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FINAL REPORT

February 1990

EVT 12-90

Transportation Test of "Fast Pallet" with Multiple Launch Rocket System (MLRS) and Projectile Loads

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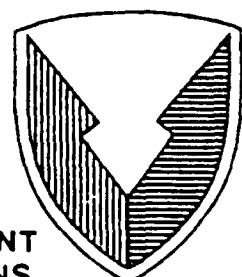
Prepared for:

Office of the Project Manager
for Ammunition Logistics
ATTN: AMCPM-AL
Picatinny Arsenal, NJ 07806-5000

91-00958



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US ARMY
ARMAMENT
MUNITIONS
CHEMICAL COMMAND

US ARMY DEFENSE AMMUNITION
CENTER AND SCHOOL

EVALUATION DIVISION
SAVANNA, ILLINOIS 61074-9639

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division (SMCAC-DEV), was tasked by the Office of the Project Manager for Ammunition Logistics (PM-AMMOLOG), AMCPM-AL, to test the 'Fast Pallet' for shipment of Multiple Launch Rocket System (MLRS) and future delivery of Army Tactical Missile System (ATACMS). The 'Fast Pallet', which is manufactured by Load and Roll, Inc., has been offered for service by EDI, Inc., and is being considered for more economical handling and transportation of ammunition in the Pacific. Two 'Fast Pallet' load configurations were tested in a standard International Standards Organization (ISO) container. The first pallet load consisted of four MLRS pods, restrained with 3-inch-wide web strapping. The second load consisted of 42 each pallets of 155mm projectiles to simulate the gross carrying capacity of the containerized unit. Both test loads were subjected to rail impact test, hazard course, panic stops, washboard course, and Shipboard Transportation Simulator (STS) tests.						
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22a. NAME OF RESPONSIBLE INDIVIDUAL THOMAS J. MICHELS, Chief, Evaluation Division			22b. TELEPHONE (Include Area Code) 815-273-8928	22c. OFFICE SYMBOL SMCAC-DEV		

19. ABSTRACT (continued)

The MLRS load successfully passed all of the transportation tests. The 155mm load failed at the 8 miles per hour (mph) impact when the rear header assembly collapsed due to compressional forces of the shifting load. The proposed load procedure for 155mm projectiles is not acceptable for transportation of this item.

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

REPORT NO. EVT 12-90

TRANSPORTATION TEST OF 'FAST PALLET'
 WITH MULTIPLE LAUNCH ROCKET SYSTEM (MLRS)
 AND PROJECTILE LOADS

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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 PM-AMMOLOG, AMCPM-AL, to test the 'Fast Pallet' or Load and Roll Platform (LRP) for shipment of MLRS and future delivery of ATACMS. The 'Fast Pallet' which is manufactured by Load and Roll, Inc., has been offered for service by EDI Inc., and is being considered for more economical handling and transportation of ammunition in the Pacific. Two 'Fast Pallet' load configurations were tested in a standard ISO container. The first pallet load consisted of four MLRS pods, restrained with 3-inch-wide web strapping. The second load consisted of 42 each pallets of 155mm projectiles to simulate the gross carrying capacity of the containerized unit. Both test loads were subjected to rail impact test, hazard course, panic stops, washboard course, and STS tests. Blocking and bracing procedures were supplied by the Storage and Outloading Division (SMCAC-DEO). The loaded container and test 'Fast Pallet' were subjected to rail impact test, hazard course, road trip, panic stops, washboard course, and STS.

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, 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 these tests was to determine if the 'Fast Pallet' unitized with two different test loads and shipped in an Intermodal

shipping container would be suitable in a road, ship, and rail transportation environment.

D. CONCLUSIONS. The Intermodal shipping container safely retained the inert load of MLRS/ATACMS unitized on a 'Fast Pallet' shipping pallet when subjected to rail, road, and STS tests. When the 'Fast Pallet' was configured with 42 pallets of 155mm inert ammunition, and reloaded into a standard ISO container, the unitization procedure failed to restrain the load during the rail transportation test. The 'Fast Pallet' remained intact.

E. RECOMMENDATIONS. It is recommended that the use of the 'Fast Pallet' in an ISO container be approved for the transportation of MLRS/ATACMS systems. It is further recommended that the outloading procedure developed for the 155mm ammunition be improved to support a 70,000- to 140,000-pound columnar compressive load and be retested.

PART 2

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PART 3

TEST PROCEDURES

A. RAIL IMPACT TEST. 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.

B. HAZARD COURSE. The specimen being tested will be subjected to the road hazard course. Using a suitable truck/tractor or tactical vehicle, the vehicle/specimen of test method No. 1 shall be towed/driven over a hazard course two times at a speed of approximately 5 mph. The speed may be increased or decreased, as appropriate, to produce the most violent load response.

C. ROAD TRIP. Using a suitable truck/tractor and trailer, or tactical vehicle, the tactical vehicle/specimen load shall be driven/towed for a total

distance of at least 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. Test route shall include curves, corners, railroad crossings, cattle guards, stops, and starts. The test vehicle shall travel at the maximum speed suitable for the particular road being traversed, except as limited by legal restrictions. This step provides for the tactical vehicle/specimen load to be subjected to three full airbrake stops while traveling in the forward direction and one in the reverse direction. The first three stops are at 5, 10, and 15 mph, while the stop in the reverse direction is of approximately 5 mph.

D. WASHBOARD COURSE. Using a suitable truck/tractor, and/or tactical vehicle, the specimen shall be towed/driven over the washboard course at a speed which produces the most violent response in the particular test load (as indicated by the resonant frequency of the suspension system beneath the load).

E. SHIPBOARD TRANSPORTATION SIMULATOR. The test load (specimen) shall be positioned onto the STS and securely locked in place using the cam lock at each corner. Using the procedure detailed in the operating instruction, the STS shall be started oscillating at an amplitude of $30^{\circ} \pm 2^{\circ}$, either side of center and a frequency of 2 cycles-per-minute (30 seconds + 2 seconds total roll period). This frequency shall be maintained for at least 15 minutes during which time the load will be observed for apparent defects that could cause a safety hazard. The frequency of oscillation shall then be increased to 4 cycles-per-minute (15 seconds + 1 second roll period) and the apparatus operated for 2 hours. If an inspection of the load does not indicate an impending failure, the frequency of oscillation shall be further increased to 5 cycles-per-minute (12 seconds + 1 second cycle time), and the apparatus operated for 4 hours. The operation does not necessarily have to be continuous; however, no change or adjustments to the load or load restraints

shall be permitted at any time during the test. After once being set in place, the test load (specimen) shall not be removed from the apparatus until the test has been completed or is terminated.

PART 4
TEST RESULTS

RAIL IMPACT DATA

TEST NO. 1

DATE: 6 FEBRUARY 1990

TEST SPECIMEN: Trailer-on-flatcar (TOFC), ISO container, LRP and MLRS pods.

TEST CAR NO.	TTX 153487	LT. WT.	73,400	pounds
CHASSIS NO.	5394	LT. WT.	6,040	pounds
CONTAINER NO.	INBU 2598901	LT. WT.	5,200	pounds
LRP NO.	EDIT 3007	LT. WT.	3,600	pounds
LADING AND DUNNAGE		WT.	20,000	pounds
	TOTAL SPECIMEN	WT.	108,240	pounds
	BUFFER CAR (5 CARS)	WT.	250,000	pounds

IMPACT NO.	END STRUCK	VELOCITY (MPH)	REMARKS
1	rear	4.21	no movement.
2	rear	6.47	LRP shifted forward 3/4 inch. Pallet chocks loose. Shim at end of container omitted.
3	rear	7.75	Velocity too slow. Impact recycled.
4	rear	8.33	LRP left side shifted 3/4 inch toward rear. Right side, 7/8 inch.
5	forward	8.33	Pallet moved back to base reference line.

ROAD TEST DATA

TEST NO. 2

DATE: 6 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and MLRS pods.

PASS 1-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 1-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: Rear pallet chocks were disengaged from the container corner post.
1-inch x 3-inch channel steel bent. Damage was caused from engagement with a
plate on the pallet. Pallet chocks were replaced and spaced to prevent pallet
engagement. TEST SEQUENCE STARTED OVER. .

RAIL IMPACT DATA

TEST NO. 3

DATE: 6 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and MLRS pods.

TEST CAR NO.	TTX 153487	LT. WT.	73,400	pounds
CHASSIS NO.	5394	LT. WT.	6,040	pounds
CONTAINER NO.	INBU 2598901	LT. WT.	5,200	pounds
LPR NO.	EDIT 3007	LT. WT.	3,600	pounds
LADING AND DUNNAGE		WT.	20,000	pounds
	TOTAL SPECIMEN	WT.	108,240	pounds
	BUFFER CAR (5 CARS)	WT.	250,000	pounds

IMPACT NO.	END STRUCK	VELOCITY (MPH)	REMARKS
1	rear	5.36	Chocks loose both sides.
2	rear	6.15	Pallet moved 1/4 inch to rear.
3	rear	8.15	1/2-inch shift to rear.
4	forward	8.33	Pallet shifted a total of 1 inch to rear.

ROAD TEST DATA

TEST NO. 4

DATE: 7 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and MLRS pods.

PASS 1-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 1-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: 1/8 inch forward load movement. Pallet chocks loosened, started tight.

PASS 2-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 2-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: Total 1/2-inch load movement. Chocks loose. No pallet or load damage, container ok.

30-MILE ROAD TEST: No change in load or blocking.

PANIC STOP TEST: No load movement.

PASS 3-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 3-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: No change.

PASS 4-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 4-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: No damage or breakage to the unit loads or tiedown procedure.

WASHBOARD COURSE: No physical damage.

SHIPBOARD TRANSPORTATION SIMULATOR: No damage to container, LRP or MLRS pods.

RAIL IMPACT DATA

TEST NO. 5

DATE: 9 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and 155mm projectiles.

TEST CAR NO.	TTX 153487	LT. WT.	73,400	pounds
CHASSIS NO.	5394	LT. WT.	6,040	pounds
CONTAINER NO.	INBU 2598901	LT. WT.	5,200	pounds
LRP NO.	EDIT 3008	LT. WT.	3,600	pounds
LADING AND DUNNAGE		WT.	37,500	pounds
	TOTAL SPECIMEN	WT.	125,740	pounds
	BUFFER CAR (5 CARS)	WT.	250,000	pounds

IMPACT NO.	END STRUCK	VELOCITY (MPH)	REMARKS
1	rear	4.21	Pallet shifted to rear 3/4 inch. Header assembly rotated. Stop Assemblies bending toward rear of container. Entire load shifted 1-1/2 inches to rear.
2	rear	6.58	LRP shifted to rear 1 inch at both sides. One pallet unit racked between first and second row.
3	rear	8.52	Unitization failed. LRP remained in position. Rear beam of unit load collapsed from impact force.

PART 5
TEST PROCEDURES

PROPOSED LOADING AND BRACING PROCEDURES
 FOR ATACMS (OR MLRS) ROCKET POD/CONTAINERS
 ON COMMERCIAL LOAD AND ROLL PLATFORM
 (FAST PALLET) IN COMMERCIAL CONTAINER

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NOTE: The attached 10 page document is an interim procedure (drawing D-SMCAC-4465) which is in the process of being superseded by a final procedure (drawing 19-48-8184 GM15RS3). This document is used to delineate proposed outloading procedures to be used for the shipment of ATACMS (or MLRS rocket pod/containers) when loaded on commercial Load and Roll Platform (Fast Pallet) and into a commercial container. The procedures as delineated are to be verified by rail impact, road transportability, and shipboard simulation tests prior to their approval for actual shipment.

Prepared during February 1989 by:
 U.S. Army Defense Ammunition
 Center and School
 ATTN: SMCAC-DEO
 Savanna, IL 61074-9639

APPROVED BY U.S. COAST GUARD <i>R. W. Tanner</i> DATE <u>9/15/97</u>	APPROVED BY HAZARDOUS MATERIALS SYSTEMS (BOE) ASSOCIATION OF AMERICAN RAILROADS DATE _____
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INTERIM PROCEDURES

MLRS

LOADING AND BRACING¹ WITH LOAD AND ROLL PLATFORM² IN COMMERCIAL CONTAINERS OF ROCKET POD/ CONTAINERS (RP/C) FOR MULTIPLE LAUNCH ROCKET SYSTEM, FOR SHIPMENT BY T/COFC CARRIER

THE INTERIM LOADING AND BRACING PROCEDURES SPECIFIED BY THIS DRAWING ARE ONLY APPLICABLE, UNLESS OTHERWISE DIRECTED, FOR ONE TIME USE IN SUPPORT OF A TRIAL SHIPMENT PROGRAM. APPROVAL OF THIS DRAWING, AS REFLECTED HEREON, IS BASED ON THE CONSTRAINTS SET FORTH IMMEDIATELY ABOVE.

● THE LOAD AND ROLL PLATFORM IS A COMMERCIAL PRODUCT. FOR A SOURCE OF SUPPLY, CONTACT CONTAINER CONCEPTS, INC., 1521 BOLSON DRIVE, DOWNERS GROVE, IL 60516. PHONE 1-312-968-1835.

● LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLAT-CAR (T/COFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS. SEE GENERAL NOTE "L" ON PAGE 2.

REVISIONS			DRG/ISSUED	PROJ ENG
			<i>W</i>	<i>JM</i>
			CHECKER	LAF/WRF
			<i>CIG</i>	LOG ENGINE OFFICE
				<i>W. J. Daniels</i>
			APPROVED, U.S. ARMY ELEMENT, QUARTERS 800 GENERAL CORDAGE	
			APPROVED BY ORDER OF COMMANDER GENERAL, U.S. ARMY MATERIAL COMMAND (AMC)	
			U.S. ARMY DEFENSE ADMINISTRATION CENTER AND SCHOOL	
			U.S. ARMY AMC DRAWING	
			DEF AMMO CEN & SCH DWG NO.	
			D-SMCAC-4465	

DO NOT SCALE

GENERAL NOTES

(GENERAL NOTES CONTINUED)

- A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1 AND AUGMENTS TM 743-200-1 (CHAPTER 5).
- B. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED TO SUPPORT A TRIAL SHIPMENT PROGRAM. THE OUTLOADING PROCEDURES DEPICTED HEREIN ARE APPLICABLE TO THE MULTIPLE LAUNCH ROCKET SYSTEM ROCKET POD/CONTAINER (RP/C). SUBSEQUENT REFERENCE TO CONTAINER HEREIN MEANS THE RP/C WITH ROCKET COMPONENTS.
- C. FOR DETAILS OF THE ROCKET POD/CONTAINER, SEE US ARMY MISSILE COMMAND DRAWING NO. 13027900.
- CONTAINER DIMENSIONS ———13'-30" LONG BY 41-1/2" WIDE BY 33" HIGH.
- GROSS WEIGHT —————5,078 POUNDS (APPROX).
- D. THIS ITEM IS A DOT CLASS "A" EXPLOSIVE, AND A COAST GUARD CLASS "C". THE OUTLOADING PROCEDURES SPECIFIED HEREIN CAN ALSO BE UTILIZED FOR THE SHIPMENT OF THE DEPICTED CONTAINERS WHEN THEY ARE LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEM DESIGNATED IN THE DRAWING TITLE.
- E. THE LOAD AS SHOWN IS BASED ON A 4,700 POUND 20'-0" LONG BY 8'-0" WIDE BY 8'-6" HIGH INTERMODAL COMMERCIAL CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 7'-2" WIDE BY 9'-5" HIGH. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLATCAR (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.
- F. WHEN LOADING THE CONTAINERS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE TIGHT LOAD (TIGHT AGAINST THE FORWARD BLOCKING ASSEMBLY). ALTHOUGH A TOTAL OF ONE AND ONE-HALF INCHES OF UNBLOCKED SPACE ACROSS THE WIDTH OF THE 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 FILL PIECES ON THE CORNER RETAINER PIECES. NAIL EACH ADDITIONAL PIECE TO THE FILL PIECE W/4 APPROPRIATELY SIZED NAILS. ADDITIONALLY, THE THICKNESS OF THE FILL PIECES MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE LENGTH OF THE LOAD AND ROLL PLATFORM.
- G. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 6" MATERIAL IS ACTUALLY 3/4" THICK BY 5-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" BY 5-1/2" WIDE.
- H. WHEN STEEL STRAPPING IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF ONE SEAL WITH TWO PAIR OF NOTCHES WILL BE USED. A MINIMUM OF TWO SEALS, BUTTED TOGETHER, WITH TWO PAIR OF CRIMPS PER SEAL WILL BE USED TO SEAL THE JOINT WHEN A CRIMP TYPE SEALER IS BEING USED. REFER TO THE "STRAP JOINT A" AND "STRAP JOINT B" DETAILS ON PAGE 5 FOR GUIDANCE.
- J. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS ONE OF THE SIDE WALLS, HAVE NOT BEEN SHOWN IN THE LOAD VIEW FOR CLARITY PURPOSES.
- K. DIMENSIONS GIVEN FOR DUNNAGE PIECES OR ASSEMBLIES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY AND INSTALLATION IN THE COMMERCIAL CONTAINER.
- L. REQUIREMENTS CITED WITHIN THE BUREAU OF EXPLOSIVES PAMPHLET 6C 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 T/COFC 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.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

LUMBER ————— TM 743-200-1 (DUNNAGE LUMBER) AND FED SPEC MM-L-731.

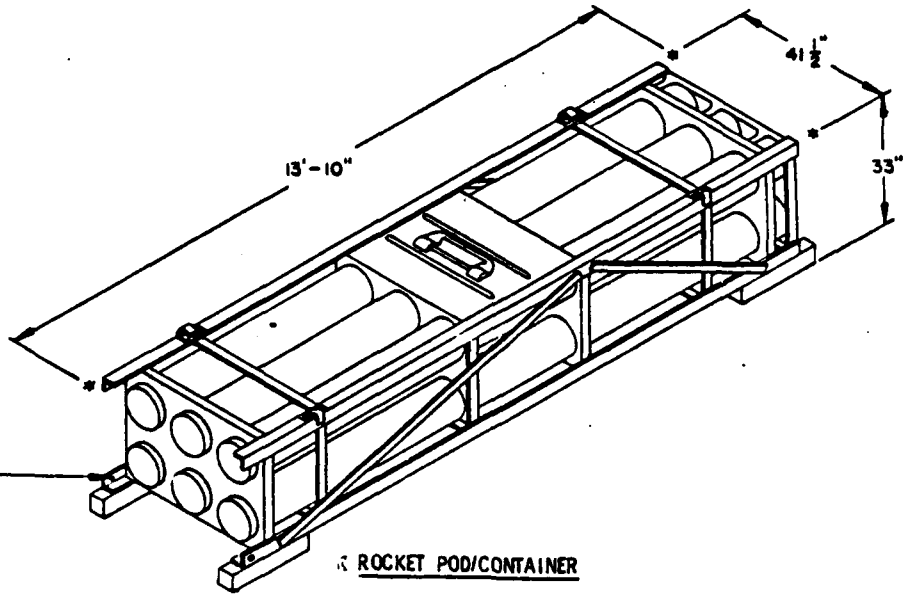
NAILS ————— FED SPEC FF-N-105; COMMON.

WIRE ————— FED SPEC QQ-W-461.

LOAD AND ROLL PLATFORM → LRP-107NP-MUS-A1, BALBENT BENDING 70857.

ANTI-CHIPPING MATERIAL FIBERBOARD ————— FED SPEC PPP-F-380; TYPE 3F (SOLID FIBERBOARD), CLASS-DOMESTIC, ALL GRADES.

INDICATES DRAGGING FACILITY HOLES IN RP/C FRAME (LOCATED ON AFT END ONLY).



SPECIAL HANDLING GUIDANCE

1. CONTAINER STACKING FOR OUTLOADING PURPOSES.

- A. THE UPPER CONTAINER SHOULD BE PLACED AS CLOSELY AS POSSIBLE IN VERTICAL ALIGNMENT WITH THE LOWER CONTAINER.
- B. WHEN STACKING THESE CONTAINERS, CARE MUST BE EXERCISED TO INSURE THAT THE INTERLOCKING HOLES IN THE BOTTOM OF THE CONTAINER SKIDS ALIGN CORRECTLY WITH THE INTERLOCKING PINS ON THE TOP OF THE CONTAINER FRAME. THIS WILL PRECLUDE DAMAGE TO THE SKIDS AND INSURE PROPER FUNCTIONING OF THE CONTAINER INTERLOCKS.

2. CONTAINER OR CONTAINER STACK HANDLING.

NOTES: (1) MATERIALS HANDLING EQUIPMENT (MHE) IS INTENDED TO MEAN EQUIPMENT, SUCH AS FORKLIFT TRUCKS, CRANES, HAND TRUCKS, DOLLIES, ROLLER ASSEMBLIES, SLINGS, AND SPREADER BARS, THAT CAN BE USED TO HANDLE THE DEPICTED CONTAINERS.

(2) PRECAUTIONARY HANDLING TECHNIQUES NORMALLY EMPLOYED OR AS SPECIFIED FOR THE TYPE OF COMMODITY INVOLVED WILL BE OBSERVED.

- A. ONLY APPROVED AND APPROPRIATELY SIZED MHE WILL BE USED FOR HANDLING THE DEPICTED CONTAINERS.
- B. IF HANDLING IS ACCOMPLISHED WITH A FORKLIFT TRUCK, THE CONTAINERS SHOULD BE HANDLED FROM A SIDE POSITION ONLY. CARE MUST BE EXERCISED WHEN INSERTING THE FORKS UNDER THE CONTAINER TO PREVENT DAMAGE TO THE CONTAINER BY THE FORK TINES OR THE FORKLIFT PACKAGE GUARD. ADDITIONALLY, THE FORK TINES SHOULD BE PLACED UNDER THE CONTAINER'S STRONGEST AREAS; THAT IS, THE LATERAL FRAME MEMBERS/BULKHEADS LOCATED NEAR THE LONGITUDINAL CENTER OF THE CONTAINER.

3. SEQUENTIAL CONTAINER LOADING.

- A. **NOTE:** FOR EASE IN LOADING THE LOAD AND ROLL PLATFORM INTO THE COMMERCIAL CONTAINER, SET THE FORWARD END OF THE LOAD AND ROLL PLATFORM IN THE OPEN END OF THE COMMERCIAL CONTAINER AND INSTALL APPROPRIATELY SIZED 4" BY PLATFORM WIDTH MATERIAL UNDER THE REAR OF THE LOAD AND ROLL PLATFORM UNTIL THE PLATFORM IS LEVEL HORIZONTALLY.
- B. LOAD THE CONTAINERS OR CONTAINER STACKS BY FIRST INSERTING THE FAR SKIDS IN THE CENTER SKID HOLDERS ON THE LOAD AND ROLL PLATFORM, THEN LOWERING AND INSERTING THE NEAR SKIDS INTO THE OUTSIDE SKID HOLDERS ON THE PLATFORM. **NOTE:** THE AFT END OF THE CONTAINERS MUST BE POSITIONED AT THE FORWARD END OF LOAD AND ROLL PLATFORM.
- C. APPLY THE STACK UNITIZING STRAP. **NOTE:** FIBERBOARD ANTI-CHAFING MATERIAL MUST BE INSTALLED UNDER THE STRAPS AT ALL POINTS OF CONTACT WITH THE CONTAINERS.

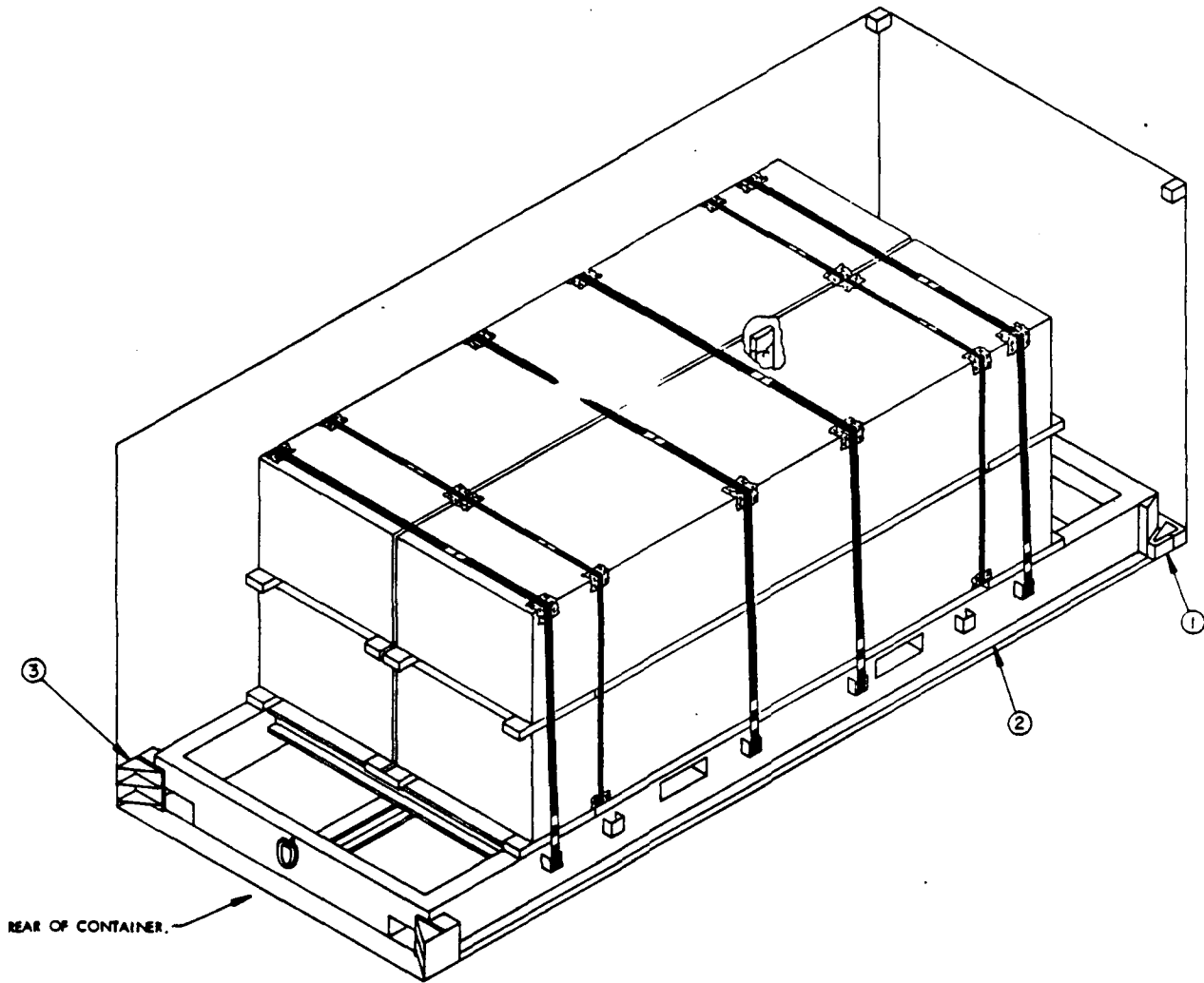
(SPECIAL HANDLING GUIDANCE CONTINUED)

- D. INSTALL THE CENTER FILL PIECES. POSITION THE CENTER FILL PIECES SO THAT THEY ARE SUPPORTED BY THE TOP SIDE OF THE FORK POCKET (TUNNEL) ON THE LOAD AND ROLL PLATFORM. WIRE TIE THE CENTER FILL PIECES TO THE CONTAINER FRAME.
- E. NEXT, LOAD AND UNITIZE THE REMAINING CONTAINERS IN THE MANNER DETAILED IN PARAGRAPHS 3B AND 3C AT LEFT.
- F. APPLY THE HOLD-DOWN STRAPS, POSITIONING FIBERBOARD ANTI-CHAFING MATERIAL UNDER THE STRAPS AT ALL POINTS OF CONTACT WITH THE CONTAINERS. **CAUTION:** THE HOLD-DOWN STRAPS MUST BE INSTALLED WITH CARE SO AS NOT TO HAVE EDGE-TO-EDGE CONTACT WITH THE STACK UNITIZING STRAPS.
- G. POSITION THE FORWARD BLOCKING ASSEMBLY IN THE COMMERCIAL CONTAINER. LIFT THE REAR END OF THE LOAD AND ROLL PLATFORM WITH APPROPRIATELY SIZED MHE UNTIL ONLY THE ROLLER CONTACTS THE COMMERCIAL CONTAINER FLOOR (REF: 4"). ROLL THE PLATFORM INTO THE CONTAINER UNTIL IT CONTACTS THE FORWARD BLOCKING ASSEMBLY. SET THE REAR OF THE PLATFORM ON THE COMMERCIAL CONTAINER FLOOR. INSTALL THE CORNER RETAINER PIECES AND FILL MATERIAL AS NECESSARY.

UNLOADING THE LOAD AND ROLL PLATFORM FROM THE COMMERCIAL CONTAINER.

- A. THE LOAD AND ROLL PLATFORM MAY BE UNLOADED USING THE REVERSE OF THE METHOD DETAILED IN 3G ABOVE.
- B. THE LOAD AND ROLL PLATFORM MAY ALSO BE UNLOADED USING A VEHICLE WITH AN APPROPRIATELY SIZED WINCH. FIRST, REMOVE THE CORNER RETAINER PIECES. ATTACH THE WINCH TO THE D-RING ON THE REAR OF THE LOAD AND ROLL PLATFORM, RAISE THE PLATFORM UNTIL THE ROLLER CONTACTS THE COMMERCIAL CONTAINER FLOOR, AND PULL THE CONTAINER OUT USING THE WINCHING VEHICLE, TAKING CARE NOT TO PULL THE PLATFORM TOTALLY OUT OF THE COMMERCIAL CONTAINER. SET BLOCKING UNDER THE REAR END OF THE PLATFORM, AND UNLOAD THE MHS CONTAINERS, USING APPROPRIATELY SIZED MHE.

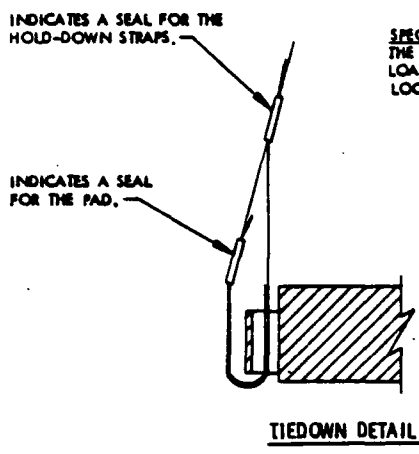
(CONTINUED AT RIGHT)



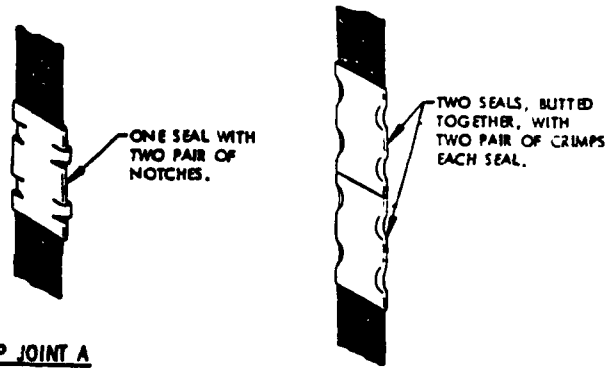
ISOMETRIC VIEW

KEY NUMBERS

- ① FORWARD BLOCKING ASSEMBLY (1 REQD). See page 5-9.
- ② LOAD AND ROLL PLATFORM, LOADED (1 REQD). SEE THE DETAIL ON PAGE 6.
- ③ CORNER RETAINER PIECE (2 REQD). See page 5-9.



SPECIAL NOTE:
THE SEAL(S) USED TO FASTEN THE HOLD-DOWN STRAPS TO LOAD AND ROLL PLATFORM TIEDOWN ANCHOR SHOULD BE LOCATED A MINIMUM OF 18" ABOVE THE PLATFORM DECK.



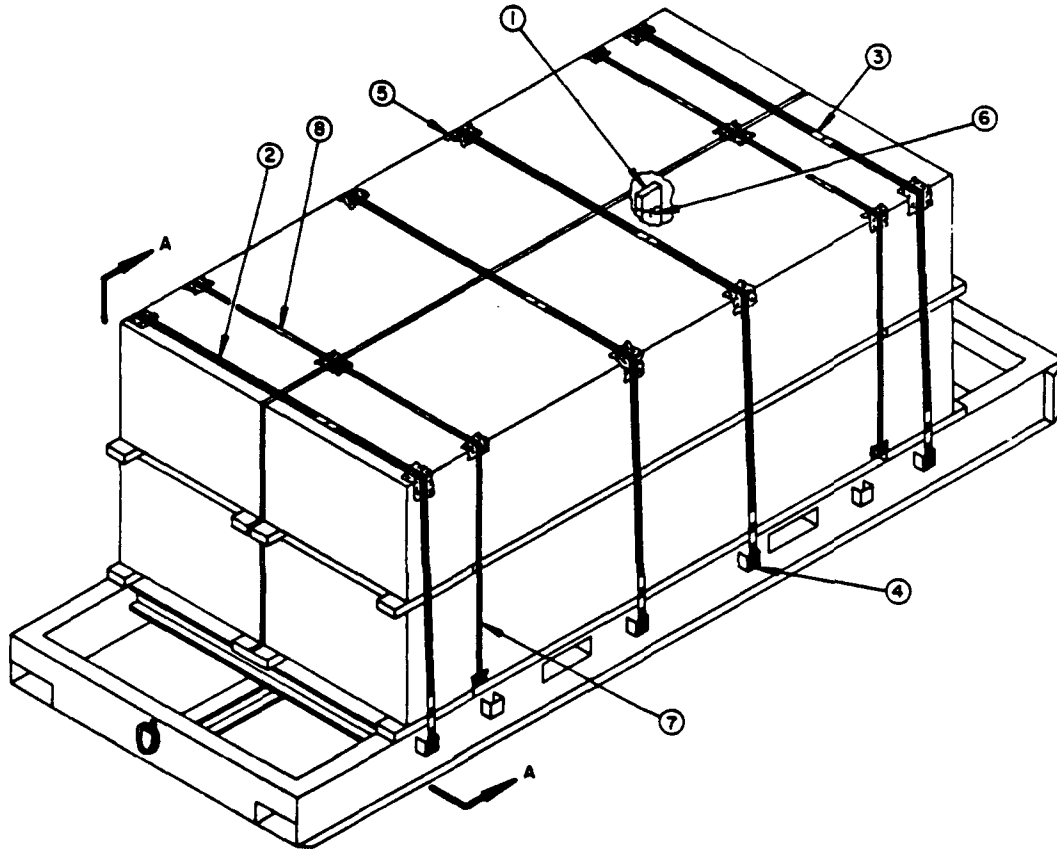
STRAP JOINT A
METHOD OF SECURING A STRAP JOINT WHEN USING A NOTCH-TYPE SEALER.

STRAP JOINT B
METHOD OF SECURING A STRAP JOINT WHEN USING A CRIMP-TYPE SEALER.

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 6"	11	11
STEEL STRAPPING, 2" X .050"	128' REQD	43 LBS
SEAL FOR 2" STRAPPING	24 REQD	5 LBS
STEEL STRAPPING, 1-1/4" X .035" OR .031"	88' REQD	12 LBS
SEAL FOR 1-1/4" STRAPPING	8 REQD	1/2 LBS
WIRE, NO. 14 GAGE	8' REQD	NIL
FIBERBOARD ANTI-CHAFING MATERIAL	AS REQD	NIL
LOAD AND ROLL PLATFORM	1 REQD	1,933 LBS

LOAD AS SHOWN

ITEM	ITEM	QUANTITY	WEIGHT (APPROX)
MILS RP/CS		4	20,312 LBS
DUNNAGE			2,016 LBS
COMMERCIAL/CONTAINER		1	4,700 LBS
TOTAL WEIGHT			27,028 LBS

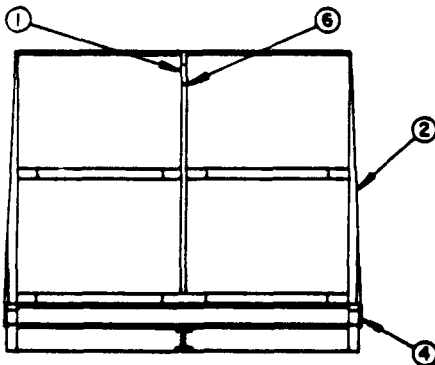


ISOMETRIC VIEW

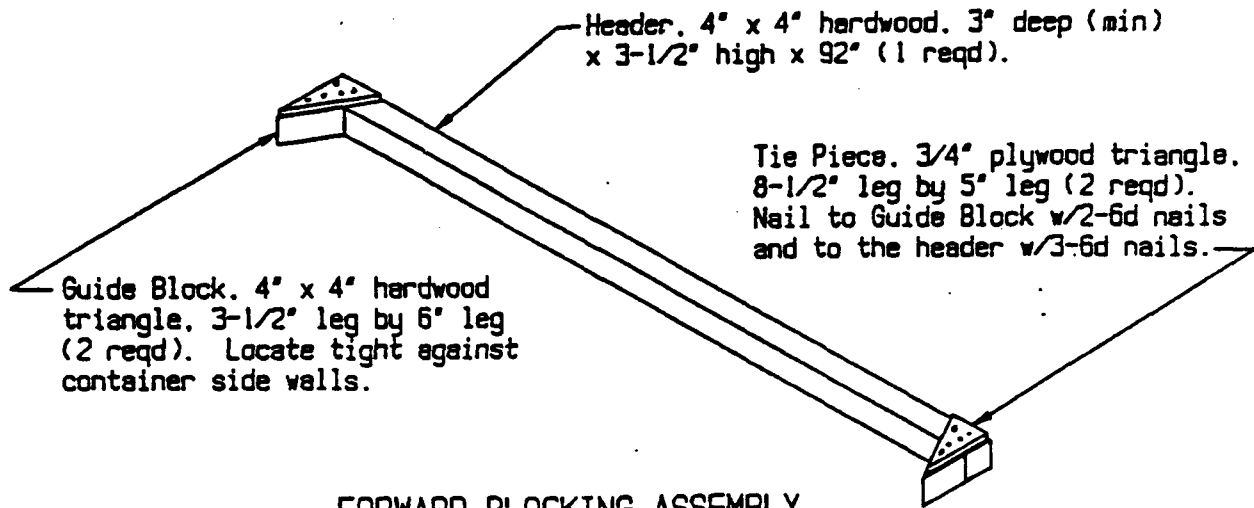
KEY NUMBERS

- ① CENTER FILL PIECE, 2" X 6" X 66" (2 REQD). POSITION ON THE FORKLIFT TUNNEL.
- * ② HOLD-DOWN STRAP, 2" X .050" X 28'-0" LONG STEEL STRAPPING (4 REQD). INSTALL EACH STRAP FROM TWO 14'-0" LONG PIECES.
- * ③ SEAL, 2" (24 REQD, 6 PER STRAP). DOUBLE CRIMP EACH SEAL, EXCEPT THOSE USED TO SECURE THE PADS, PIECES MARKED ④. SEE GENERAL NOTE "H" ON PAGE 2.
- ④ PAD, STRAPPING, 2" X .050" X 24" (8 REQD). PREPOSITION THE PAD BETWEEN THE STRAPPING, PIECE MARKED ②, AND THE LOAD AND ROLL PLATFORM TIEDOWN PROVISION AND SECURE WITH ONE PAIR OF CRIMPS. SEE THE "TIEDOWN DETAIL ON PAGE 5.
- ⑤ FIBERBOARD ANTI-CHAFING MATERIAL (AS REQD). PLACE UNDER STRAPPING AT ALL POINTS OF CONTACT WITH THE CONTAINERS.
- ⑥ TIE WIRE, NO. 14 GAGE WIRE, 24" LONG (4 REQD). WIRE TO FORM A LOOP AROUND A HORIZONTAL FRAME MEMBER OF A CONTAINER AND THE CENTER FILL PIECE, PIECE MARKED ①. BRING ENDS TOGETHER AND TWIST TAUT.
- ⑦ STACK UNITIZING STRAP, 1-1/4" X .035" OR .031" BY A LENGTH-TO-SUIT (REF: 20'-0") (4 REQD). INSTALL TO ENCIRCLE THE CONTAINERS IN ONE STACK.
- ⑧ SEAL 1-1/4" (8 REQD, 2 PER STRAP). CRIMP EACH SEAL WITH TWO PAIR OF CRIMPS. SEE GENERAL NOTE "H" ON PAGE 2.

* Note: For the test program, a 3-inch-wide web cargo strap assembly is to be used in lieu of the steel strap and seal. The web cargo strap assembly is ANCRA part no. 48050-12 (8M-3D-3D-24-260P3) consisting of a heavy capacity ratchet, 3-inch-wide polyester webbing, a keepered flat hook on both ends, and a minimum capacity of 15,000 pounds. See page 5-12 for photograph.

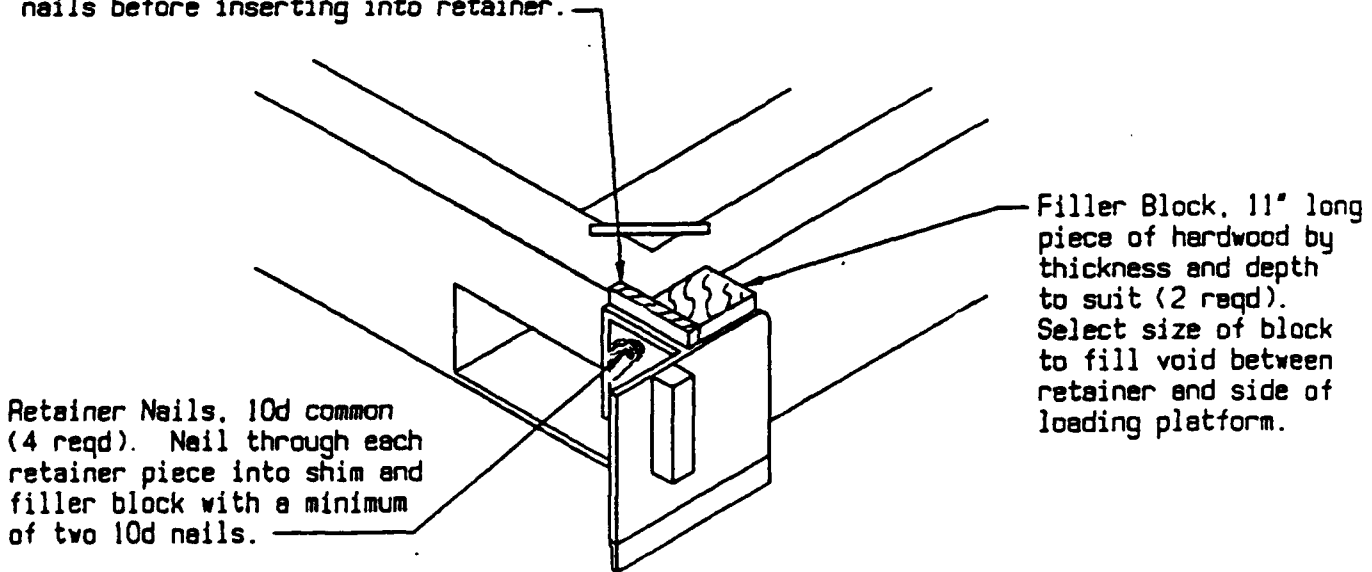


SECTION A-A

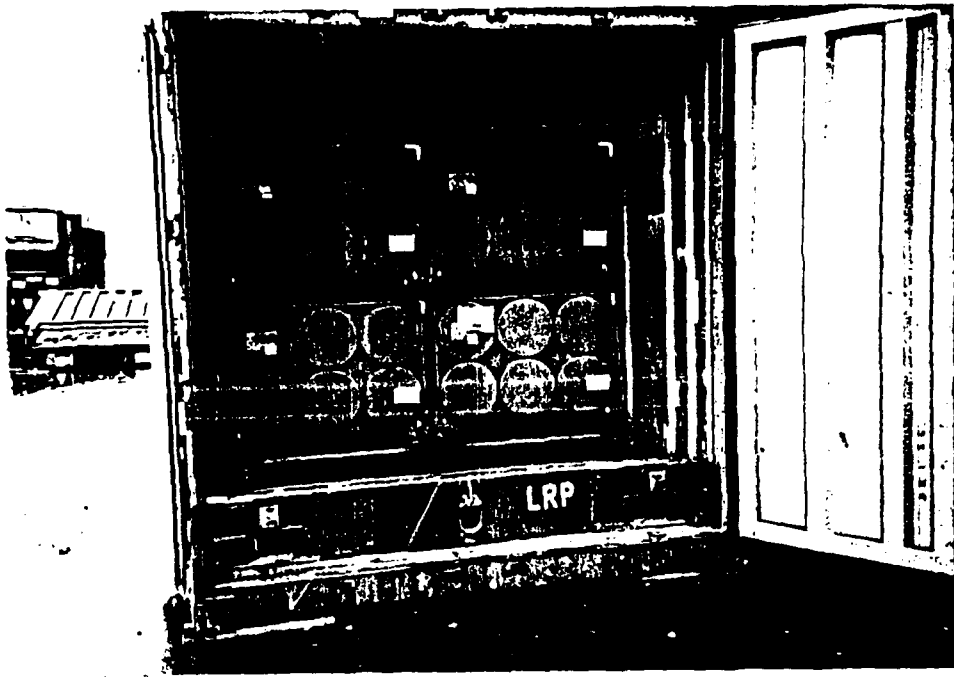


FORWARD BLOCKING ASSEMBLY

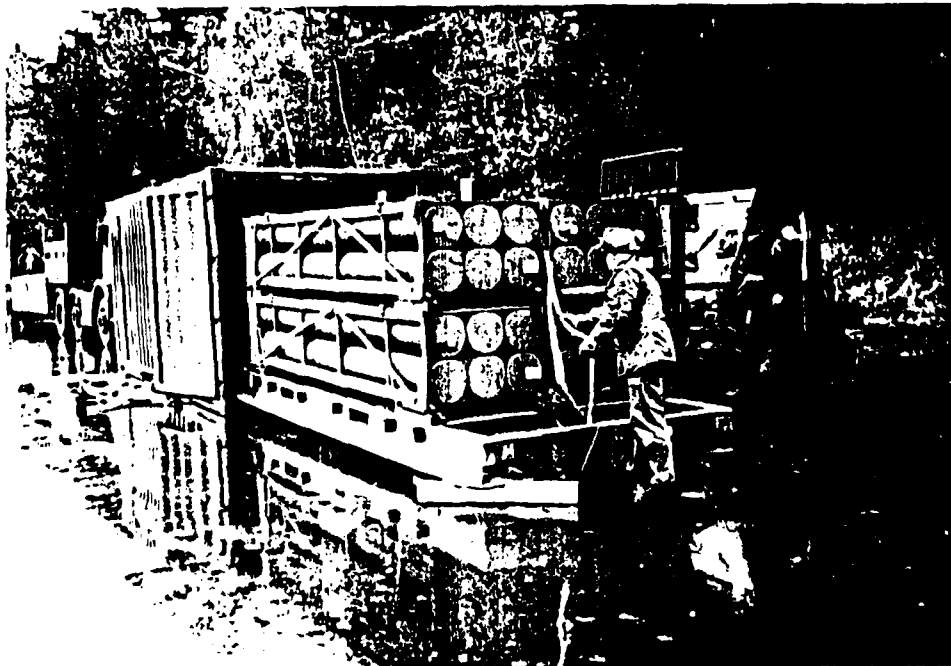
Shim. 6" x 11" plywood by thickness to suit (as reqd). Select thickness of plywood to fill void between face of retainer and end of loading platform. Nail plywood to filler block w/2-6d nails before inserting into retainer.



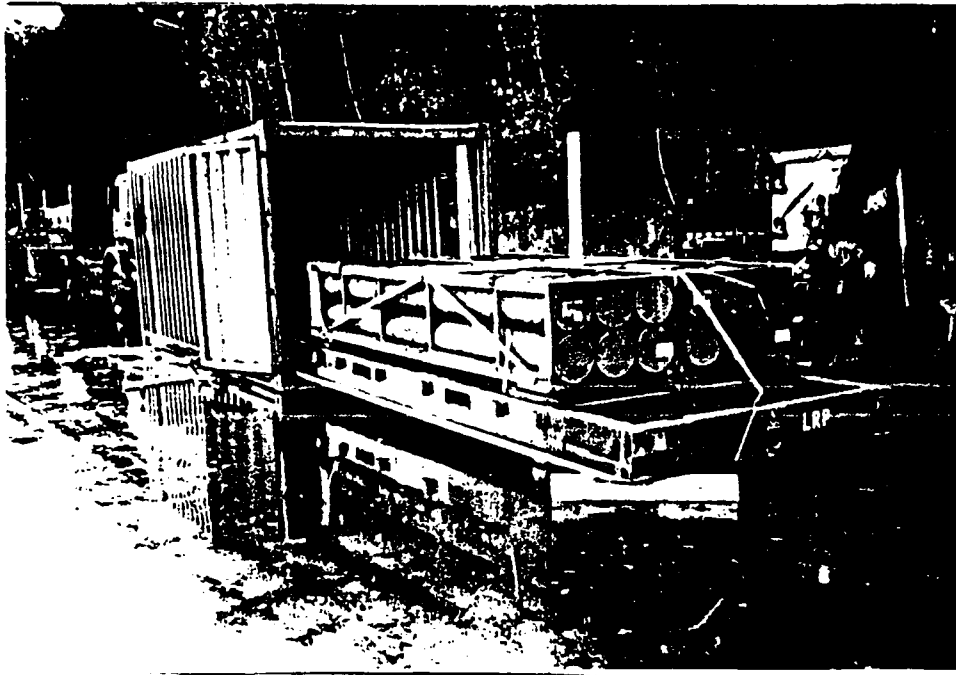
CORNER RETAINER PIECE



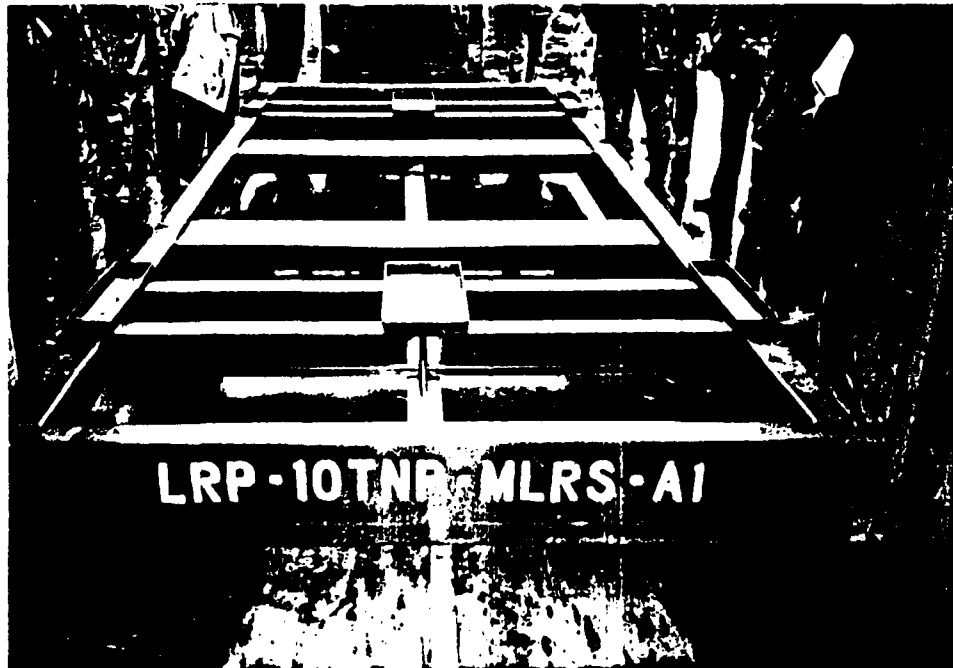
*MLRS PODS SECURED ON LOAD AND ROLL PLATFORM (LRP)
AND BLOCKED INSIDE STANDARD COMMERCIAL CONTAINER*



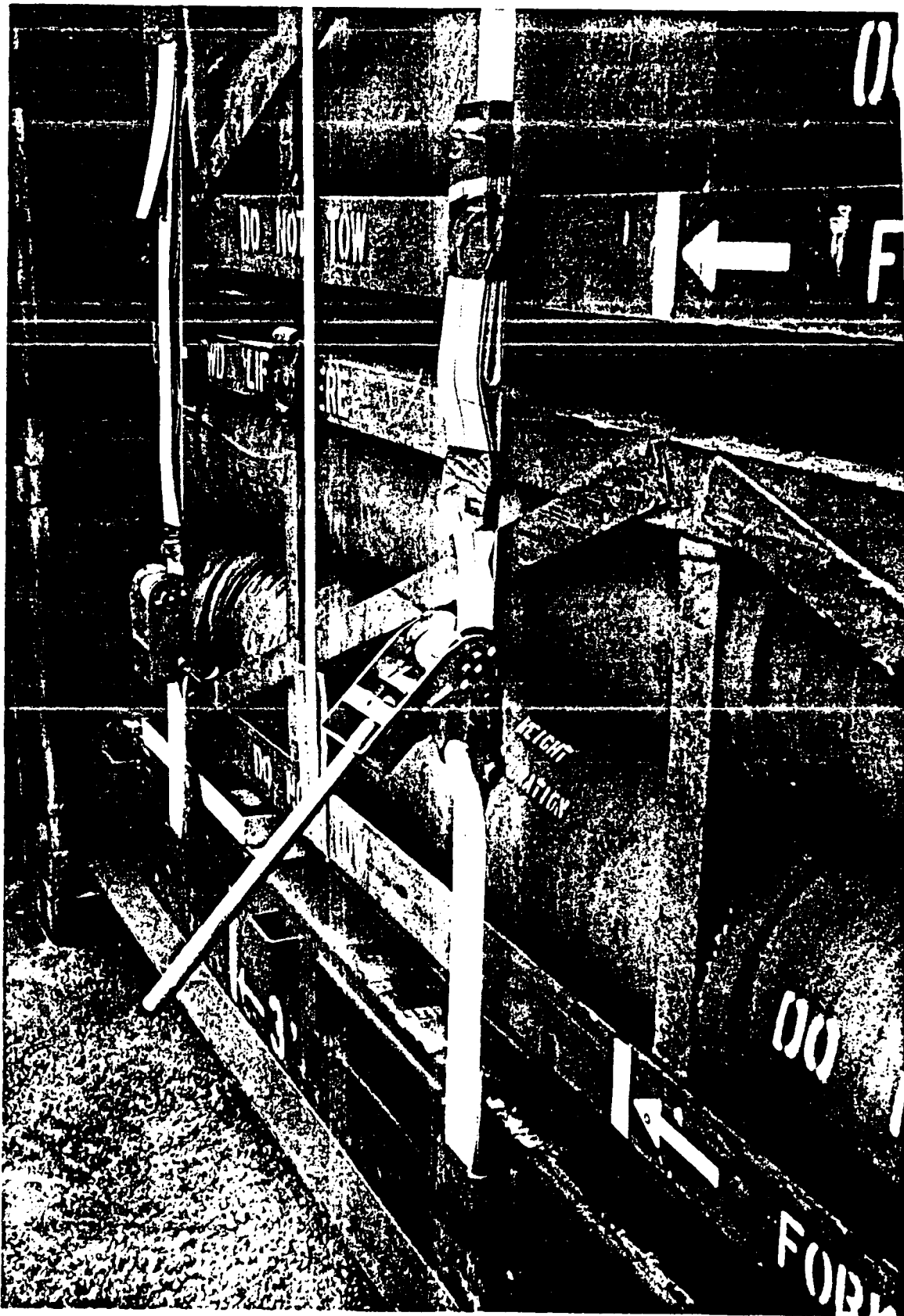
*AFTER REMOVING CORNER BLOCKS AND ROLLING OUT LRP,
MLRS PODS ARE ACCESSIBLE FOR DIRECT SIDE HANDLING*



*TWO 6K FORKLIFTS PERFORM ENTIRE UNLOADING OPERATION
AND LOAD TRAILER WITH THE FOUR PODS IN 5 MINUTES*



*OBSERVERS VIEW EMPTY LRP JUST PRIOR TO BEING ROLLED
BACK INTO COMMERCIAL END OPENING CONTAINER*



The 3-inch-wide web cargo strap assemblies are depicted. Note the extension handle inserted in the ratchet of the strap assembly in the foreground.

PROPOSED LOADING AND BRACING PROCEDURES
 FOR PALLETIZED UNITS OF 155MM SEPARATE LOADING
 PROJECTILES ON COMMERCIAL LOAD AND ROLL
 PLATFORM (FAST PALLET) IN COMMERCIAL CONTAINER

LOAD AS SHOWN

<u>ITEM</u>	<u>QUANTITY</u>	<u>WEIGHT (APPROX)</u>
PALLET UNITS	--- 42 ● 873 LBS -----	36,666 LBS
DUNNAGE	-----	225 LBS
FAST PALLET	-----	3,600 LBS
CONTAINER	-----	4,700 LBS

	TOTAL WEIGHT -----	45,191 LBS

INDEX

<u>ITEM</u>	<u>PAGE (S)</u>
ISOMETRIC OF FULL LOAD PROCEDURES -----	2
DETAILS -----	3-8

NOTE: This 8 page document delineates proposed outloading procedures to be used for the shipment of palletized 155mm separate loading projectiles on commercial Load and Roll Platform (Fast Pallet) and into a commercial container. The procedures as delineated are to be verified by rail impact, road transportability, and shipboard simulation tests prior to their approval for actual shipment.

Prepared during February 1989 by:

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

ISOMETRIC VIEW

1-1/4" X .031" OR .035"
STEEL STRAPPING. FORM
FROM TWO 18'-0" PIECES.

HEADER ASSEMBLY (2 REQD). NAIL
THROUGH STOP ASSEMBLIES INTO
HEADER 1/8"-8d NAILS. SEE PAGE 3.

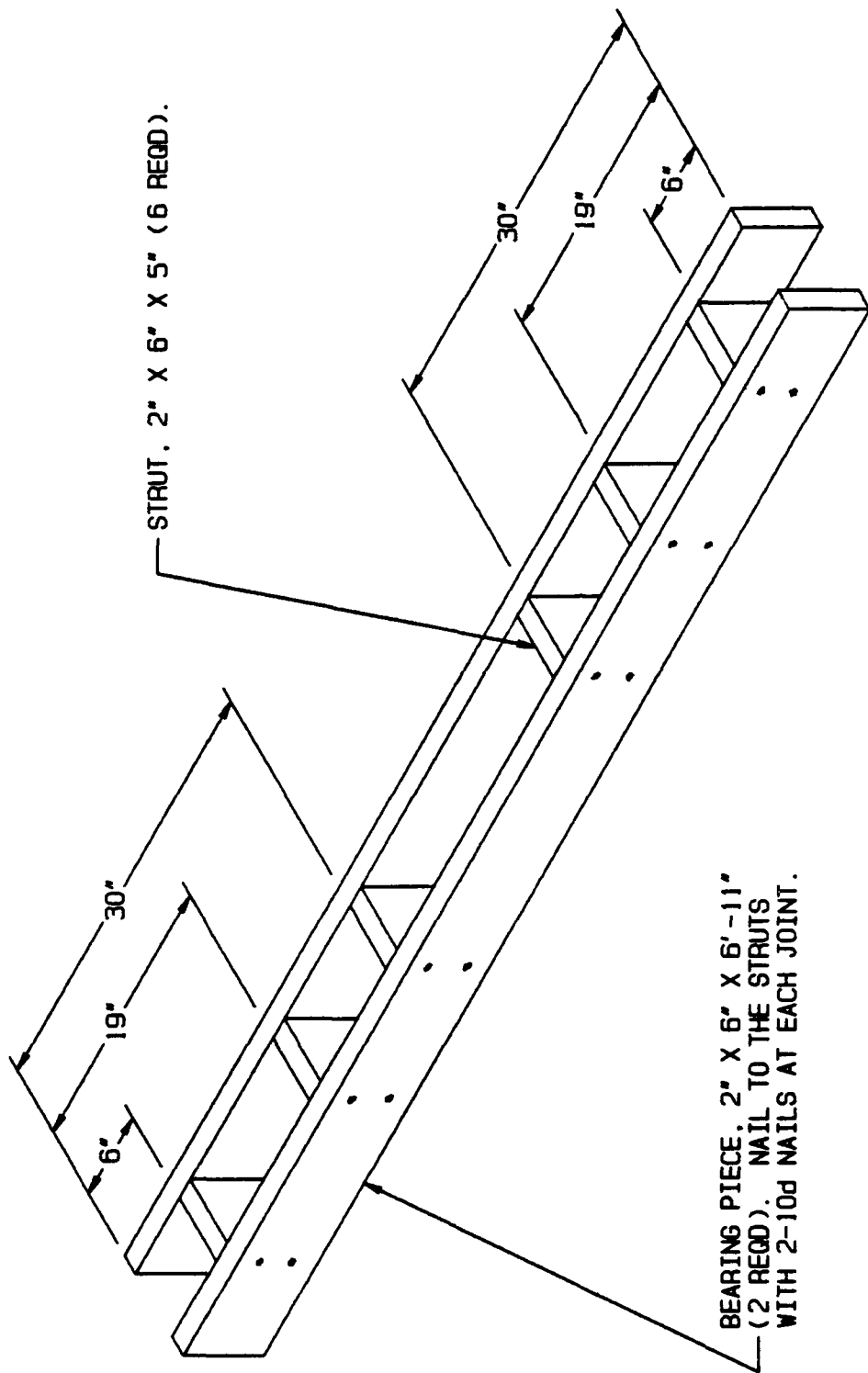
SEAL FOR 1-1/4" STRAPPING
(21 REQD). CRIMP WITH
DOUBLE NOTCH.

STRAPPING BOARD ASSEMBLY
(7 REQD). SEE PAGE 4.

FIBERBOARD EDGE PROTECTORS (14 REQD).

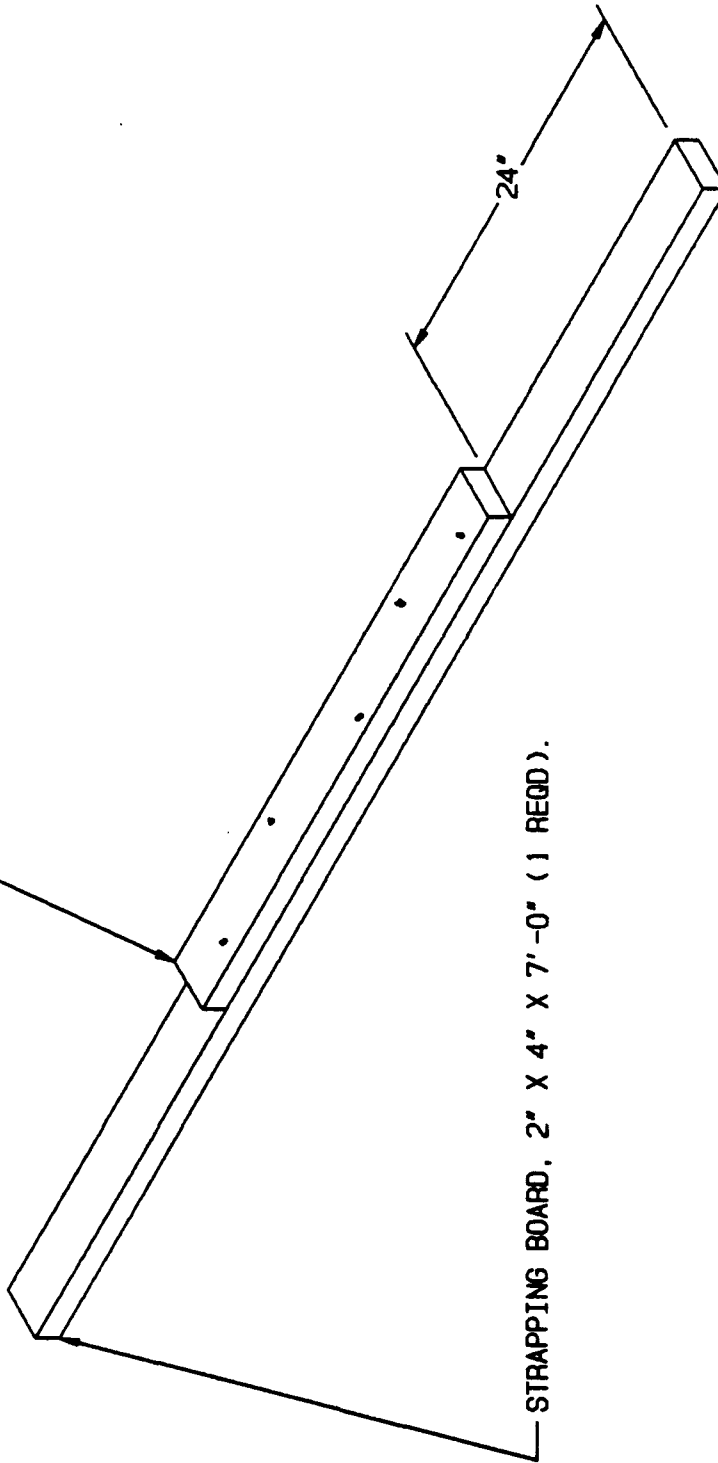
RIGHT-HAND STOP ASSEMBLY
(2 REQD). POSITION ONE AT
EACH END AS SHOWN. SEE PAGE 6.

LEFT-HAND STOP ASSEMBLY
(2 REQD). POSITION ONE AT
EACH END AS SHOWN. SEE PAGE 5.



HEADER ASSEMBLY

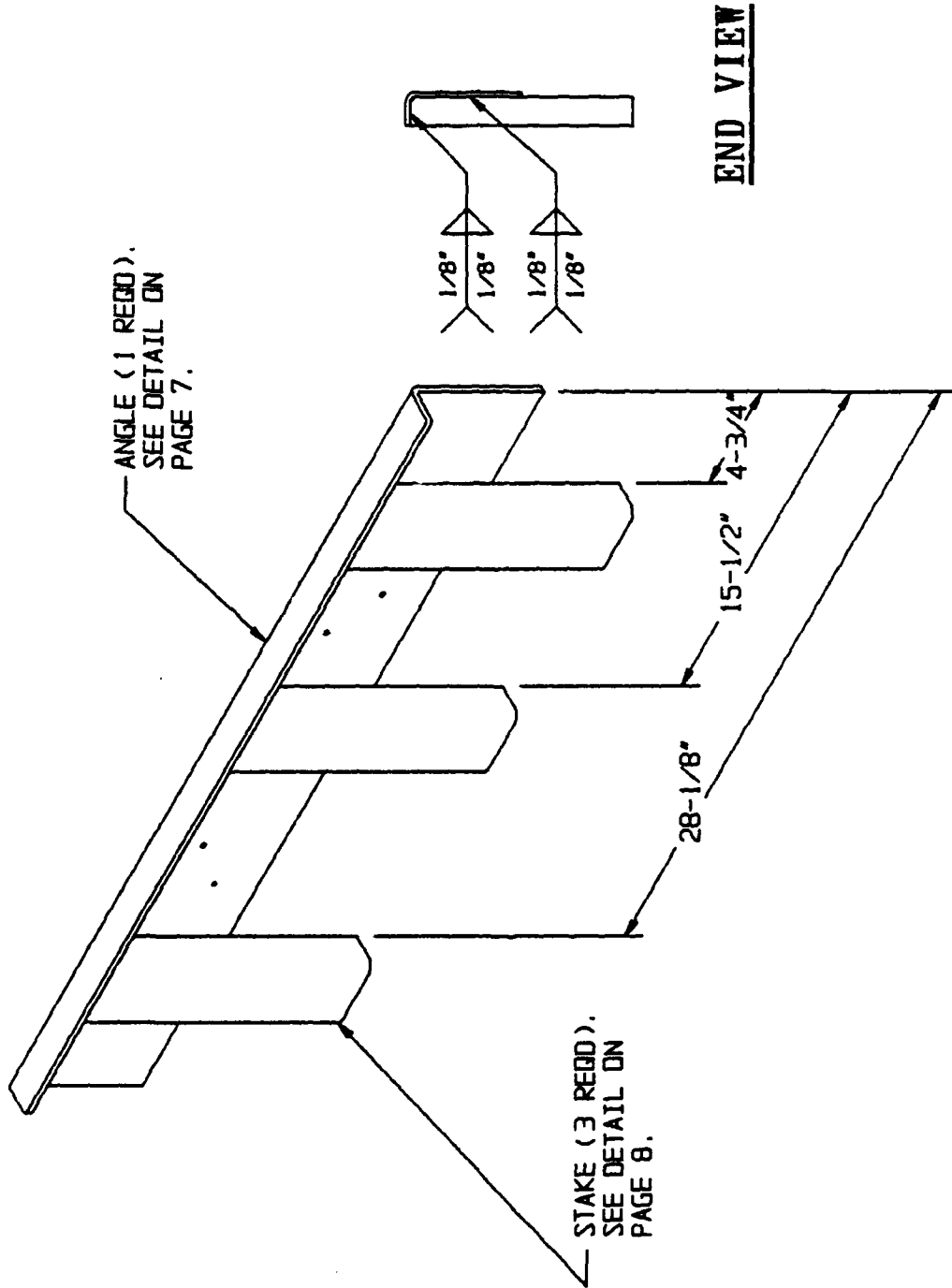
PURCHASE BOARD, 2" X 4" X 36" (1 REQD).
NAIL TO THE STRAPPING BOARD W/5-10d NAILS.



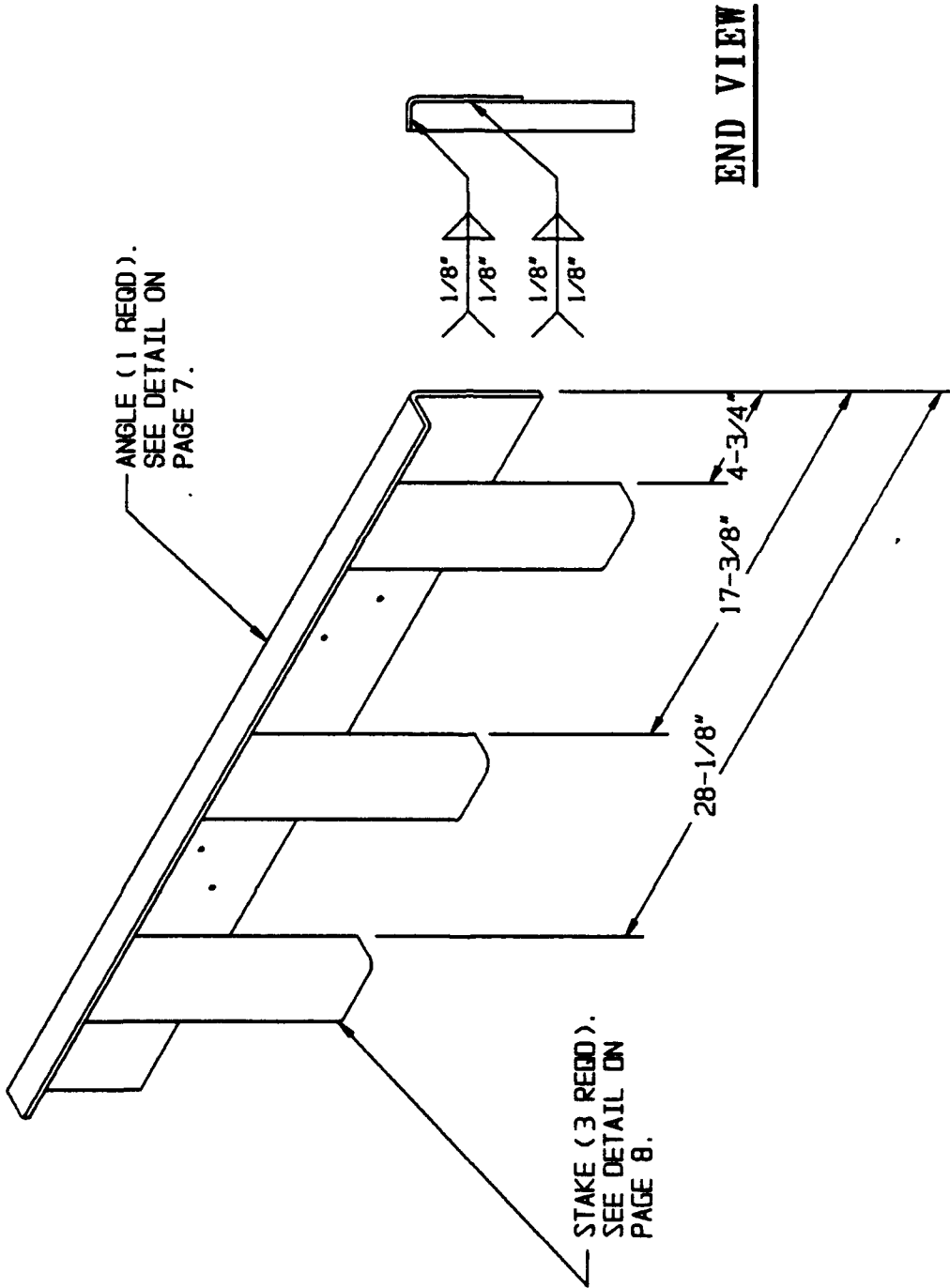
STRAPPING BOARD, 2" X 4" X 7'-0" (1 REQD).

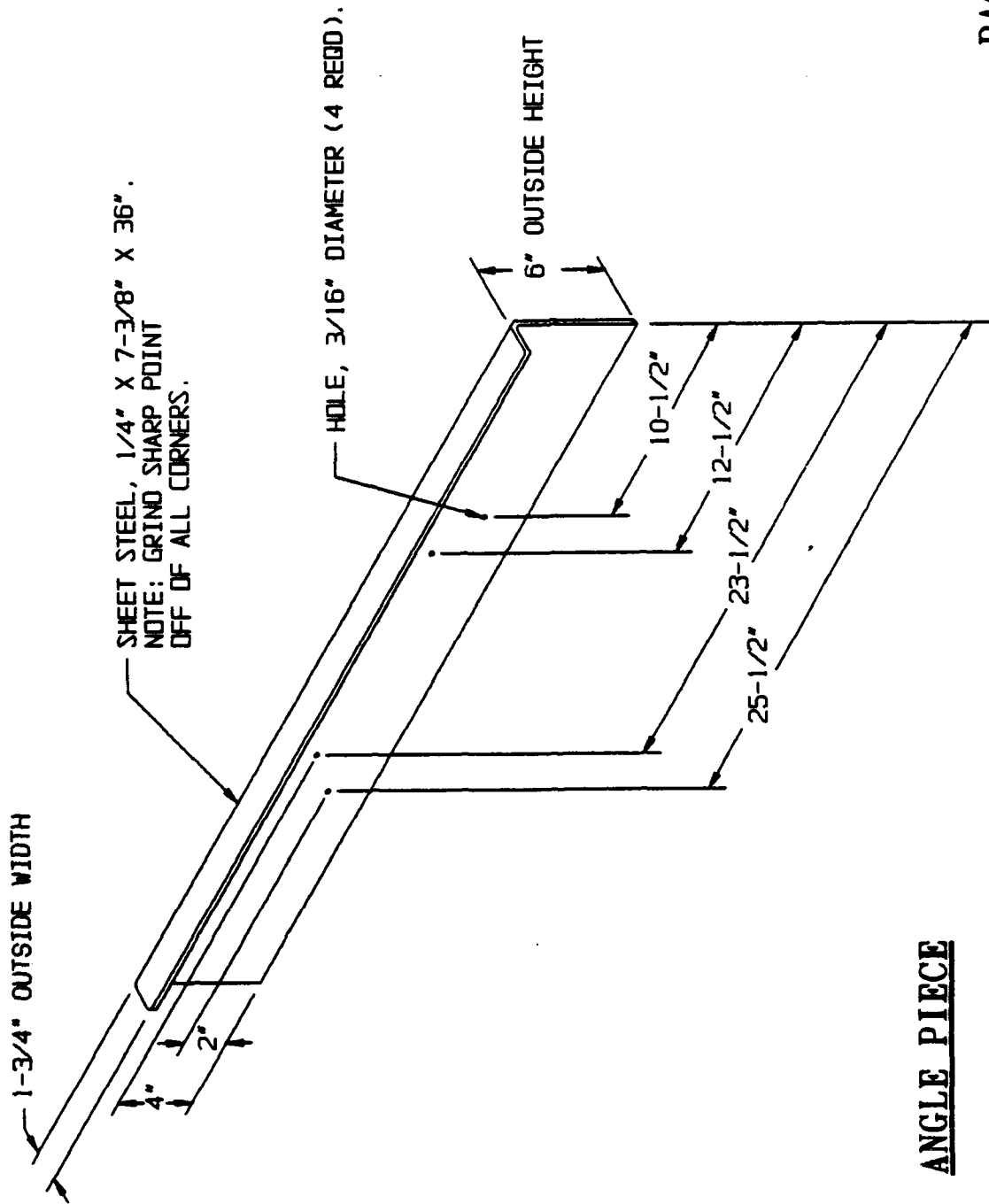
STRAPPING BOARD ASSEMBLY

LEFT-HAND STOP ASSEMBLY

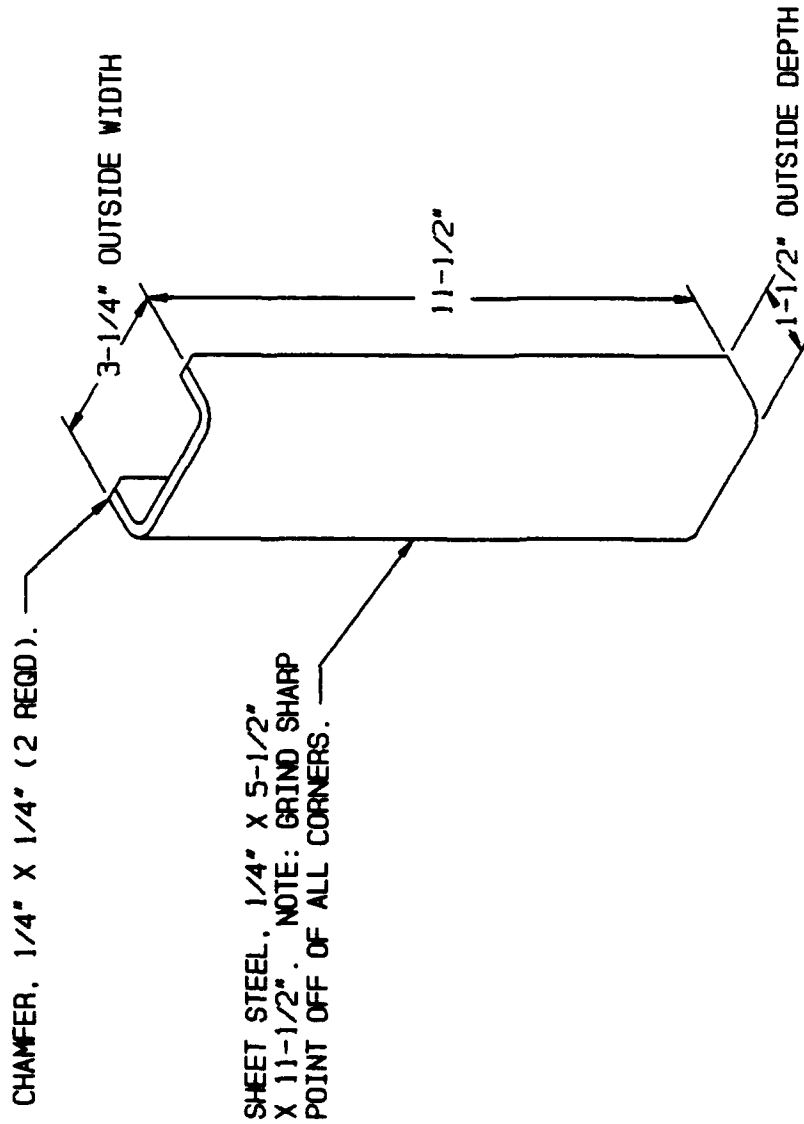


RIGHT-HAND STOP ASSEMBLY



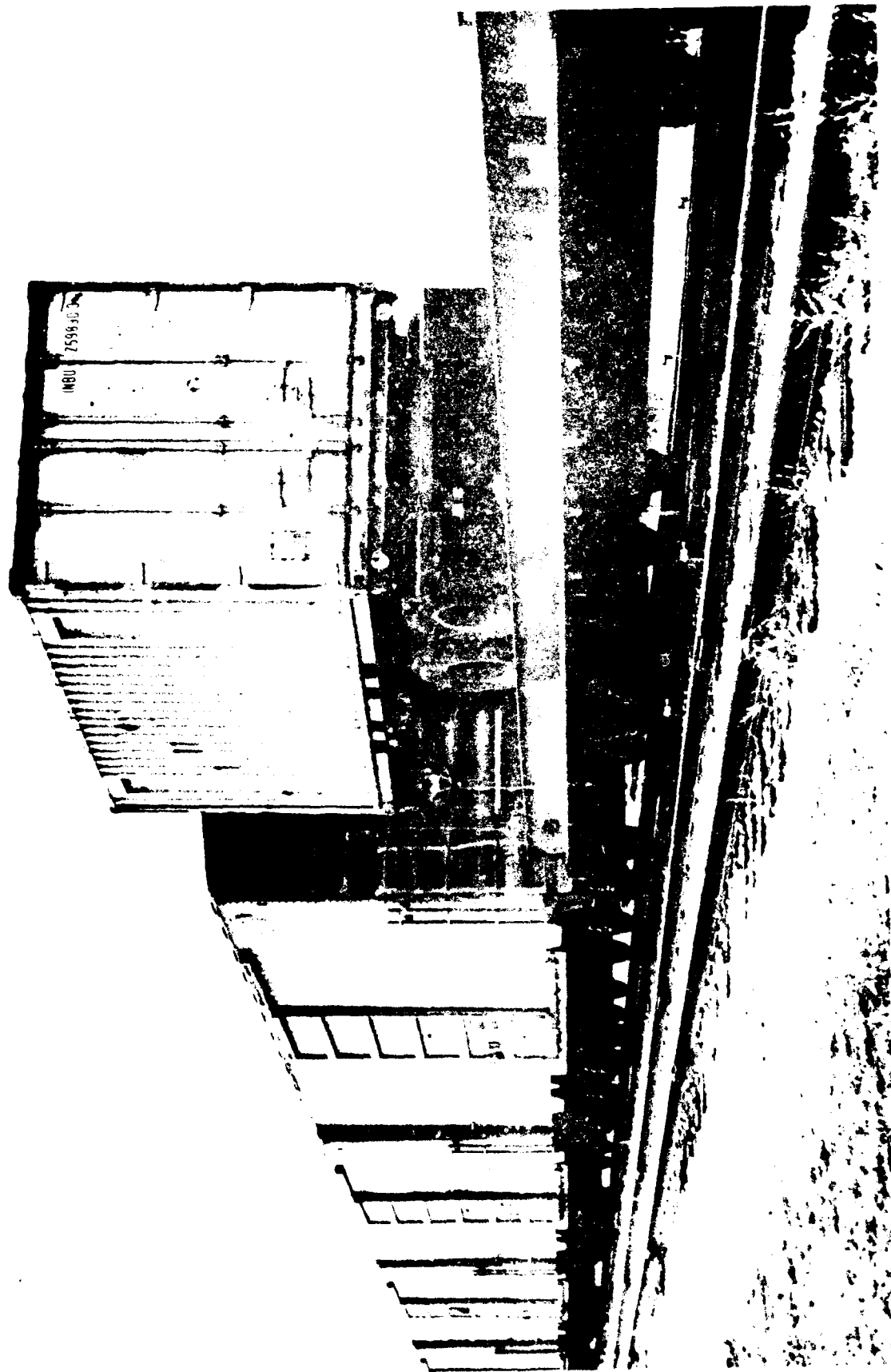


ANGLE PIECE



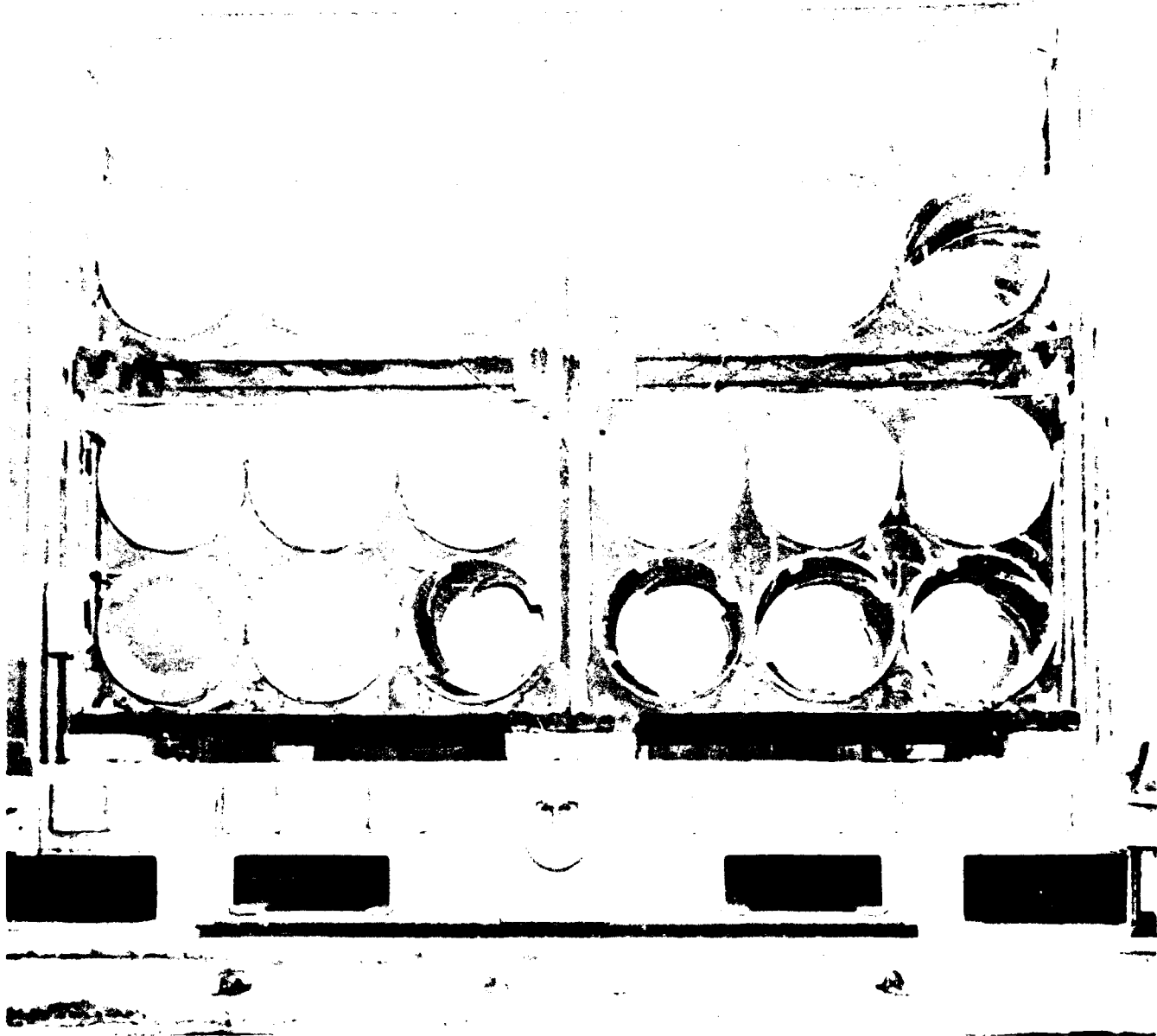
STAKE PIECE

PART 6
PHOTOGRAPHS



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

This photo shows the forward end of the 150' long building. The building is a
150' long building of four MILB pads or 170mm projectiles on a 120'.



1	DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
<p>Faint, illegible text, possibly a title or description, located below the header row.</p>		



90-1554

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 3 This photo shows the ISO container loaded with the LRP and MLRS. The test specimen is being subjected to the road hazard course. The vehicle is driven over the alternately spaced railroad ties at approximately 5 mph.



90-1774

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 4 This photo shows a special design check that is required to retain the LRP inside the container. Shims are inserted between the checks and LRP for a fit that prevents longitudinal and lateral movement. A second check is placed opposite the one shown. The metal tang on the LRP is a stacking aid for LRPs and interferes with check installation. A vertical bar on the check butts against the ISO container corner post.



90-1766 DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 5 This photo shows the ERP sheet after becoming disengaged while traversing the road hazard course. Note damage to the 4-inch channel steel. The channel steel was probably bent when the ERP slid forward during rail impact testing. The photo on the left which contacted the channel steel can be seen in the photo at the left side of the pallet, on the container floor.



90-1563

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 6. This photo shows a damaged IPP check. Damage was probably caused by collision with a plate mounted to the bottom of the IPP that protruded about four inches from the edge.



60-1571

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 7. This photo shows the pallet chock with wood spacers to prevent contact with the ERP plates. With the vertical and horizontal shims, both right and left chocks remained intact throughout the rail, road, and STS test sequences.