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Final Report
February 1990

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TRANSPORTABILITY TESTING
OF
6,000-GALLON WATER DISTRIBUTOR

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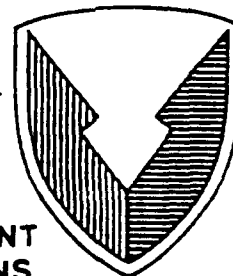


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Prepared For:

U.S. Army Tank-Automotive Command
ATTN: AMSTA-ISFA
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US ARMY
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CHEMICAL COMMAND

US ARMY DEFENSE AMMUNITION
CENTER AND SCHOOL

EVALUATION DIVISION
SAVANNA, ILLINOIS 61074-9639

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<p>The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division (SMCAC-DEV), was tasked by the U.S. Army Tank-Automotive Command (TACOM), AMSTA-ISFA, to perform a rail impact test for the 6,000-Gallon Water Distributor fabricated by E. D. Entyre and Co. From information provided, the Storage and Outloading Division (SMCAC-DEO), developed tiedown procedures for transporting the 6,000-Gallon Distributor on a flatcar. These procedures were then tested to Association of American Railroads (AAR) Rail Impact test requirements. The 6,000-Gallon Water Distributor, as tied down on a flat car, passed these requirements. The results of these tests are contained in this report.</p> <p style="text-align: right;">* Rail transport * Impact test</p>			
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REPORT NO. EVT 5-90
 TRANSPORTABILITY TESTING OF
 6,000-GALLON WATER DISTRIBUTOR

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School, Evaluation Division (SMCAC-DEV), was tasked by TACOM, AMSTA-ISFA, to perform a rail impact test for the 6,000-Gallon Water Distributor fabricated by E. D. Entyre and Co. From information provided, the Storage and Outloading Division (SMCAC-DEO), developed tiedown procedures for transporting the 6,000-Gallon Water Distributor on a flatcar. These procedures were then tested to AAR Rail Impact test requirements.

B. AUTHORITY. This test was conducted in accordance with mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-6000. Reference is made to Change 4, October 1974, to AR 740-1, 23 April 1971, Storage and Supply Operations; AMCCOMR 10-17, 13 January 1986, Mission and Major Functions of U.S. Army Defense Ammunition Center and School.

C. OBJECTIVE. The objective of this test was to determine if the 6,000-Gallon Water Distributor was transportable on a rail flatcar when tested to AAR Rail Impact test requirements and the developed tiedown procedure.

D. CONCLUSIONS. The tiedown procedure for the 6,000-Gallon Water Distributor satisfied the AAR Rail Impact test requirements.

E. RECOMMENDATIONS. It is recommended that the tiedown procedure for transportation of the 6,000-Gallon Water Distributor be approved.

PART 2

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PART 3

TEST PROCEDURES

RAIL IMPACT. The test load or vehicle should be positioned in/on a railcar. For containers, the loaded container shall be positioned on a container chassis and securely locked in place using the twist locks at each corner. The container chassis shall be secured to a railcar. Equipment needed to perform the test includes the specimen (hammer) car, five empty railroad cars connected together to serve as the anvil, and a railroad locomotive. These anvil cars are positioned on a level section of track with air and hand brakes set, and with the draft gear compressed. The locomotive unit pulls the specimen car several hundred yards away from the anvil cars and, then, pushes the specimen car toward the anvil at a predetermined speed, disconnects from the specimen car about 50 yards away from the anvil cars, and allows the specimen car to roll freely along the track until it strikes the anvil. This constitutes an impact. Impacting is accomplished at speeds of 4, 6, and 8 mph in one direction and at a speed of 8 mph in the opposite direction. The 4 and 6 mph impact speeds are approximate; the 8 mph speed is a minimum. Impact speeds are to be determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars.

PART 4
TEST RESULTS

RAIL IMPACT DATA

TEST NO. 1

DATE: 1 November 1989

TEST SPECIMEN: 6,000-Gallon Water Distributor on a flatcar.

TEST CAR NO. BN600082 LT. WT. 47,900 pounds

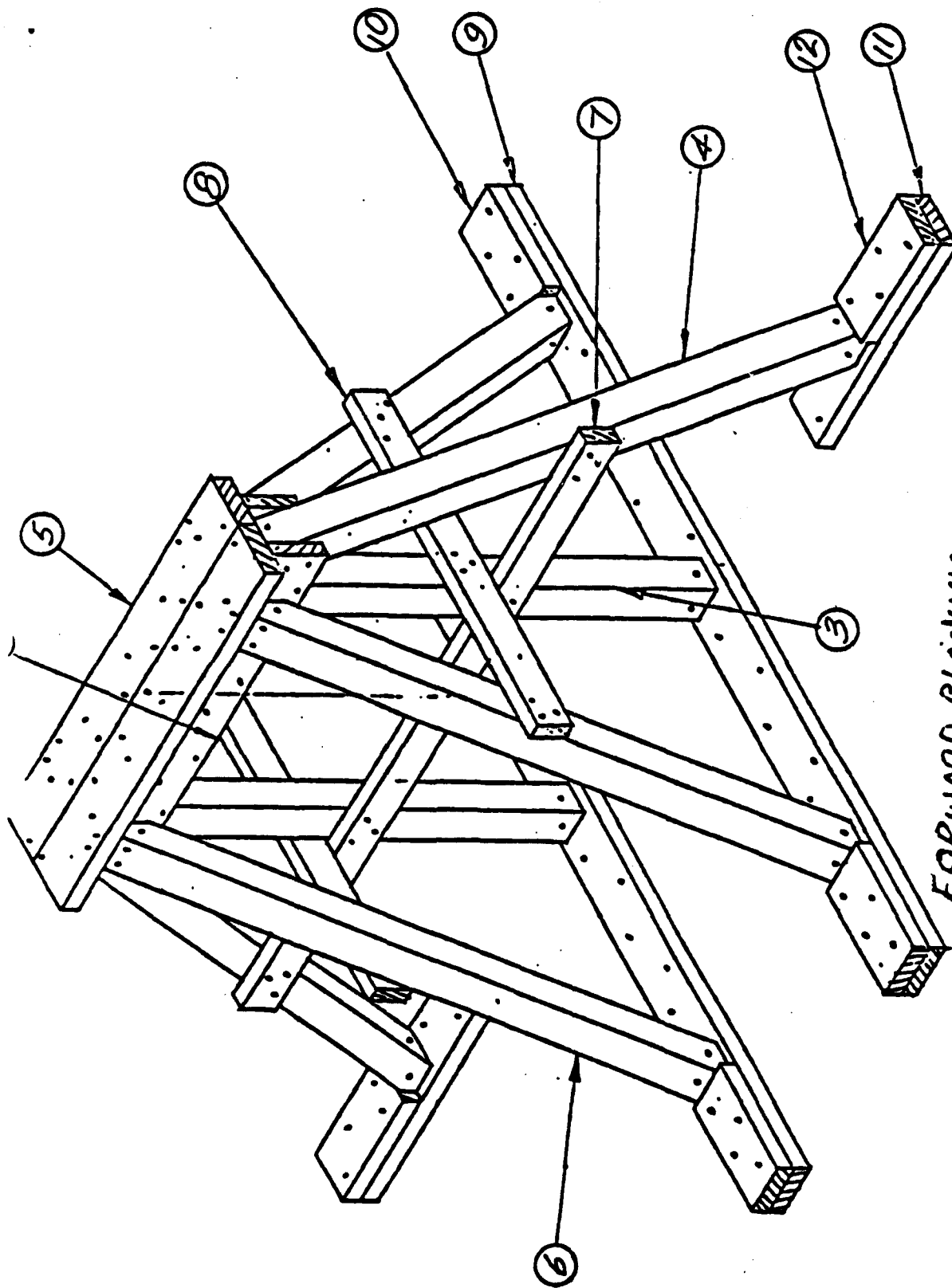
LADING AND DUNNAGE WT. 15,000 pounds

TOTAL SPECIMEN WT. 62,900 pounds

BUFFER CAR (5 CARS) WT. 250,000 pounds

IMPACT NO.	END STRUCK	VELOCITY (MPH)	IMPACT FORCE	REMARKS
1	forward	4.60		no damage
2	forward	6.57		no damage
3	forward	8.57		no damage
4	reverse	8.72		no damage

PART 5
TEST PLANS



**FORWARD BLOCKING
STANCHION TYPE X**

SAFE WORKING LOAD - 15,000 LBS (CONCENTRATED ON CAP ⑤ AT 2 POINTS, EACH DIRECTLY ABOVE A VERTICAL LEG ③).

4,200 LBS (DISTRIBUTED EQUALLY ON CAP ⑤).

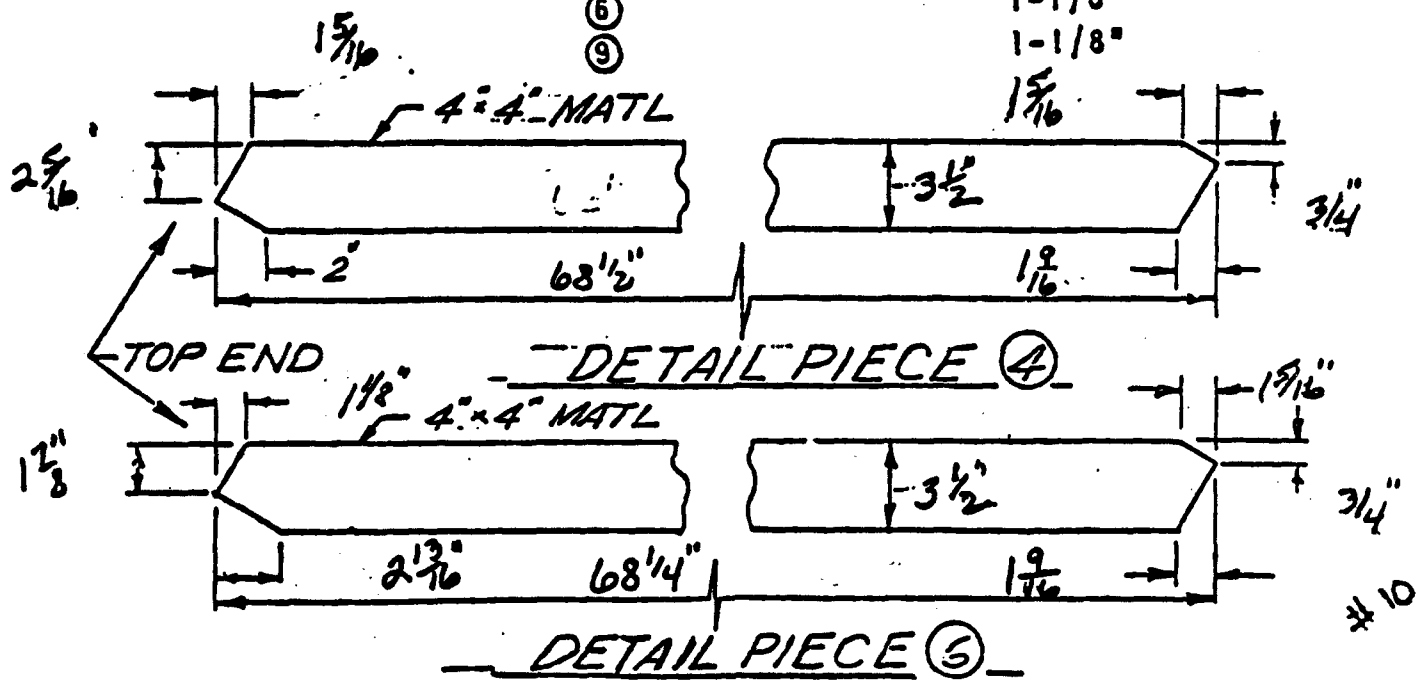
2,100 LBS (CONCENTRATED ON CAP ⑤ AT ONE POINT CENTERED BETWEEN LEGS ③).

KEY NUMBERS

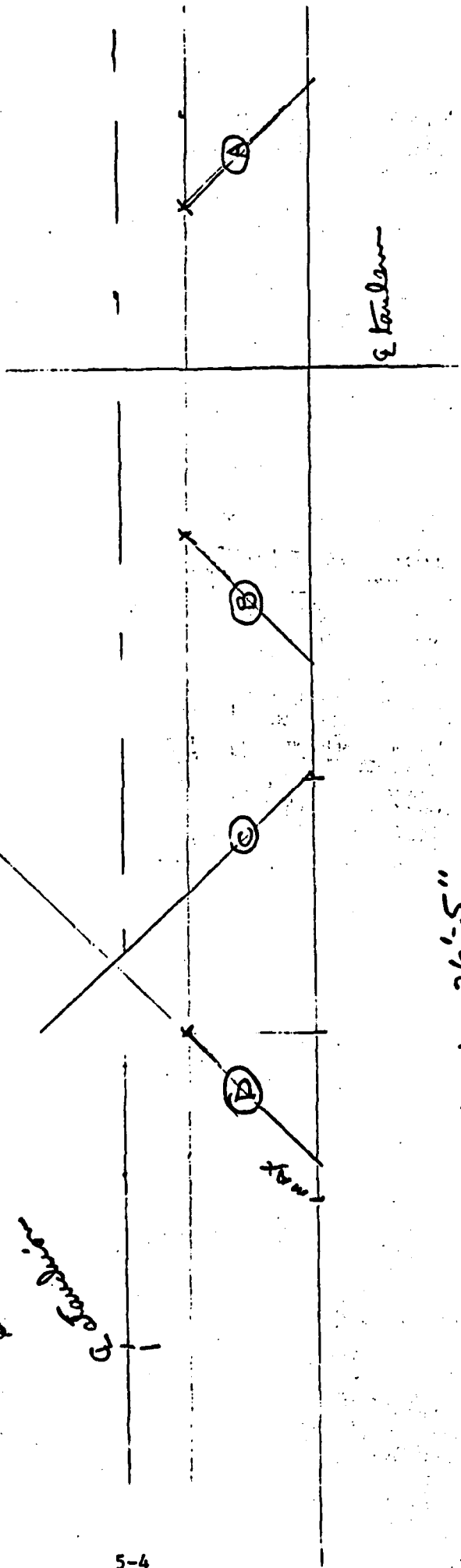
- ① 4" x 4" x 30" (1 REQD).
- ② 2" x 6" x 40" (2 REQD). NAIL TO ① W/6-12d NAILS. NAIL TO ③ AND ④ W/2-12d NAILS EACH.
- ③ ⊕ 4" x 4" x 55" (2 REQD). TOENAIL TO ① AND ⑨ W/4-16d NAILS EACH END.
- ④ ⊕ 4" x 4" x 68½" (2 REQD). DOUBLE BEVEL EACH END. SEE "DETAIL PIECE ④" FOR BEVEL CUTS REQUIRED. TOENAIL TO ① W/2-16d NAILS. NAIL TO ① W/4-16d NAILS AFTER ASSEMBLY (① THRU ⑨) HAS BEEN LOCATED ON CAR AND ① HAS BEEN NAILED TO CAR FLOOR.
- ⑤ 2" x 6" x 40" (2 REQD). NAIL TO ① AND ② W/5-12d NAILS EACH AND TO ④ AND ⑥ W/2-12d NAILS EACH JOINT.
- ⑥ ⊕ 4" x 4" x 68¼" (4 REQD). DOUBLE BEVEL EACH END. SEE "DETAIL PIECE ⑥" FOR BEVEL CUTS REQUIRED. TOENAIL TO ② W/4-16d NAILS. TOENAIL TO ⑨ W/4-16d NAILS BEFORE ASSEMBLY (① THRU ⑨) HAS BEEN LOCATED UNDER ITEM AND ⑨ HAS BEEN NAILED TO CAR FLOOR.
- ⑦ 2" x 4" x 68" (1 REQD). NAIL TO ③ AND ④ W/3-12d NAILS EACH JOINT.
- ⑧ 2" x 4" x 39" (2 REQD). NAIL TO ③ AND ⑥ W/3-12d NAILS EACH JOINT.
- ⑨ ⊕ 2" x 6" x 8'-8" (2 REQD). NAIL TO CAR FLOOR W/1-30d NAIL EVERY 8".
- ⑩ 2" x 6" x 12" (4 REQD). POSITION AGAINST ⑥ AND NAIL TO ⑨ W/4-30d NAILS.
- ⑪ 2" x 6" x 24" (2 REQD). NAIL TO CAR FLOOR W/5-30d NAILS.
- ⑫ 2" x 6" x 12" (2 REQD). POSITION AGAINST ④ AND NAIL TO ⑪ W/4-30d NAILS.

NOTE ⊕ : THE LENGTHS SPECIFIED FOR ③, ④, ⑥, AND ⑨ ARE BASED ON AN ASSEMBLY HEIGHT OF 52". FOR EACH ONE INCH (1") VARIATION IN THE ASSEMBLY HEIGHT, THE SPECIFIED OVERALL LENGTHS OF THESE PIECES WILL BE ADJUSTED AS FOLLOWS:

KEY NUMBER	ADJUSTMENT
③	1"
④	1-1/8"
⑥	1-1/8"
⑨	1-1/8"



POCKETS A	POCKETS B	POCKETS C	D	TANDEMS TO A	A POCKET TO STANCHION
3	8	8	12	8'-3" TO 8'-11"	30'-4" TO 31'-0"
2	7	8	11	8'-11"	31'-0"
2	7	7	11	8'-2" TO 8'-10"	30'-3" TO 30'-11"
1	6	6	10	7'-8" TO 8'-6"	29'-9" TO 30'-7"
4	9	9	13	8'-3" TO 9'-0"	30'-4" TO 31'-1"
5	10	10	14	8'-0" TO 8'-10"	30'-1" TO 30'-11"
6	11	11	15	7'-11" TO 8'-7"	30'-0" TO 30'-8"



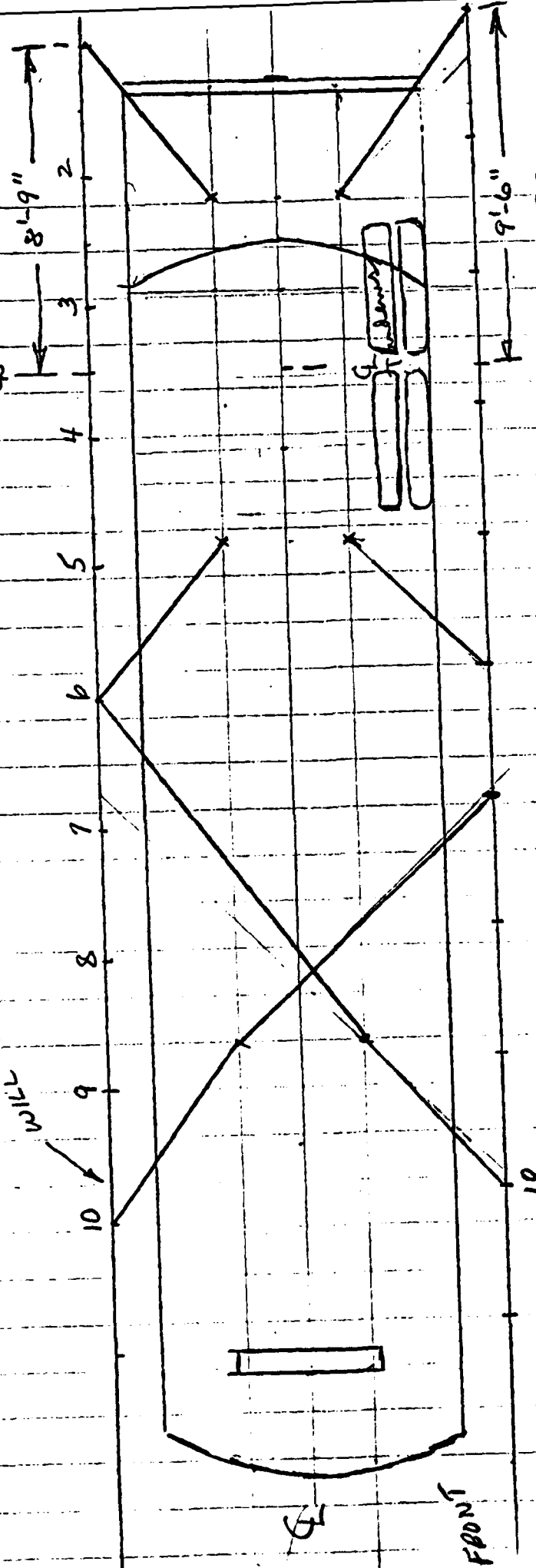
♀ TANDEM TO ♀ STANCHION = 26'-5"
 BASE OF STANCHION = 8'-8"
 ♀ TANDEM TO BASE OF STANCHION = 22'-1"

SS5 made for

NO CLEAR LANDING LEGS

THIS THICK

OFF TRACKS



4 EA 1/2" CABLE CAPACITY IS 50,000 LBS
 4 EA 3/8" CABLE CAPACITY IS 28,000 LBS

Use this side for cable spacing

PART 6
PHOTOGRAPHS



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 1 (90-1528) This photo shows the 6,000-Gallon Water Distributor tied down on standard friction draft flatcar. The Distributor is secured to the flatcar with eight 3/8-inch wire rope cables. The stanchion provides forward vertical support. Landing gear is not designed to support the semitrailer in a transportation environment.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 2 (90-1534) This photo shows the 6,000-Gallon Water Distributor loaded on a standard flatcar. A stanchion supports the forward end of the trailer in a transportation environment. The landing gear will not support the trailer while being transported by rail.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 3 (90-1529) This photo show 3/8-inch diameter tiedown cables in front of the rear wheels. Two cables, one on each side of the trailer, were used in front of and behind the wheels.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 4 (90-1531) This photo shows the tiedown cables at the forward end of the trailer. Two cables are attached at the tiedown eye. The cables going toward the wheels had to be crossed. The cable attached to the left tiedown eye crossed the cable attached to the right tiedown eye before it was secured to the right side of the flatcar. These cables had to be crossed in order to clear the rear brace on the landing gear. The forward tiedown cables were positioned between the rear landing gear brace and the landing gear. Note: Forward cable contacting the landing gear stand. Repositioning the forward tiedown points would prevent cable interference with vehicle components.