) Colts Neck, NJ 07722-5000			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
			WORK UNIT ACCESSION NO.		
1. TITLE (Include Security Classification) Road Testing of Navy Mines					
2. PERSONAL AUTHOR(S) Jerome H. Krohn					
3a. TYPE OF REPORT Final		13b. TIME COVERED FROM Jan '89 to Jan '89		14. DATE OF REPORT (Year, Month, Day) 1989 March	
				15. PAGE COUNT 33	
6. SUPPLEMENTARY NOTATION					
7. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
9. ABSTRACT (Continue on reverse if necessary and identify by block number)					
The U.S. Army Defense Ammunition Center and School (USADACS) was requested by the Naval Weapons Station Earle to conduct a road transportability test with a series of Navy Alpha mines. The purpose of the tests was to confirm if the Alpha mine drawings are adequate for CONUS highway shipments. Two separate distinct Navy truckload drawings depicting the procedures to be tested along with the inert items to be tested were received at USADACS prior to the scheduled test. The first test load consisted of MK 62, MK 63, and MK 64 Alpha mines on a commercial flatbed trailer. The second test load consisted of MK 56 and MK 55 Alpha mines on a commercial flatbed trailer. Both test loads completed the USADACS five step road hazard course. With the exception of the MK 64 mines, all other tested securement					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION		
22a. NAME OF RESPONSIBLE INDIVIDUAL			22b. TELEPHONE (Include Area Code)		22c. OFFICE SYMBOL

#19 Abstract

procedures for the MK 62, MK 63, MK 55, and MK 56 mines were acceptable for movement over public highway. A retest of MK 64 mines also failed.

Navy test attendees agreed to no further testing of the MK 64 mines at this time.

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
 Evaluation Division
 Savanna, IL 61074-9639

REPORT NO. FVT 30-88

ROAD TESTING OF THE NAVY MINES

TABLE OF CONTENTS

PART	PAGE NO.
1. GENERAL	1-1
A. Introduction	1-1
B. Authority	1-1
C. Objective	1-1
D. Conclusions	1-1
E. Recommendations	1-2
2. ATTENDEES	2-1
3. ROAD TEST PROCEDURES.	3-1
4. TEST SPECIMENS, LOAD DRAWINGS AND RESULTS	4-1

Accession	
NTIS	ORDNI
DATE	1988
USER	1988
J. 1988	
by	
Date	
1988	
Det	
A-1	

PART 1

GENERAL

A. INTRODUCTION

The U.S. Army Defense Ammunition Center and School (USADACS) was requested by Naval Weapons Station Earle to conduct a road transportability test with a series of Navy Alpha Mines.

The first of two test loads consisted of MK 62, MK 63, and MK 64 Alpha mines blocked, braced, and chained to a 40-foot commercial flatbed trailer. The second test load consisted of MK 56 and MK 55 Alpha Mines blocked, braced, and chained to a 40-foot commercial flatbed trailer. Both test loads were subjected to the USADACS five-step road hazard course.

B. AUTHORITY

Testing has been 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 the tests was to determine the adequacy of the restraint procedures to withstand the forces generated over the USADACS road hazard course.

D. CONCLUSIONS

1. The MK 62, MK 63, MK 55 and MK 56 Alpha mines restraint methods were successfully tested and are considered to be acceptable for movement of the mines on commercial flatbed trailers over public highways.

2. The MK 64 Alpha mine tiedown procedure failed the road hazard course test and retest. An approved restraint method was not developed.

E. RECOMMENDATIONS

1. The MK 64 Alpha mine restraint system failed during the initial test and the retest. Recommend additional testing for the development of an approved method of securement.

2. Recommend the center pallet of the three MK 55 mine pallets be moved 5-1/2-inches rearward to permit the strapping or protector board to bear down on the center pallet as well as the outside pallets.

PART 2

ATTENDEES

<u>NAME</u>	<u>TELEPHONE</u>	<u>ADDRESS</u>
MNCM Cliff Bombard	AV 953-7335 Comm (804) 887-7335	Naval Mine Warfare Engineering Activity Yorktown, VA 23691-5076
MNCS Michael Whitener	AV 563-4143 Comm (803) 743-4143	Commander Mobile Mine Assembly Group COMOMAG Charleston, SC 29408
MN2 Charles Humbard	AV 563-6040/4876 Comm (803) 743-640/4976	Mobile Mine Assembly Group Unit II MOMAG Unit II Charleston, SC 29408
MN3 Larn S. Crse	AV 563-4143 Comm (803) 743-4143	Commander Mobile Mine Assembly Group Charleston, SC 29418
Andrew Leissing	AV 449-2855	Naval Weapon Station Earle Code 8024 Colts Neck, NJ 07722-5000
Jim Foster	AV 953-4777	Naval Mine Warfare Engineering Activity Yorktown, VA 23691-5076
Kevin Lane	AV 764-4630	Mobile Mine Assembly Group Unit II Charleston, SC 29408
Jerry Krohn	AV 585-8908 Comm (815) 273-8908	Director U.S. Army Defense Ammunition Center and School ATTN: SMCAC-DEV Savanna, IL 61074-9639
Thomas A. Heitzmann	AV 222-7754 Comm (202) 692-7754	Commander Naval Sea Systems Command Washington, DC 20362

Attendees cont'd

Tom Wick

AV 585-8616

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

Ralph Arnold

AV 585-8073
Comm (815) 273-8073

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

PART 3

ROAD TEST PROCEDURES

Five separate road testing steps are required as identified herein:

1. 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.

a. 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.

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 ties is alternately positioned similarly to the first, but spaced on 10-foot centers for a distance of 50 feet.

d. 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 mph).

2. 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.

3. 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 of approximately 5 mph.

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

5. 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 on 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.

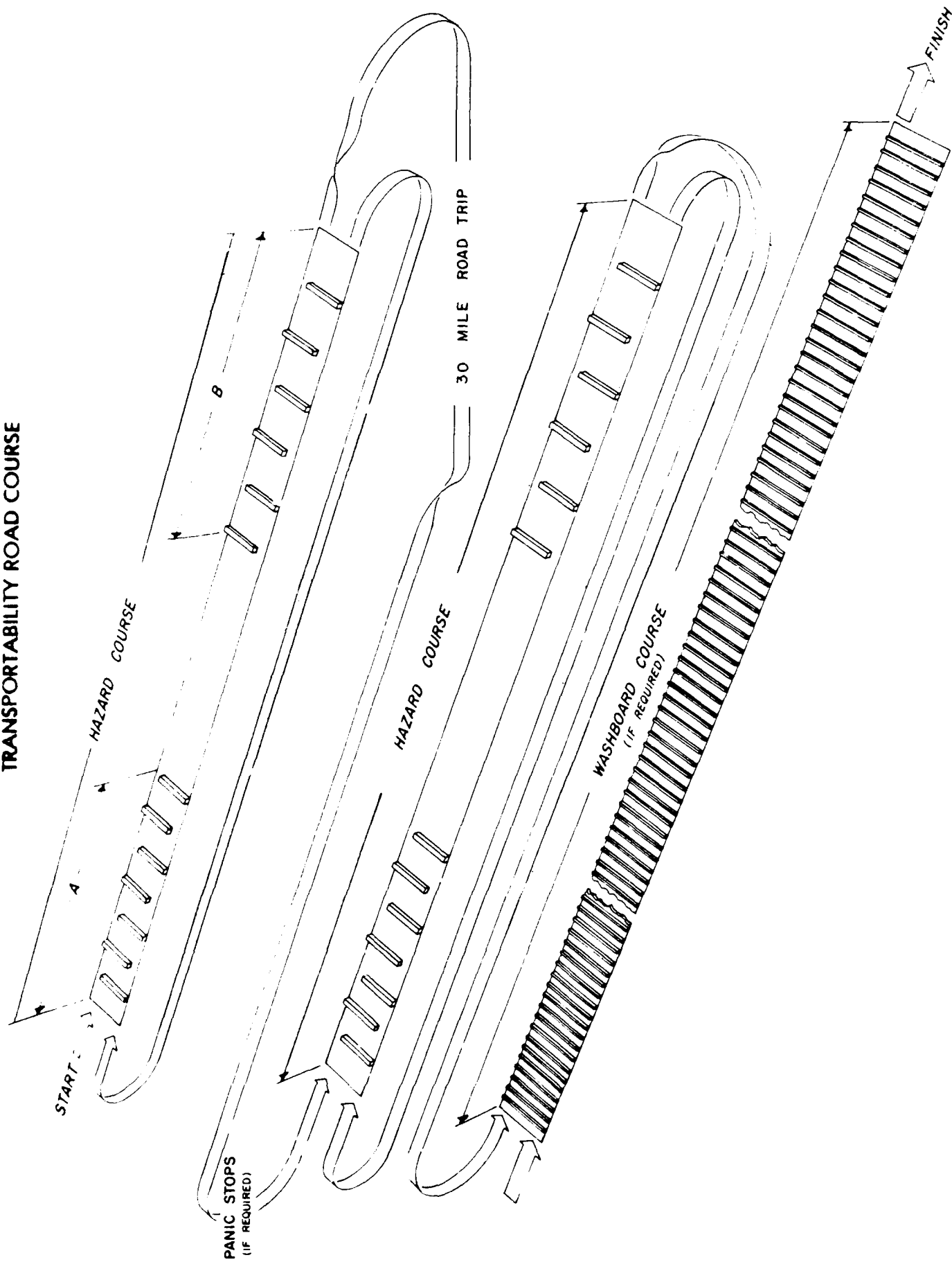
NOTE: Step Nos. 3 and 5 may be deleted at the discretion of the test conductor.

INSPECTIONS 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. This data is recorded in Part 5 following.

US ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

TRANSPORTABILITY ROAD COURSE



PART 4

TEST SPECIMENS, LOAD DRAWINGS AND RESULTS

TEST SPECIMEN AND RESULTS

A. PRETEST ASSEMBLY

Test No. 1 was a test load prepared in accordance with the Department of Navy, Naval Weapons Handling Center Drawing No. NWHC 10823. From front to rear, the load consisted of MK 64, MK 63, and MK 62 Navy Alpha configured mines on a 40-foot-long commercial flatbed semitrailer, TRI-STATE Trailer No. 340310.

The two MK 64 Alpha mine pallets were repalletized in an effort to position the mines so as to prevent the fins from adjacent mines from making contact. To prevent each MK 64 mine from rotating, two internal 1-1/4-inch steel bands were used to encircle the mine. The bands extended over the mine, around the outside longitudinal member of the pallet bottom frame, around the inside longitudinal member of the pallet bottom frame, around the inside longitudinal member of the pallet top frame and connected to the band end over the mine.

The two MK 63 Alpha Mine Pallets were repalletized with two MK 63 mines in each pallet. During repalletizing, wooden spacers were added between the top and bottom pallet frame and the nose of the MK 63 mines. Also, wooden blocks were positioned between the MK 63 lifting lugs and a lateral member of the top pallet frame.

The two MK 62 Alpha Mine Pallets were also repalletized with two MK 62 mines in each pallet. During repalletization, wooden spacers were added between the top and bottom pallet frame and the nose of the MK 62 mines. Wooden blocks were positioned between the MK 62 lifting lugs and a lateral member of the top pallet frame.

All three mine types required nailed wooden prepositioned blocking. The MK 64 and MK 62 were narrow enough to permit the nailing of side blocking. Two steel chains with load binders were used over each pair of mine pallets.

B. TEST I ANALYSIS

Under the nose of the MK 62 and MK 63 Alpha mines, the pallet bases deflected downward during the completion of the USADACS road hazard course. The pallet deflection resulted from the placement of the wooden spacer between the mine nose end and the extreme unsupported steel pallet section. Position of the wooden spacer at the location tested placed all the load on the point farthest from a support.

Loading the support closer to the pallet skid with a smaller wooden spacer would most likely prevent a recurrence of the pallet deflection. This relocation of the spacer would also be much closer to the banding strap creating a much tighter pallet.

As the USADACS road hazard course progressed, the MK 64 mines continued to move rearward within the confines of their steel pallet. The rearward movement was enhanced by the nose end of the pallet top moving down the tapered nose of the mine. This pallet top movement caused a loosening of the bundling straps and chains which permitted the MK 64 mines to rotate on the pallet. Due to closeness of the tail fins, the mine rotation resulted in adjacent mine fins making contact and causing fin damage. Fin damage is critical to flight stability and free fall drag.

The MK 64 mines were not left in a transportable condition following completion of the 5-step road hazard course. This failure necessitates a retest with the MK 64 mines.

ROAD TEST DATA

TEST NO. 1

DATE: 24-25 January 1989

TEST SPECIMEN: MK 62, MK 63 and MK 64 Alpha Mines blocked with prepositioned dunnage and secured with chains with load binders on a 40-foot commercial flatbed trailer.

PASS 1-A OVER FIRST SERIES OF TIES: 6.30 SEC 5.41 mph

PASS 1-B OVER SECOND SERIES OF TIES: 6.30 SEC 5.41 mph

REMARKS: The MK 64 mines moved slightly rearward within their pallets.

PASS 2-A OVER FIRST SERIES OF TIES: 6.45 SEC 5.28 mph

PASS 2-B OVER SECOND SERIES OF TIES: 6:30 SEC 5.41 mph

REMARKS: MK 64 mines moved 3/16-inch rearward within their pallets.

30 MILE ROAD TEST: Notice pallet section under nose of MK 64 mines bend downward 1/2-inch.

PANIC STOP TEST: No movement

PASS 3-A OVER FIRST SERIES OF TIES: 6.30 SEC 5.41 mph

PASS 3-B OVER SECOND SERIES OF TIES: 6.45 SEC 5.28 mph

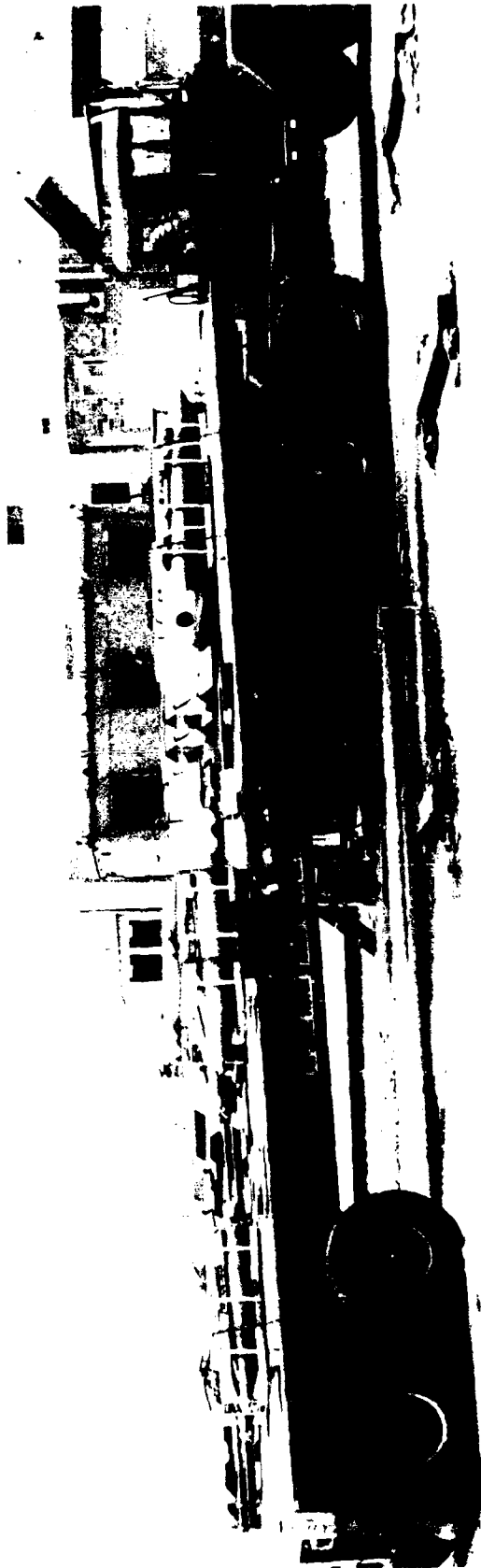
REMARKS: No movement

PASS 4-A OVER FIRST SERIES OF TIES: 6.15 SEC 5.54 mph

PASS 4-B OVER SECOND SERIES OF TIES: 6.30 SEC 5.41 mph

REMARKS: MK 64 mines moved 1/4-inch rearward within their pallets. MK 63 mines pallets moved left 1/2-inch.

WASHBOARD COURSE: MK 64 mines moved rearward from 1-7/8-inch to 3-3/8-inch causing loose chains and banding resulting in FAILURE. Both MK 63 and MK 62 experienced 1/2-inch and 1/4-inch downward bending of the nose and rear pallet ends, respectively.



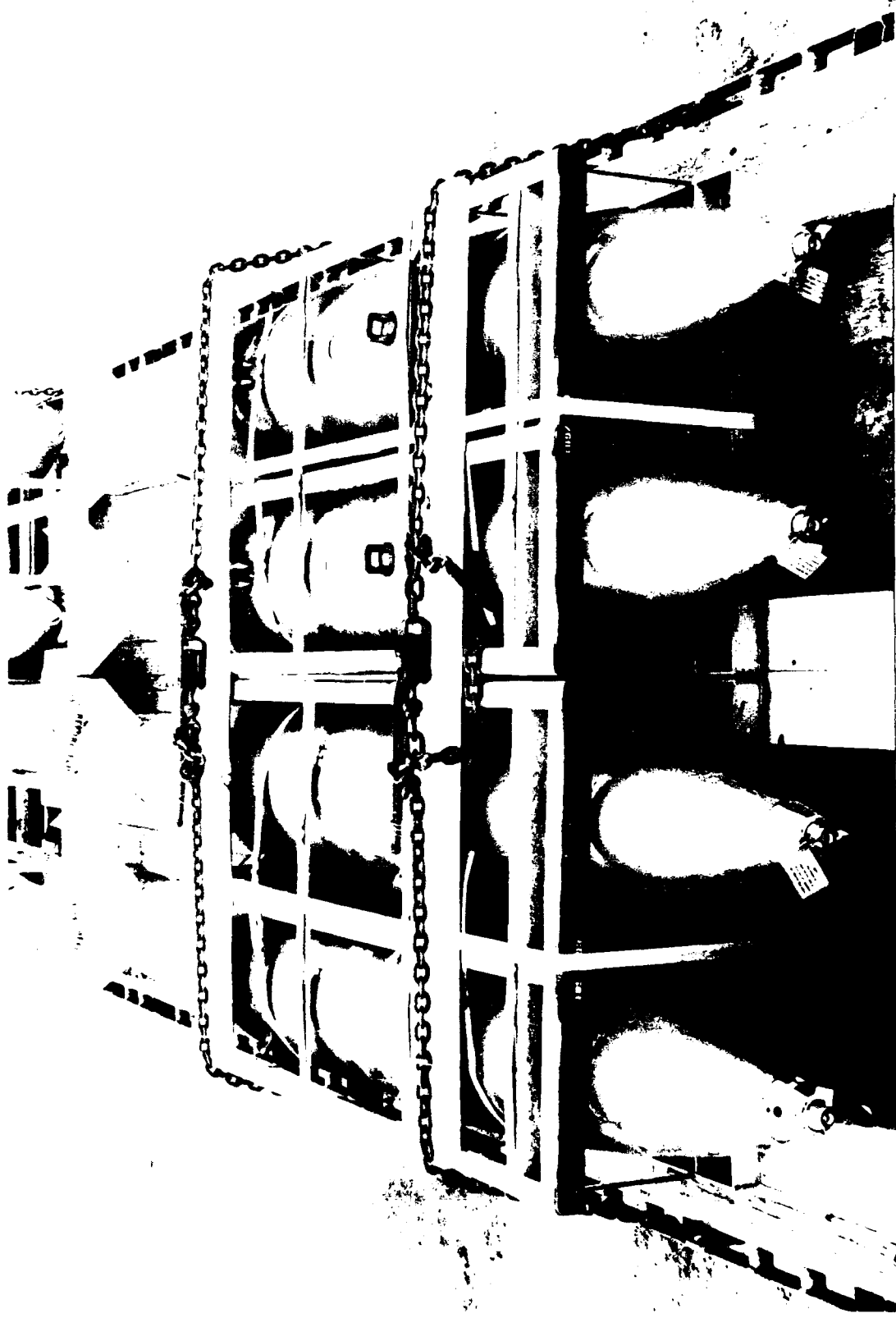
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 1 View of the MK 62, MK 63 and MK 64 Alpha mines secured to a 40-foot-long commercial flatbed semitrailer.



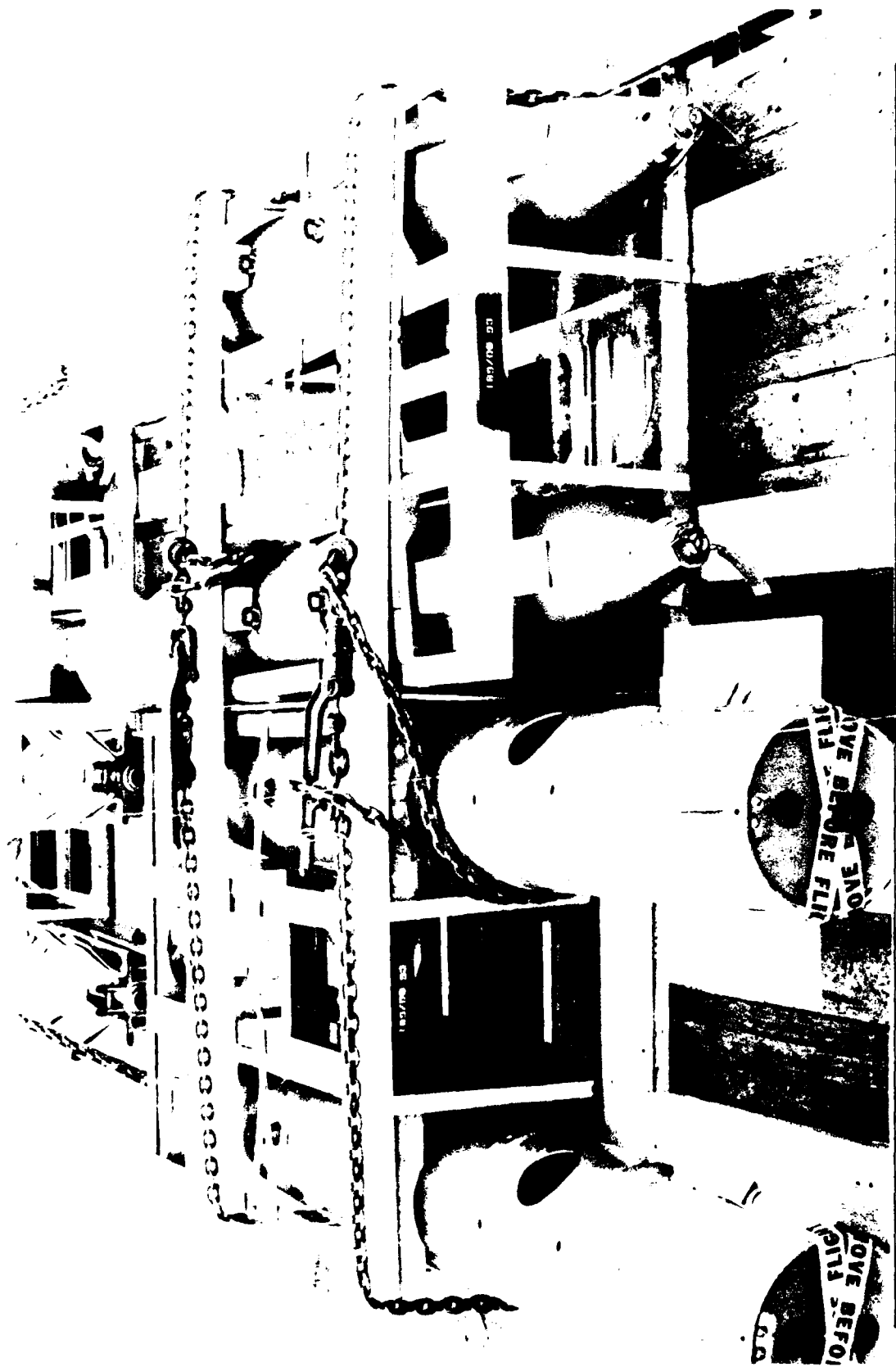
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 2 View of the prepositioned nailed wooden dunnage on the 40-foot-long commercial flatbed semitrailer.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

12. A view of the MK 60 pallets being loaded on the MK 60 palletizing machine. The MK 60 palletizing machine is a large, industrial structure with multiple levels and a complex system of chains and rollers. The pallets are visible on the machine, and the background shows a building with a sign that reads "DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL".



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 4 View of the MK 63 pallets prior to testing on the 40-foot commercial flatbed semitrailer. Note wooden blocks between steel and steel pallets. Also note plywood sheet between two pallets.



	DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL
Photo No. 5	View of the MK 62 pallets prior to loading on the flatbed semitrailer. Note the wooden blocks being loaded onto the MK 62 pallets.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 6 View of a MK 63 mine in the pallet showing the movement of the wooden blocking during testing.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNAH, IL

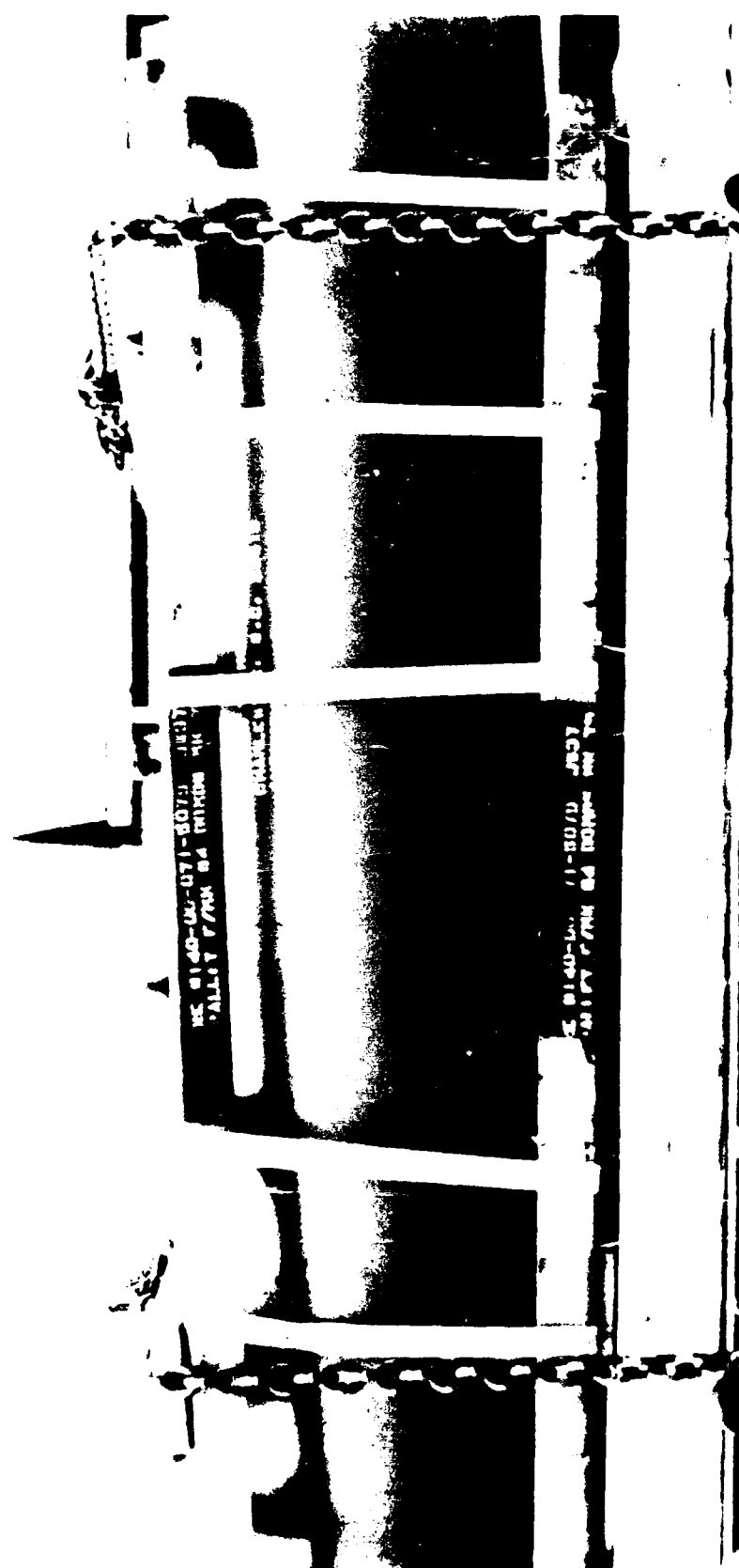


DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. - View of MK 64 mine nose and showing looseness of pallet handling and where tapered end of mine has moved away from forked area of steel pallet.



	DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNAH, IL	
This document contains information that is classified as "Secret" under the provisions of Executive Order 11652, dated March 1, 1957, and is to be controlled accordingly.		



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

C. TEST NO. 2 ANALYSIS

Test No. 2 was a test load prepared in accordance with the Department of Navy, Naval Weapons Handling Center Drawing No. NWAC 10823. From front to rear, the load consisted of MK 55 and MK 56 Navy Alpha configured mines on a 40-foot-long commercial flatbed semitrailer, TRI-STATE Trailer No. 340310

A previously damaged nose cone shield separated from one of the MK 55 mines during the first step of the road hazard course. The MK 55 mine fins made contact with the floor of the semitrailer but no damage resulted. The nose of the MK 56 mines made contact with the prepositioned wooden dunnage; however, there was no evidence of damage. Due to reversing the direction of the MK 56 center pallet, the strapping or protector board did not bear on the mine frame. This lack of vertical restraint on the mine frame permitted the center of three MK 56 pallets to move up and down violently during the washboard step of the road hazard course. This condition can be corrected by moving the center MK 56 mine pallet forward 5-1/2 inches in relation to the center MK 56 mine pallet. This movement will align crossmembers of the top frame and allow the strapping or protector board to bear on all three pallets.

Both securement methods for MK 56 and MK 55 mines were acceptable for movement on/off public highway.

ROAD TEST DATA

TEST NO. 2

DATE: 26 January 1989

TEST SPECIMEN: MK 56 and MK 55 Alpha mines blocked with prepositioned dunnage and secured with chains with load binders on a 40-foot-long commercial flatbed trailer.

PASS 1-A OVER FIRST SERIES OF TIES: 6.45 SEC 5.28 mph

PASS 1-B OVER SECOND SERIES OF TIES: 6.30 SEC 5.41 mph

REMARKS: Left nose cone shield came off left MK 55 mine. MK 55 mine fins striking trailer's wooden floor. MK 56 noses striking dunnage.

PASS 2-A OVER FIRST SERIES OF TIES: 6.15 SEC 5.54 mph

PASS 2-B OVER SECOND SERIES OF TIES: 6.45 SEC 5.28 mph

REMARKS: MK 55 mines moved right 1/2-inch.

30 MILE ROAD TEST: No movement

PANIC STOP TEST: No movement

PASS 3-A OVER FIRST SERIES OF TIES: 6.45 SEC 5.28 mph

PASS 3-B OVER SECOND SERIES OF TIES: 6.15 SEC 5.54 mph

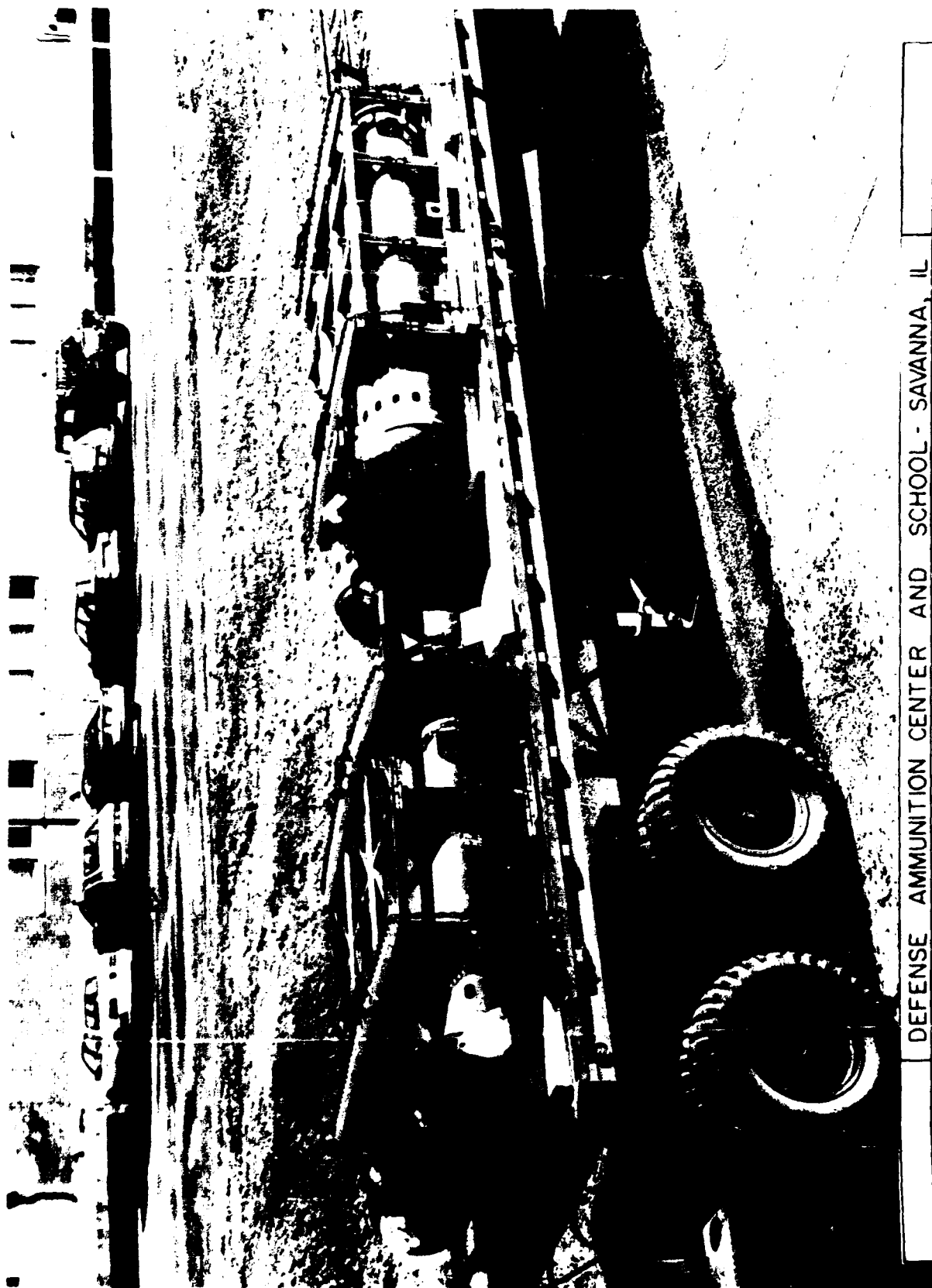
REMARKS: Nose end of MK 55 mines moving side-to-side approximately 2-inches. Nose strapping board moved rearward 3-1/2 inches. Front chain loose.

PASS 4-A OVER FIRST SERIES OF TIES: 6.75 SEC 5.05 mph

PASS 4-B OVER SECOND SERIES OF TIES: 6.90 SEC 4.94 mph

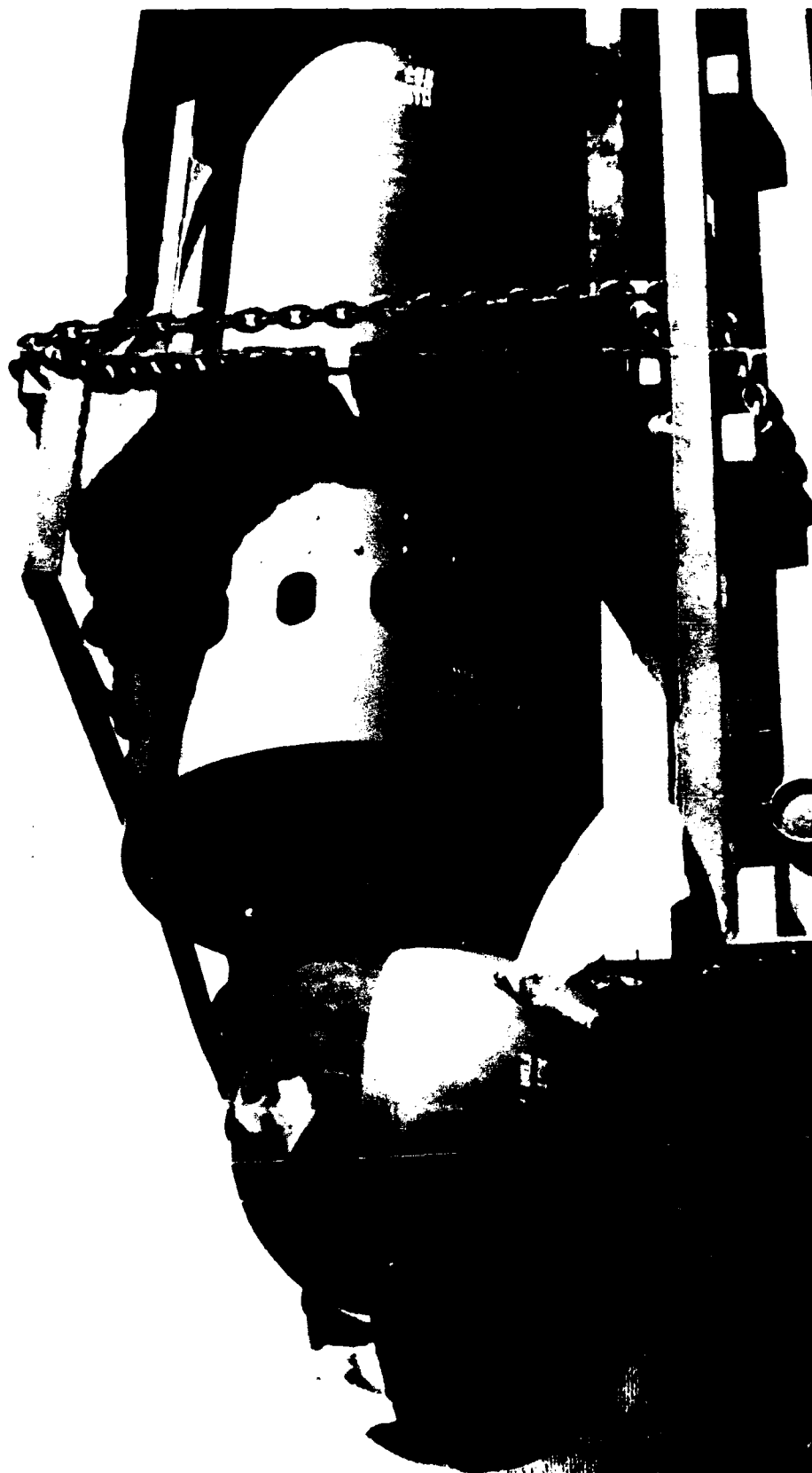
REMARKS: Nose strapping board moved rearward 1 inch.

WASHBOARD COURSE: Middle of three MK 56 mine pallet moved up and down violently.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 11 View of the MK 55 and MK 56 Alpha mines secured to a 40-foot-long commercial flatbed semitrailer.



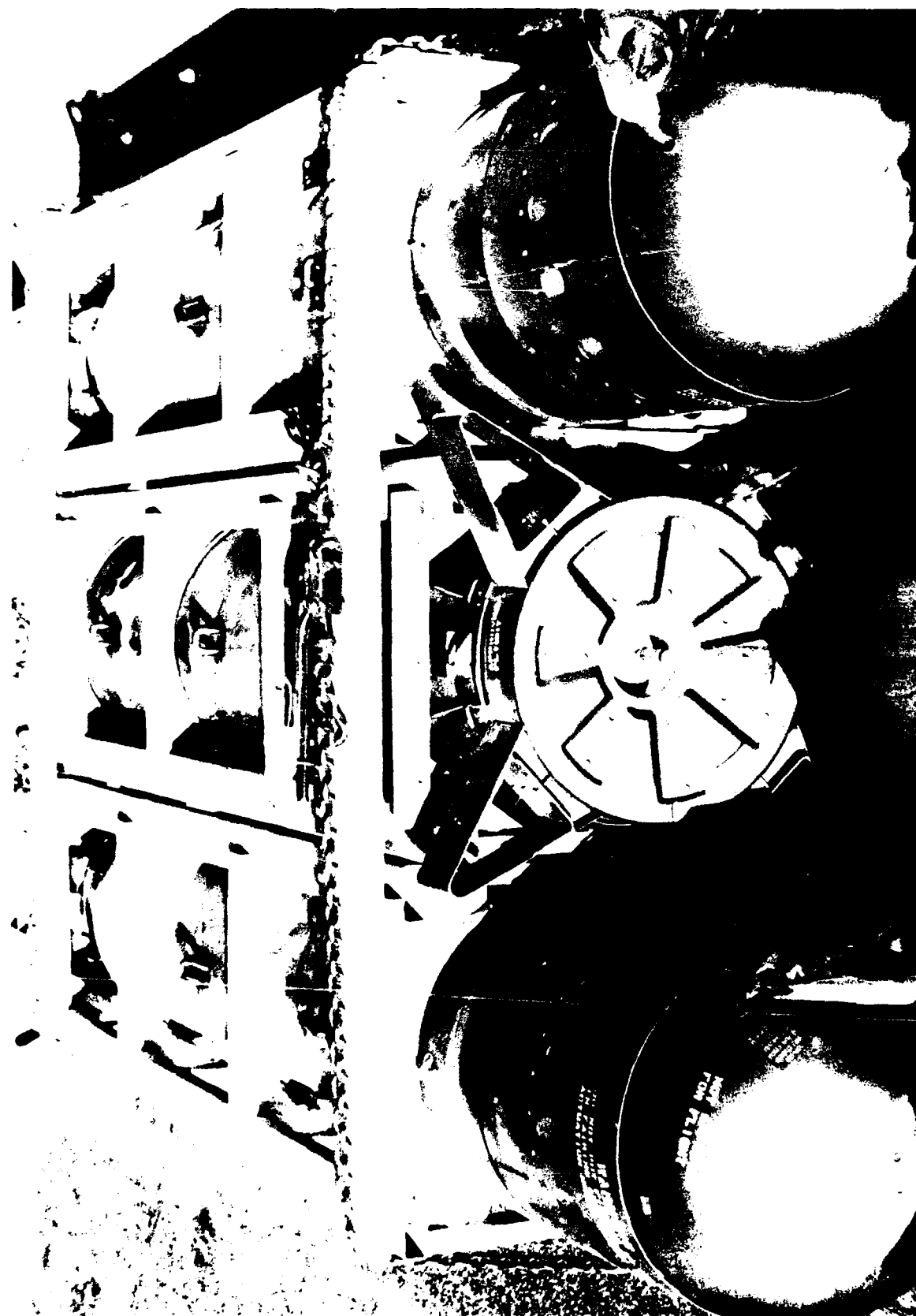
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 12 View of the MK 55 Alpha mine after being moved into the first pair of road hazard sensors.



	DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL
--	--

Photo No. 13	View of the M2 55 Alpha mine plant that was destroyed by the fire of the flashed semitrailer. No image captured.
--------------	---



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Fig. 3 - A view of the large, circular, metallic structure, possibly a gun barrel or a large wheel, mounted on a complex, dark, industrial-looking frame. The structure is the central focus of the image, with a central hub and spokes. The background is dark and indistinct.

D. TEST NO. 3 ANALYSIS

Test No. 3 is a retest of the MK 64 Alpha mine load. Prior to the test, the MK 64 mines were repalletized and rebanded omitting the internal banding. Wooden spacer blocks were placed between the lifting plugs and the pallet frame.

Since the first test failed during the washboard course, this retest began with a pass over the washboard course to measure the effectiveness of the load changes. The MK 64 mine load again failed over the washboard course and the test results were similar to the first test. No further testing of the MK 64 mines was performed.