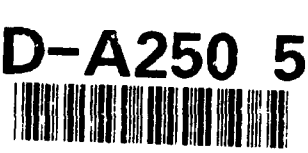

FINAL REPORT
FEBRUARY 1991

REPORT NO. EVT 23-90

TRANSPORTABILITY TESTING OF CNU-309/E AND/OR CNU-322/E CONTAINERS IN A SIDE OPENING COMMERCIAL CONTAINER

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

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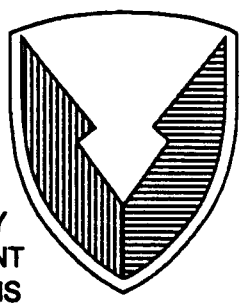

U.S. ARMY
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VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639

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A. C. McIntosh

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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), Validation Engineering Division (SMCAC-DEV), was requested by USADACS, Transportation Engineering Division (SMCAC-DET), to test a loading and bracing procedure in a side opening commercial container of 30mm ammunition in CNU-309/E or CNU-332/E containers. A total of 24 inertly-filled containers were loaded into a side opening commercial container. The gross weight of the loaded container was 33,350 pounds. Transportability tests included rail, road hazard, open road, washboard, and shipboard transportation simulation tests. After two modifications of the loading and bracing procedure, a working configuration evolved. The U.S. Army Materiel Command (AMC) Drawing No. 19-48-7115 was found to be acceptable for the tested modes of transportation. The results of the tests are included in this report.

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

REPORT NO. EVT 23-90
TRANSPORTABILITY TESTING OF, CNU-309/E AND/OR CNU-332/E CONTAINERS IN A SIDE OPENING COMMERCIAL CONTAINER

TABLE OF CONTENTS

PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was requested by USADACS, Transportation Engineering Division (SMCAC-DET), to test a loading and bracing procedure in a side opening commercial container of 30mm ammunition in CNU-309/E or CNU-332/E containers. A total of 24 inertly-filled containers were loaded. into a side opening commercial container. The gross weight of the loaded container was 33,350 pounds. Transportability tests were carried out in agreement with the procedures in part 3.

B. AUTHORITY. These tests were conducted in agreement with mission responsibilities delegated by U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL. Reference is made to Change 4, 4 October 1974; to AR-740-1, 23 April 1971; Storage and Supply Operations; and AMCCOM-R 10-17, 13 January 1986; Mission and Major Functions of USADACS.

C. OBJECTIVE. The objective of these tests was to determine if the proposed loading and bracing procedure in side opening commercial containers of 30mm ammunition loaded in CNU-309/E or CNU-322/E containers will satisfy road, rail, and ship transportation environments

D. CONCLUSIONS. The proposed loading and bracing with wooden dunnage in side opening commercial containers of 30mm ammunition loaded in CNU-309/E or CNU-322/E containers passed the rail transportation, road hazard, road, washboard, and shipboard transportation simulation tests.

E. RECOMMENDATIONS. It is recommended that the loading procedure for 30mm ammunition in CNU-309/E or CNU-322/E containers transported in a side opening commercial container be accepted.

PART 2

TRANSPORTABILITY TESTING OF CNU-309/E AND/OR CNU-332/E CONTAINERS IN A SIDE OPENING COMMERCIAL CONTAINER

AUGUST 1990

TEST ATTENDEES

NAME AND PHONE NUMBER	ORGANIZATION
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Association of American Railroads/
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309 N. Douglas
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PART 3

TEST PROCEDURES

A. RAIL IMPACT TEST. The side opening commercial container, with the inert load of 30mm containers, was positioned on a container chassis and securely locked in place using the twist locks at each corner. The chassis, with the mounted container, was secured to a Trailer-on-flatcar (TOFC) equipped with friction draft gear. Equipment needed to do the test included the specimen (hammer) car, five empty railroad cars to serve as the anvil (total weight of the railroad cars was 250,000 pounds), and a railroad locomotive. The anvil cars were positioned on a level section of track with the draft gear compressed, with air and hand brakes set. The locomotive unit pulled the specimen car several hundred yards away from the anvil cars, and, then, pushed the specimen car toward the anvil at a predetermined speed, disconnected from the specimen car (approximately 50 yards away from the anvil cars), which allowed the specimen car to roll freely along the track until it struck the anvil. This constituted an impact. Impacting was 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 were approximate; the 8 mph speed was a minimum. Impact speeds were determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately before contact with the anvil cars.

B. ROAD HAZARD COURSE. The side opening commercial container, with the inert load of 30mm ammunition containers, was positioned on a container chassis and securely locked in place using the twist locks at each corner. The chassis was towed over the road hazard course with a tractor two times at a speed of approximately 5 mph. The speed was increased or decreased, as appropriate, to produce the most violent load response.

C. ROAD TRIP TEST. Using a suitable tractor, the side opening commercial container, with the inert load of 30mm ammunition containers, was towed for a total distance of at least 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. The test route included curves, corners, railroad crossings, cattle guards, stops, and starts. This test vehicle traveled at the maximum speed suitable for the particular road traversed, except as limited by legal restrictions. The road test usually concludes with three full airbrake stops while traveling in the forward direction and one in the reverse direction while traveling down a 7 degree grade. During this test the panic stops were omitted due to the fact the test specimen sustained larger shock forces in the rail impact test, than would be realized in a panic stop.

D. POST ROAD TRIP HAZARD COURSE. After completion of the road trip test, the chassis was towed over the road hazard course with a tractor two times at a speed of approximately 5 mph. The speed was increased or decreased, as appropriate, to produce the most violent load response.

E. WASHBOARD COURSE. The side opening commercial container, with an inert load of 30mm ammunition containers, was towed over the washboard course at a speed which produced the most violent response in the particular test load (as indicated by the resonant frequency of the suspension system beneath the load).

F. SHIPBOARD TRANSPORTATION SIMULATION. The side opening commercial container, with the inert load of 30mm ammunition containers, was positioned onto the Shipboard Transportation Simulator (STS) and securely locked into place using the cam lock at each corner. The STS began oscillation at an amplitude of 30 degrees +/- 2 degrees, either side, at a frequency of 2 cycles-per-minute (30 seconds +/- 2 seconds total per roll period). This frequency was maintained for at least 15 minutes during which time the load was observed for apparent defects which could cause a safety hazard. The frequency of oscillation was then

increased to 4 cycles-per-minute (15 seconds +/- 1 second roll period) and was maintained for two hours. When an inspection of the load did not show an impending failure, the frequency of oscillation was increased to 5 cycles-per-minute (12 seconds +/- 1 second cycle time), and the equipment was operated for four more hours. This 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. The test load (specimen) shall not be removed from the apparatus, after once positioned in place, until the test is completed or stopped.

PART 4

TEST RESULTS

TEST NO 1

A. RAIL IMPACT TEST DATE: 21 June 1990

TEST SPECIMEN: TRANSPORTABILITY TESTING OF CNU-309/E AND/OR CNU-332/E CONTAINERS IN A SIDE OPENING COMMERCIAL CONTAINER

TEST TOFC NO.: TTX 151044 LT.WT.: 73,400 pounds

CHASSIS NO.: 5394 WT.: 6,100 pounds

SIDE OPENING MILVAN:USAF 0014335 WT.: 6,050 pounds

LADING & DUNNAGE (27,885 + 415) WT.: 28,300 pounds

TOTAL SPECIMEN WT.: 113,850 pounds

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

IMPACT NO.	END STRUCK	VELOCITY	REMARKS
1	Forward	4.36	Test failed after first impact. Permanent deformation to the side opening container end wall.

PART 4

TEST RESULTS

TEST NO. 2

A. RAIL IMPACT TEST DATE: 19 September 1990

TEST SPECIMEN: TRANSPORTABILITY TESTING OF CNU-309/E AND/OR CNU-332/E CONTAINERS IN A SIDE OPENING COMMERCIAL CONTAINER

TEST TOFC NO.: TTX 601760 LT.WT.: 67,600 pounds

CHASSIS NO.: 5394 WT.: 6,100 pounds

SIDE OPENING MILVAN:USAF 0014335 WT.: 6,050 pounds

LADING & DUNNAGE (27,885 + 663) WT.: 28,548 pounds

TOTAL SPECIMEN WT.: 108,298 pounds

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

IMPACT NO.	END STRUCK	VELOCITY	REMARKS
1	Forward	4.46	No movement of side opening container walls.
2	Forward	4.51	No movement of side opening container walls.
3	Forward	6.53	Permanent deformation to rear container wall. Test stopped.

PART 4

TEST RESULTS

TEST NO. 3

A. RAIL IMPACT TEST DATE: 6 November 1990

TEST SPECIMEN: TRANSPORTABILITY TESTING OF CNU-309/E AND/OR CNU-332/E CONTAINERS IN A SIDE OPENING COMMERCIAL CONTAINER

TEST TOFC NO.: TTX 250594 LT.WT.: 74,900 pounds

CHASSIS NO.: 4268 WT.: 6,100 pounds

SIDE OPENING MILVAN:USAF 0014398 WT.: 6,050 pounds

LADING & DUNNAGE (27,885 + 682) WT.: 28,882 pounds

TOTAL SPECIMEN WT.: 115,617 pounds

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

IMPACT NO.	END STRUCK	VELOCITY	REMARKS
1	Forward	4.36	No movement of side opening container walls.
2	Forward	6.57	No movement of side opening container walls.
3	Forward	8.24	No movement of side opening container end walls.
4	Reverse	8.31	No damage to container or ammunition containers.

ROAD TEST DATA

TEST NO. 4 DATE 7 November 1990

TRANSPORTABILITY TESTING OF CNU-309/E AND/OR CNU-332/E CONTAINERS IN A SIDE OPENING COMMERCIAL CONTAINER

PASS 1-A OVER FIRST SERIES OF TIES	.11	MIN	5.16	MPH
PASS 1-B OVER SECOND SERIES OF TIES	.10	MIN	5.68	MPH

REMARKS: No damage to side opening container or movement of 30mm load.

PASS 2-A OVER FIRST SERIES OF TIES	.10	MIN	5.68	MPH
PASS 2-B OVER SECOND SERIES OF TIES	.09	MIN	6.31	MPH

REMARKS: No damage to side opening container or movement of 30mm load.

30 MILE ROAD TRIP: No damage to container or 30mm load.

PASS 3-A OVER FIRST SERIES OF TIES	.09	MIN	6.31	MPH
PASS 3-B OVER SECOND SERIES OF TIES	.10	MIN	5.68	MPH

REMARKS: No damage to side opening container or movement of 30mm load.

PASS 4-A OVER FIRST SERIES OF TIES	.10	MIN	5.68	MPH
PASS 4-B OVER SECOND SERIES OF TIES	.09	MIN	6.31	MPH

REMARKS: No damage to side opening container or movement of 30mm load.

WASHBOARD COURSE: Loads and container remained intact.

STS: Load and container remained intact.

PART 5

LOADING AND BRACING PROCEDURES

APPROVED BY

BUREAU OF EXPLOSIVES

DATE ________

LOADING AND BRACING◑ WITH WOODEN DUNNAGE IN SIDE OPENING COMMERCIAL CONTAINERS OF GAU-8/A 30MM AMMUNITION PACKAGED IN AUTOMATIC LOADING SYSTEM (ALS) CNU-309/E AND/OR CNU-332/E CONTAINERS

◑ 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 "M" ON PAGE 2.

DO NOT SCALE

REVISIONS

U.S. ARMY MATERIEL COMMAND

CLASS	DIVISION	DRAWING	FILE
19	48	7115	SP 15M6

PROJECT SP 163-88

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 GAU-8/A 30MM AMMUNITION IN AUTOMATIC LOADING SYSTEM (ALS). CNU-309/E AND/OR CNU-332/E CONTAINERS. THE SHIPPING AND STORAGE CONFIGURATION FOR THE CONTAINERS CONSISTS OF TWO CONTAINERS UNITIZED INTO ONE TWIN-PACK UNIT. SUBSEQUENT REFERENCE TO TWIN-PACK UNIT HEREIN MEANS TWO CNU-309/E OR CNU-332/E CONTAINERS WITH 30MM AMMUNITION UNITIZED TOGETHER. SEE PAGE 3 FOR DETAILS OF THE TWIN-PACK UNITS. CAUTION: REGARDLESS OF THE QUANTITY OF TWIN-PACK UNITS TO BE SHIPPED, THE "MAXIMUM GROSS WEIGHT" OF THE 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 INTERMODAL COMMERCIAL CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 89" WIDE BY 88" HIGH. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLAT-CAR (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.

D. WHEN LOADING CNU-309/E OR CNU-332/E TWIN PACK UNITS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE A TIGHT LOAD (TIGHT AGAINST THE END AND SIDE DUNNAGE ASSEMBLIES). ALTHOUGH A TOTAL OF 1-1/2" OF UNBLOCKED SPACE ACROSS THE WIDTH OF A 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 BEARING PIECE ON THE SIDE FILL ASSEMBLY. NAIL EACH ADDITIONAL PIECE TO THE BEARING PIECE W/1 APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS OF THE BEARING PIECE MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE CNU-309/E OR CNU-332/E TWIN-PACK UNIT SIZE.

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. A STAGGERED NAILING PATTERN WILL BE USED WHENEVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

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 SIDE DOORS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

J. THIS ITEM IS A DOT CLASS "A" EXPLOSIVE. THE OUTLOADING PROCEDURES SPECIFIED HEREIN CAN ALSO BE UTILIZED FOR THE SHIPMENT OF THE DEPICTED TWIN-PACK UNITS WHEN THEY ARE LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEM DESIGNATED WITHIN THE DRAWING TITLE. SEE GENERAL NOTE "L" BELOW.

K. WHEN REFERING TO THE TWIN-PACK UNIT LENGTH OR UNIT WIDTH THE 53" OR 52-3/8" DIMENSION OF THE TWIN-PACK UNIT CONSTITUTES THE LENGTH AND THE 28-3/4" DIMENSION CONSTITUTES THE WIDTH. SEE THE TWIN-PACK UNIT DETAILS ON PAGE 3.

L. CNU-309/E AND CNU-332/E TWIN-PACK UNITS ARE CERTIFIED PACKAGING APPROVED IN ACCORDANCE WITH TITLE 49 OF THE CODE OF FEDERAL REGULATIONS PARAGRAPH 173.7 (A) BY CONTAINER CERTIFICATION NUMBER AF-78-51 AND DOT EXEMPTION 8101. A COPY OF THE DOT-E8101 WILL BE PROVIDED THE CARRIER AT TIME OF LOADING FOR CARRIAGE ABOARD THE VEHICLE.

(CONTINUED AT RIGHT)

(GENERAL NOTES CONTINUED)

M. REQUIREMENTS CITED WITHIN THE BUREAU OF EXPLOSIVES PAMPHLET 6C APPLY WHEN THE SHIPMENT MOVES BY TRAILER/CONTAINER-ON-FLAT-CAR (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.

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

O. 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 0.454KG.

P. RECOMMENDED SEQUENTIAL LOADING PROCEDURES:

1. PREFABRICATE TWO ENDWALL BUFFERS, TWO SIDEWALL BUFFERS, TWO SEPARATOR GATES, TWO CENTER GATES, AND TWO SIDE FILL ASSEMBLIES.
2. INSTALL ONE ENDWALL BUFFER AND ONE SIDEWALL BUFFER.
3. LOAD THREE CNU-309/E OR CNU-332/E TWIN PACK UNITS.
4. INSTALL ONE SEPARATOR GATE.
5. REPEAT STEP 3.
6. REPEAT STEP 2.
7. REPEAT STEP 3.
8. REPEAT STEP 4.
9. REPEAT STEP 3.
10. INSTALL TWO CENTER GATES AND SIX STRUTS.
11. INSTALL TWO SIDE FILL ASSEMBLIES.

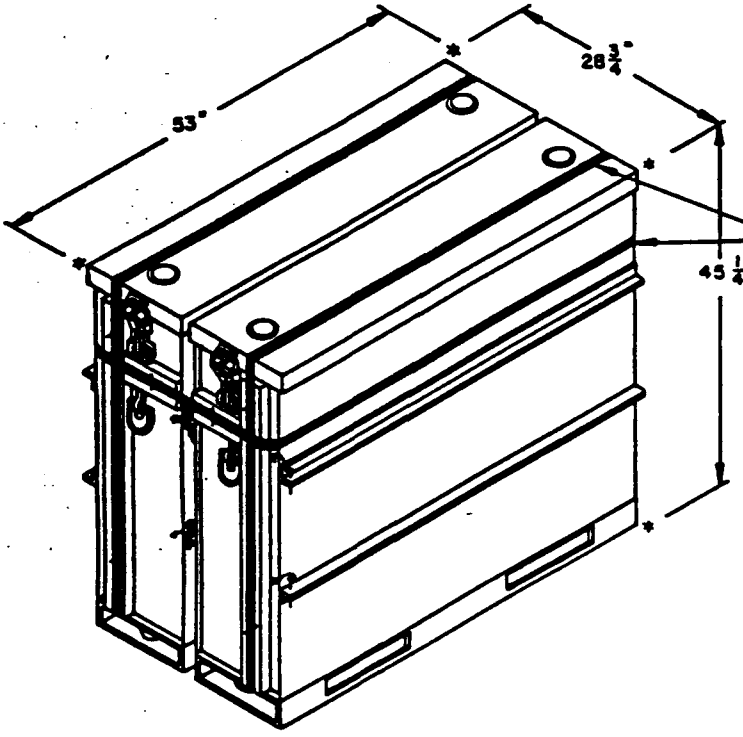
Q. TWIN PACK UNITS OF CNU-309/E CONTAINERS SHOULD BE INSPECTED AND, AS REQUIRED, LOOSE UNITIZING STEEL STRAPPING MUST BE REPLACED OR RETENSIONED.

MATERIAL SPECIFICATIONS

LUMBER ——— : SEE TM 743-200-1 (DUNNAGE LUMBER) AND FED SPEC MM-L-751.

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

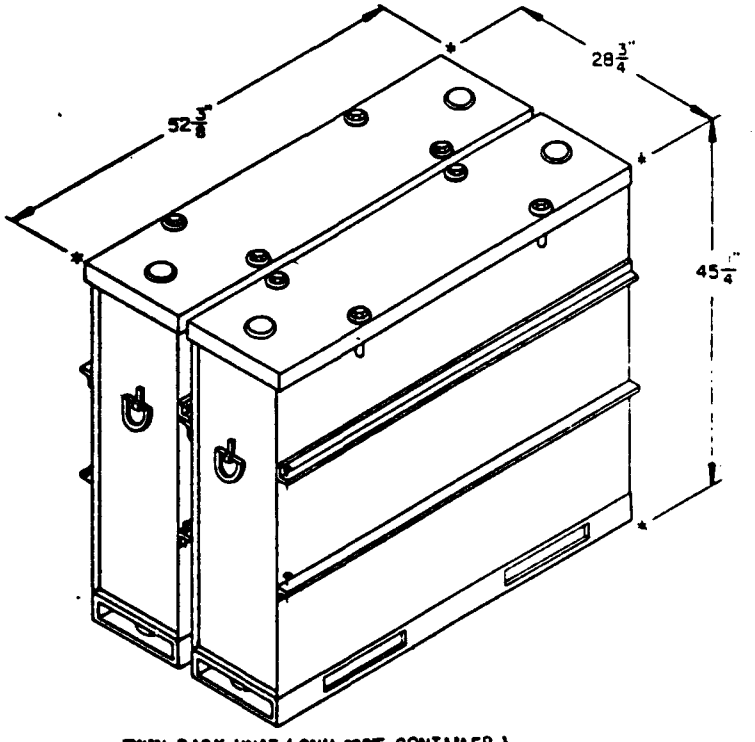
PLYWOOD ——— : FED SPEC NN-P-530; GROUP 9, CONSTRUCTION AND INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED.



TWIN-PACK UNIT (CNU-309/E CONTAINER)

TWIN-PACK UNIT DATA:

NUMBER OF CONTAINERS	TWO (2)
GROSS WEIGHT	2,350 LBS (APPROX)
CUBE	39.9 CUBIC FEET

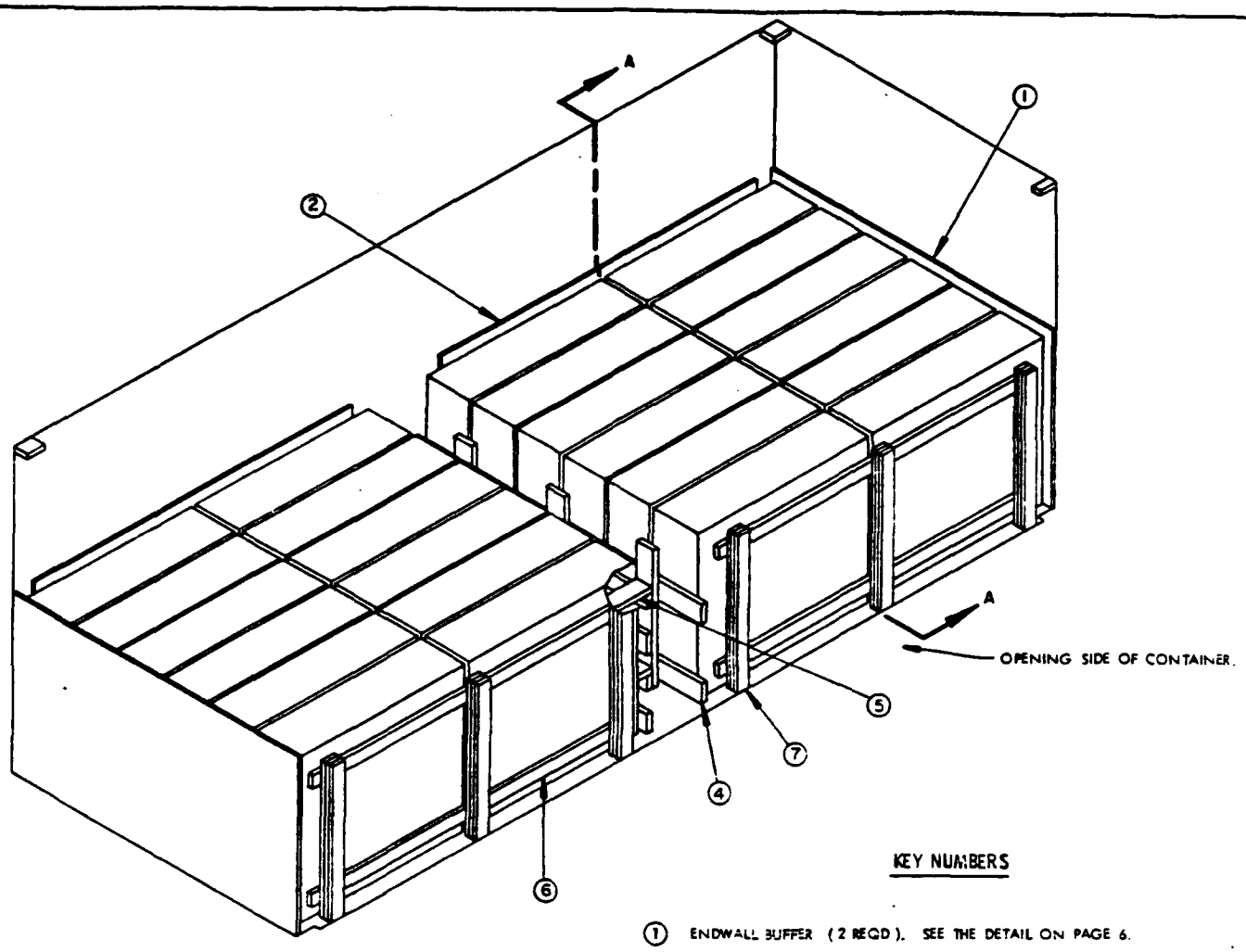


TWIN-PACK UNIT (CNU-332/E CONTAINER)

TWIN-PACK UNIT DATA:

NUMBER OF CONTAINERS	TWO (2)
GROSS WEIGHT	2,350 LBS (APPROX)
CUBE	39.4 CUBIC FEET

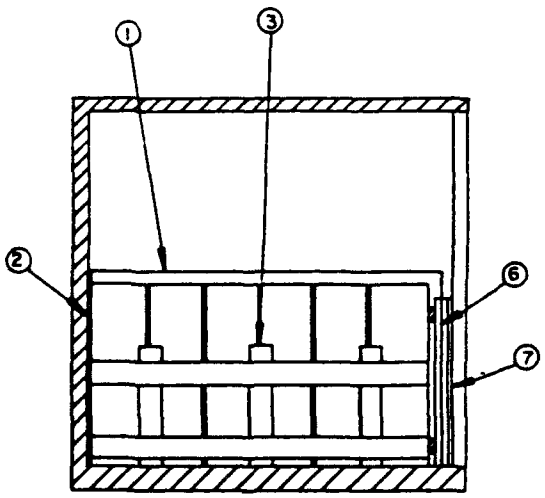
TWIN-PACK UNIT DETAILS



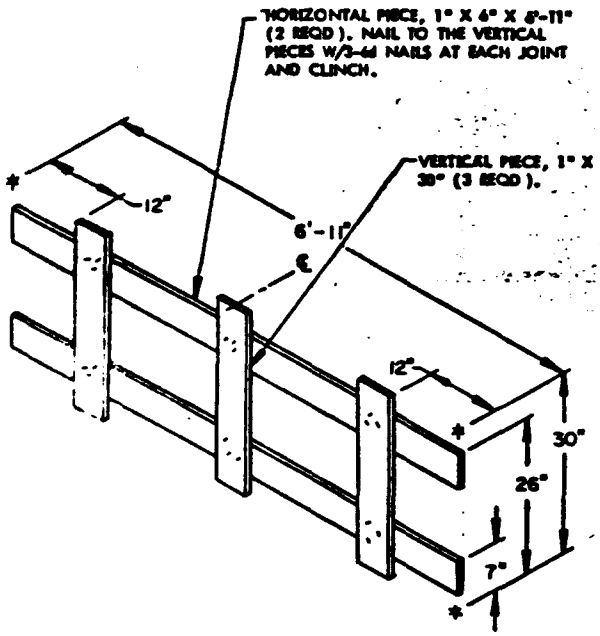
ISOMETRIC VIEW

KEY NUMBERS

1. ENDWALL BUFFER (2 REQD). SEE THE DETAIL ON PAGE 6.
2. SIDEWALL BUFFER (2 REQD). SEE THE DETAIL ON PAGE 6.
3. SEPARATOR GATE (2 REQD). SEE THE DETAIL ON PAGE 5. SEE GENERAL NOTE "F" ON PAGE 2.
4. CENTER GATE ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 6.
5. STRUT, 2" X 6" BY CUT TO FIT (REF: 12-1/2") (6 REQD). TOENAIL TO PIECE MARKED (4) W/2-16d NAILS AT EACH END.
6. SIDE FILL ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 6. SEE GENERAL NOTE "D" ON PAGE 2.
7. FILL MATERIAL, 4" WIDE BY 42" LONG MATERIAL (AS REQD). NAIL EACH PIECE TO THE VERTICAL PIECES OF THE SIDE FILL ASSEMBLY, PIECE MARKED (6), AND/OR LAMINATE TOGETHER W/4 NAILS OF A SUITABLE SIZE (6d NAILS FOR 1" MATERIAL AND 10d NAILS FOR 2" MATERIAL).



SECTION A-A



SEPARATOR GATE

SPECIAL NOTES:

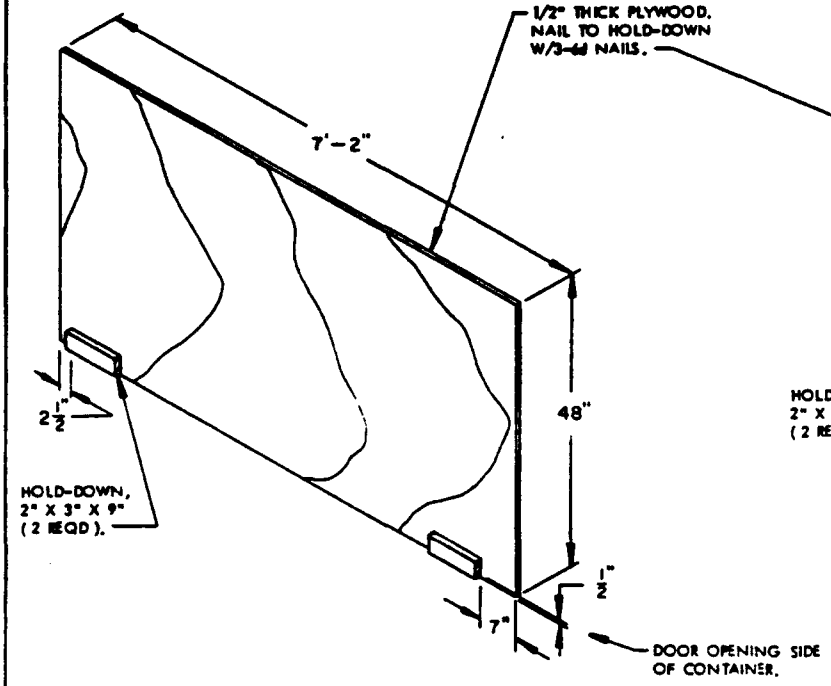
1. A 12 TWIN-PACK LOAD IS SHOWN IN A SIDE OPENING INTERMODAL COMMERCIAL CONTAINER.
2. THE CNU-332/E TWIN-PACK UNITS ARE SHOWN IN THE ISOMETRIC VIEW ON PAGE 4. THE PROCEDURES ARE ALSO APPLICABLE FOR SHIPMENTS OF CNU-309/E TWIN-PACK UNITS. SEE SPECIAL NOTES 3 AND 4.
3. THE SEPARATOR GATES, SHOWN AS PIECES MARKED (3), ARE ONLY REQUIRED WHEN SHIPPING THE CNU-332/E TWIN-PACK UNITS.
4. BOTH THE CNU-309/E TWIN-PACK UNITS AND THE CNU-332/E TWIN-PACK UNITS MAY BE SHIPPED IN THE SAME CONTAINER, HOWEVER, ALL UNITS WITHIN A LOAD BAY MUST BE OF THE SAME MODEL. A SEPARATOR GATE, PIECE MARKED (3), IS REQUIRED BETWEEN ADJACENT LENGTHWISE LOAD UNITS OF UNLIKE MODELS.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	21	7
1" X 6"	43	22
2" X 3"	6	3
2" X 4"	60	40
2" X 6"	57	57
NAILS	**NO. REQD**	**POUNDS**
6d (2")	72	1/2
10d (3")	108	1-3/4
16d (3-1/2")	24	3/4
PLYWOOD 1/2"	121 SQ FT REQD	146 LBS

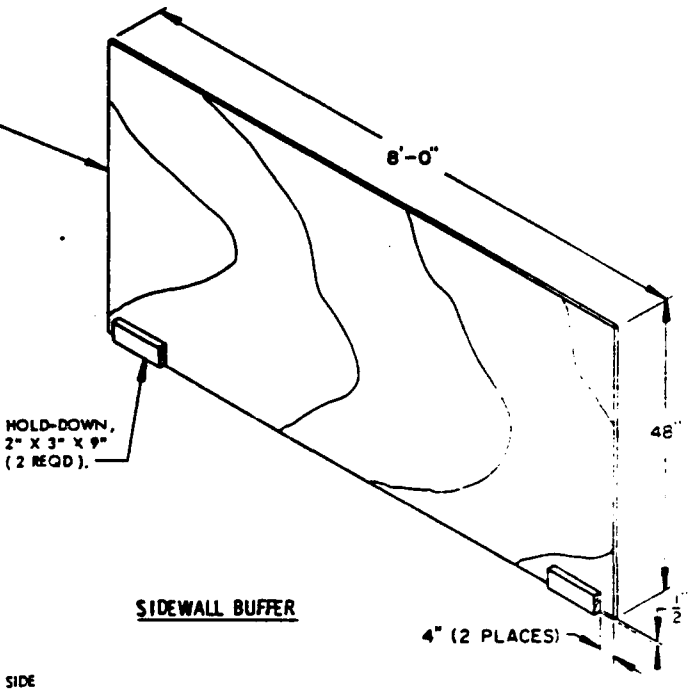
LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
TWIN-PACK UNIT	12	28,200 LBS
DUNNAGE		415 LBS
CONTAINER		6,050 LBS
TOTAL WEIGHT		34,665 LBS (APPROX)

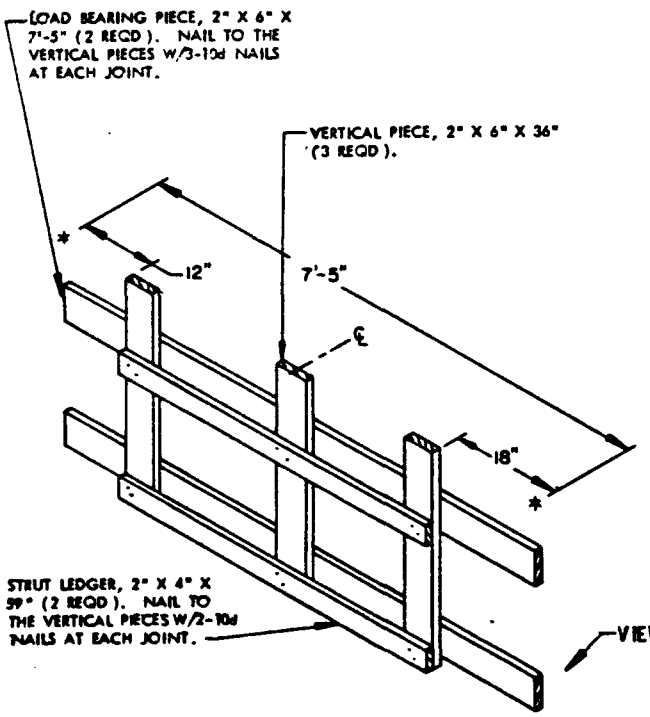


ENDWALL BUFFER

RIGHT HAND AND LEFT HAND ENDWALL BUFFERS ARE REQUIRED. A RIGHT HAND BUFFER IS SHOWN.

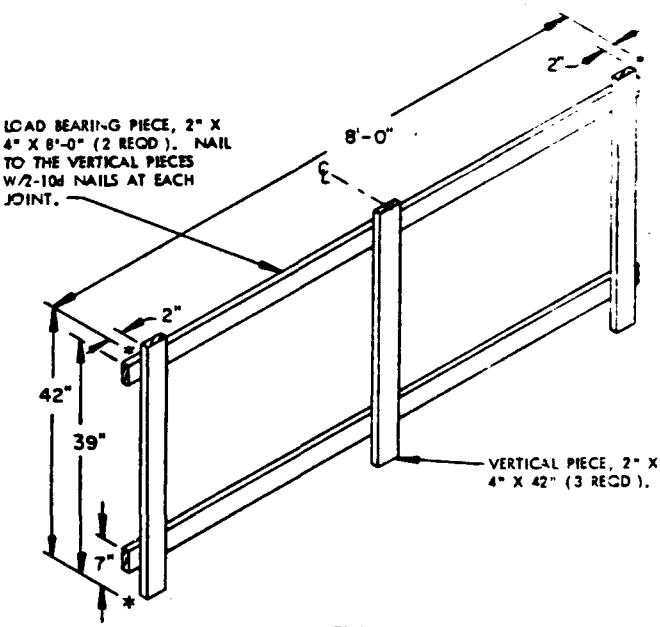


SIDEWALL BUFFER

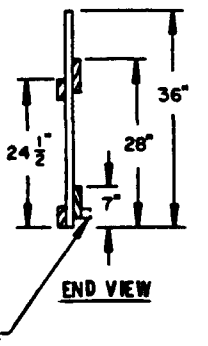


CENTER GATE

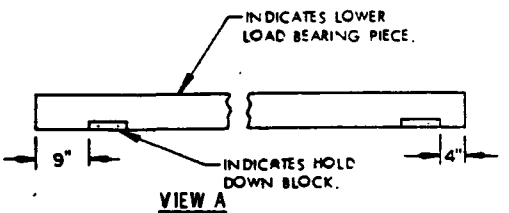
RIGHT HAND AND LEFT HAND CENTER GATES ARE REQUIRED. A RIGHT HAND CENTER GATE IS SHOWN.



SIDE FILL



END VIEW



VIEW A

SPECIAL NOTE:

CENTER GATE HOLD DOWNS, CONSISTING OF 2" X 2" X 6" LONG BLOCKS MUST BE NAILED W/2-10d NAILS, TO THE LOWER LOAD BEARING PIECES WHEN SHIPPING THE CNU-309/E TWIN PACK UNITS. THE HOLD DOWN BLOCKS WILL BE POSITIONED AS SHOWN IN "VIEW A".

SEE SPECIAL NOTE AT RIGHT.

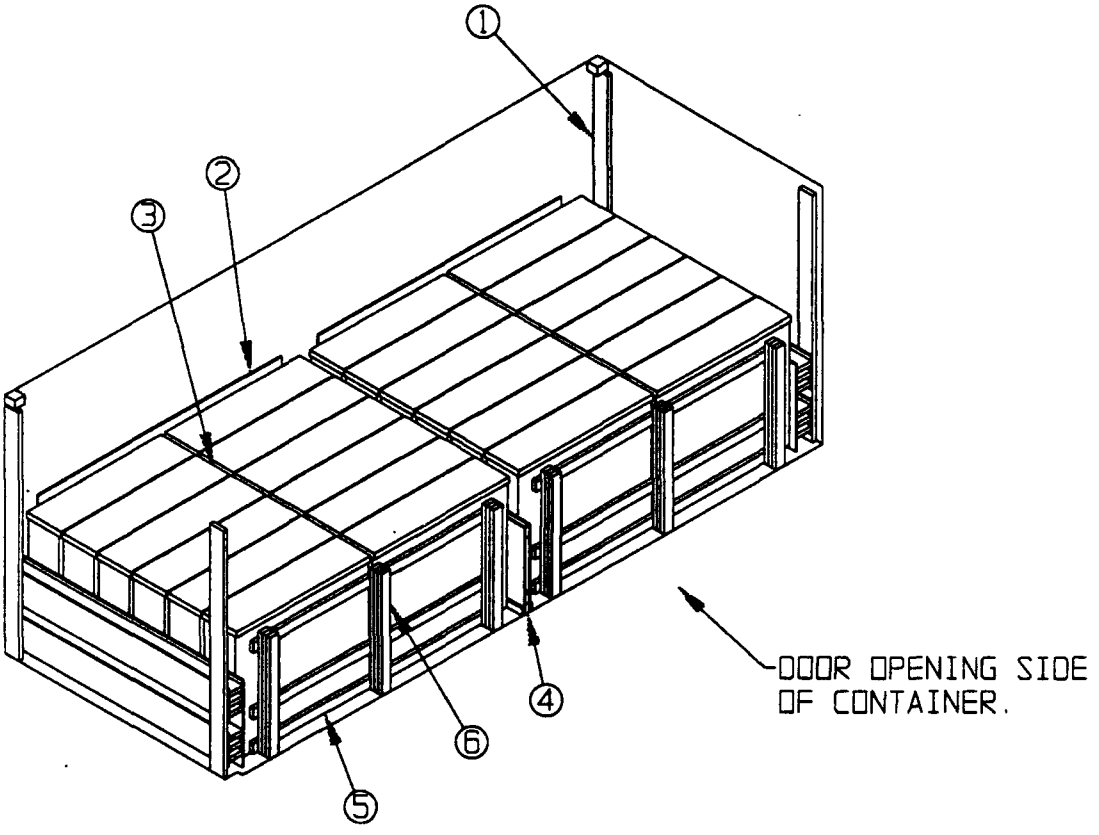
-------- TEST DRAWING --------

NOT TO BE USED AS AN OUTLOADING/
UNITIZATION/STANDARD PROCEDURE

FOR INFORMATION ONLY

DRAFTSMAN S. VON THUN	TITLE 30mm CONTAINERS IN SIDE-OPENING CONTAINER (2nd TEST)	
TEST ENGINEER A. McINTOSH		
CHIEF, VALIDATION ENGINEERING DIVISION J. KROHN	DWG NO 90-023-0-T00010	DATE SEPTEMBER 1990

30mm CONTAINERS IN SIDE-OPENING CONTAINER



FOR INFORMATION ONLY

TITLE	DWG NO
30mm CONTAINERS IN SIDE-OPENING CONTAINER (2nd TEST)	90-023-0-T00011
	VALIDATION ENGINEERING DIVISION | SHEET 2 OF 8

30mm CONTAINERS IN SIDE-OPENING CONTAINER

KEY NUMBERS

① BLOCKING ASSEMBLY (2 REQD). SEE DETAIL ON SHEET 4.

② SIDEWALL BUFFER (2 REQD). SEE DETAIL ON SHEET 5.

③ SEPARATOR GATE (2 REQD). SEE DETAIL ON SHEET 6.

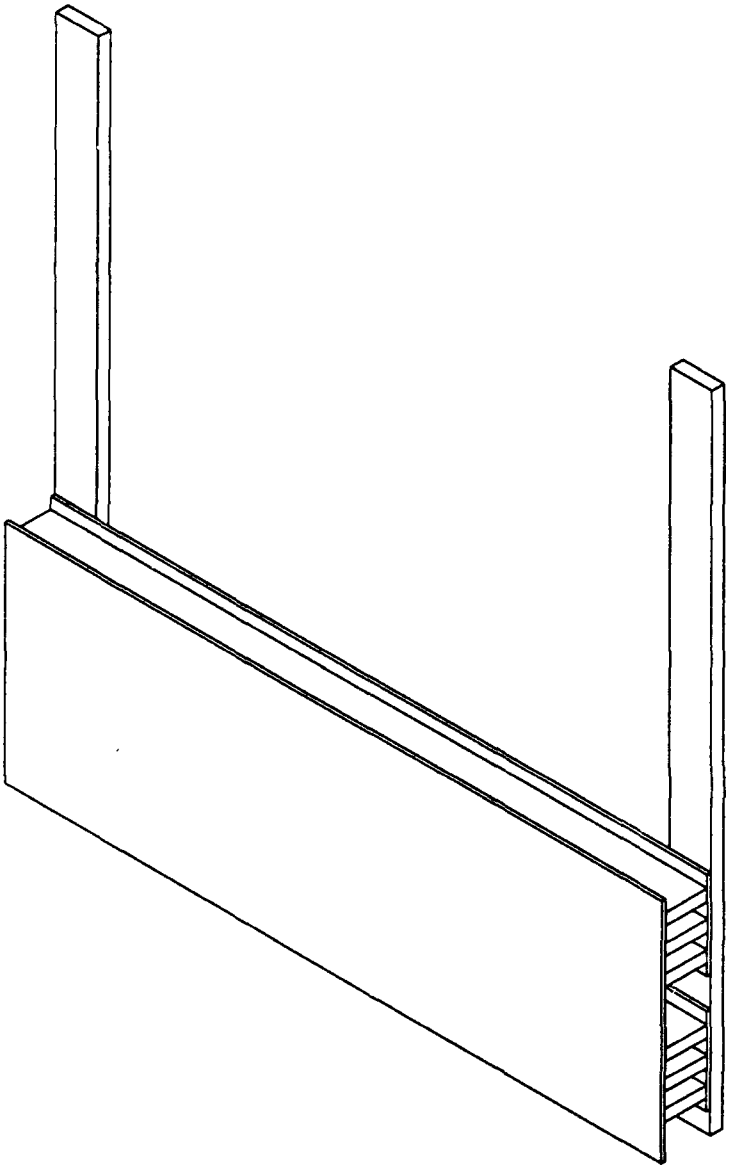
④ CENTER FILL ASSEMBLY (1 REQD). SEE DETAIL ON SHEET 7.

⑤ SIDE FILL ASSEMBLY (2 REQD). SEE DETAIL ON SHEET 8.

⑥ FILL MATERIAL, 4" WIDE X 42" LONG BY THICKNESS(ES) REQUIRED TO CONTACT THE DOORS WHEN THEY ARE CLOSED. LAMINATE TO THE VERTICAL PIECES OF THE SIDE FILL ASSEMBLY, PIECE MARKED ⑤.

FOR INFORMATION ONLY

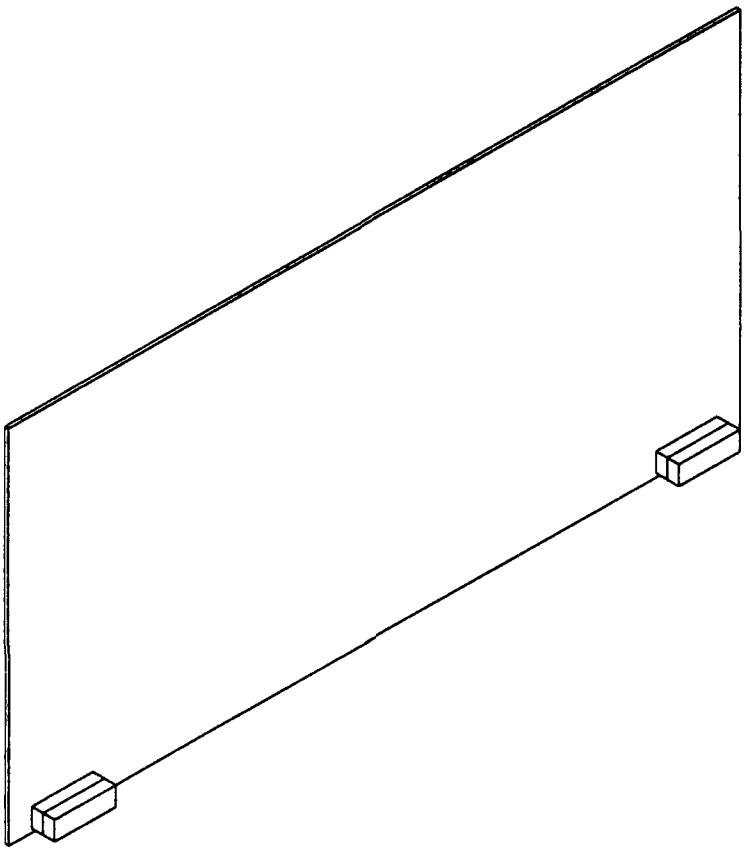
TITLE	DWG NO	
30mn CONTAINERS IN SIDE-OPENING CONTAINER (2nd TEST)	90-023-0-T00012	
	VALIDATION ENGINEERING DIVISION	SHEET 3 OF 8



BLOCKING ASSEMBLY

FOR INFORMATION ONLY

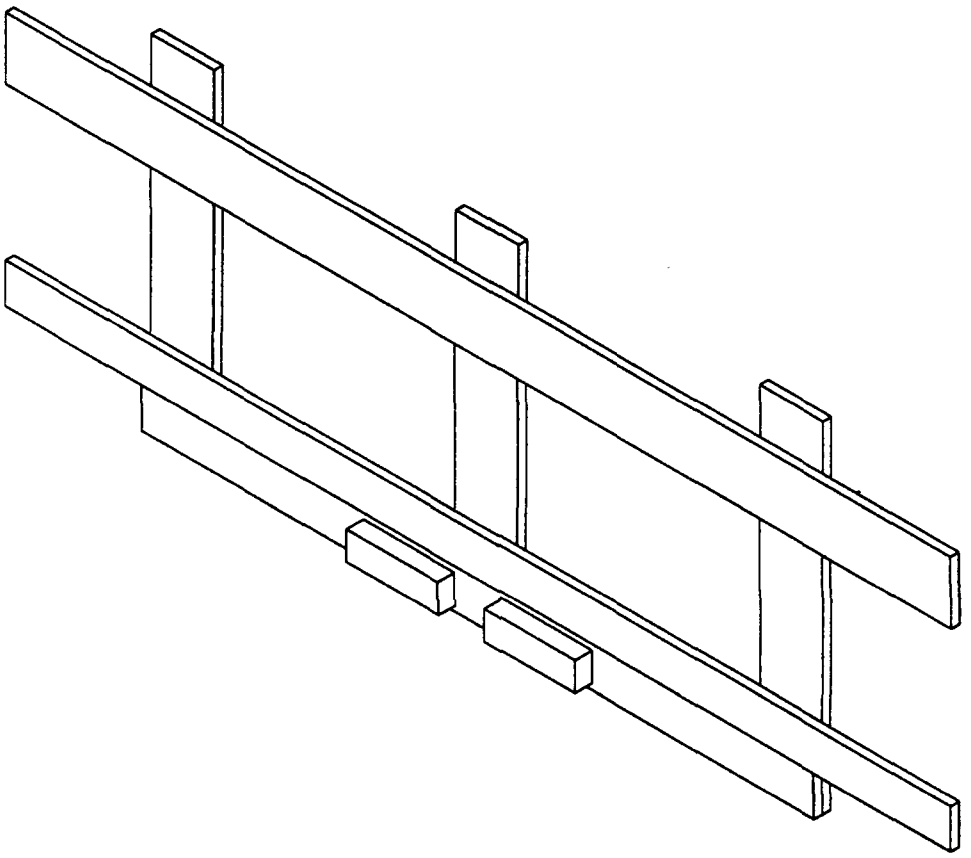
TITLE	DWG NO	
30mm CONTAINERS IN SIDE-OPENINIG CONTAINER (2nd TEST)	90-023-0-T00013	
	VALIDATION ENGINEERING DIVISION	SHEET 4 OF 8



SIDEWALL BUFFER

• FOR INFORMATION ONLY

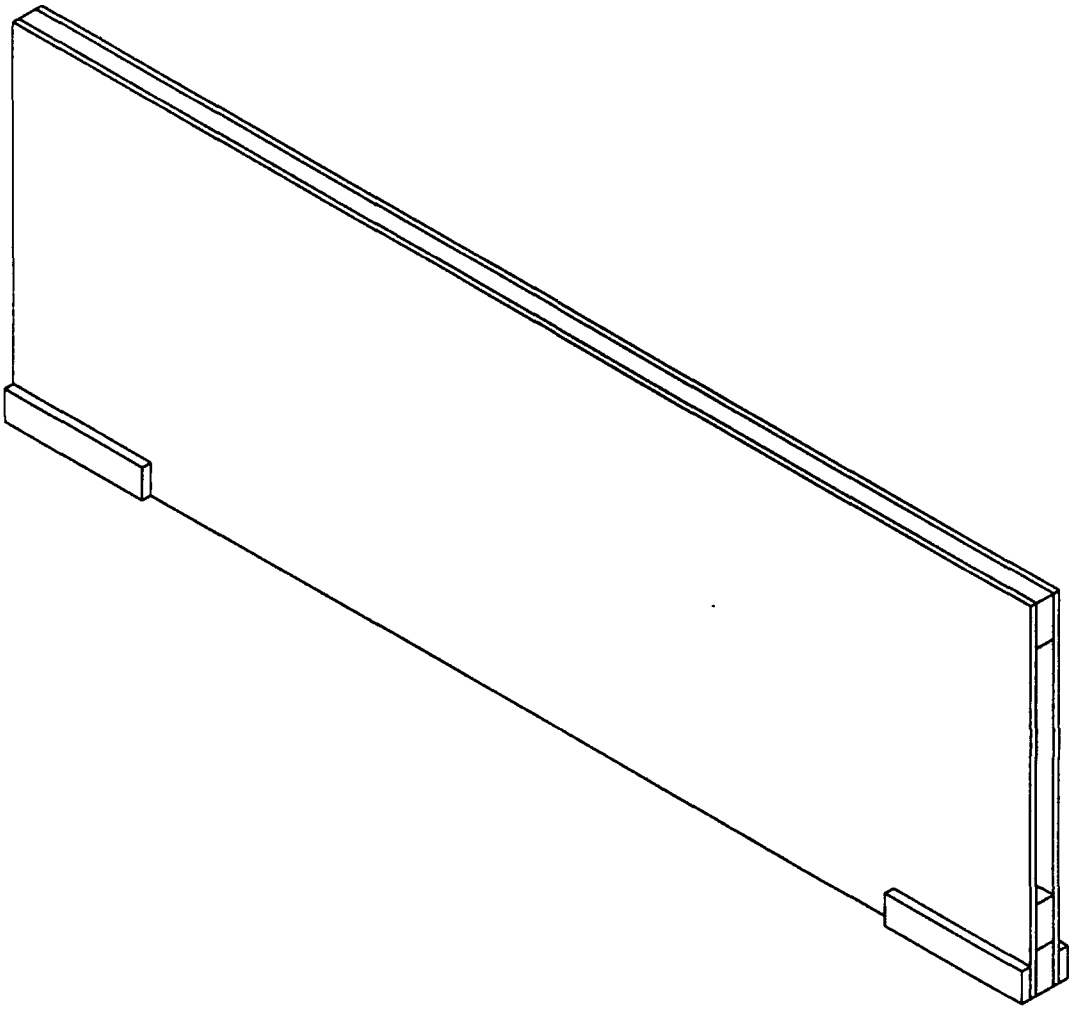
TITLE	DWG NO	
30mm CONTAINERS IN SIDE-OPENING CONTAINER (2nd TEST)	90-023-0-T00014	
	VALIDATION ENGINEERING DIVISION	SHEET 5 OF 8



SEPARATOR GATE

FOR INFORMATION ONLY

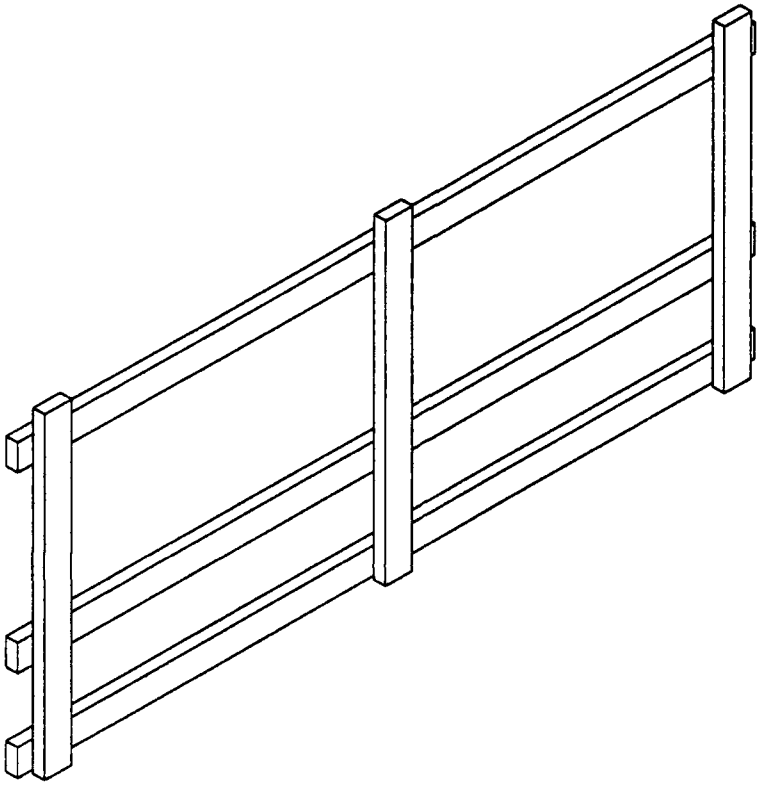
TITLE	DWG NO
30mm CONTAINERS IN SIDE-OPENING CONTAINER (2nd TEST)	90-023-0-T00015
	VALIDATION ENGINEERING DIVISION | SHEET 6 OF 8



CENTER FILL ASSEMBLY

FOR INFORMATION ONLY

TITLE	DWG NO
30mm CONTAINERS IN SIDE-OPENINIG CONTAINER (2nd TEST)	90-023-0-T00016
	VALIDATION ENGINEERING DIVISION | SHEET 7 OF 8



SIDE FILL ASSEMBLY

FOR INFORMATION ONLY

TITLE	DWG NO	
30nn CONTAINERS IN SIDE-OPENINIG CONTAINER (2nd TEST)	90-023-0-T00017	
	VALIDATION ENGINEERING DIVISION	SHEET 8 OF 8

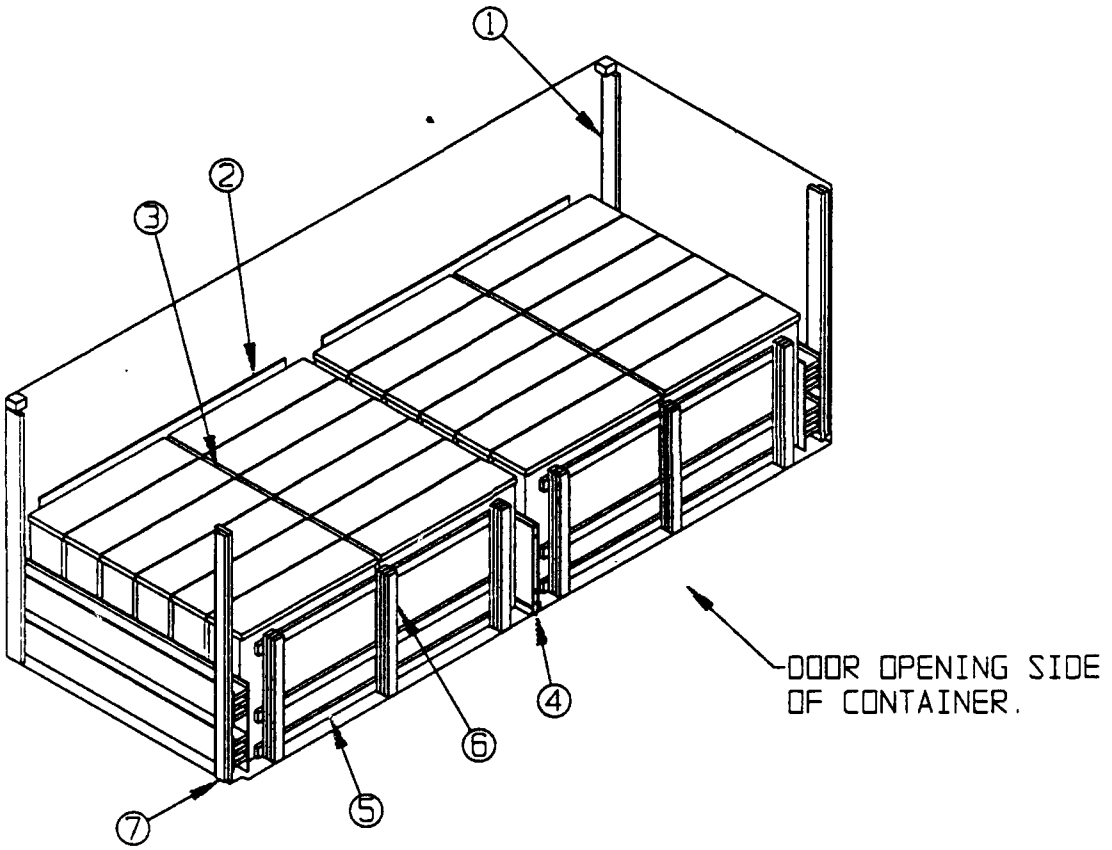
-------- TEST DRAWING --------

NOT TO BE USED AS AN OUTLOADING/
UNITIZATION/STANDARD PROCEDURE

FOR INFORMATION ONLY

DRAFTSMAN S. VON THUN	TITLE 30mm CONTAINERS IN SIDE-OPENING CONTAINER (3rd TEST)	
TEST ENGINEER A. McINTOSH		
CHIEF, VALIDATION ENGINEERING DIVISION J. KROHN	DWG NO 90-023-0-T00018	DATE OCTOBER 1990

30mm CONTAINERS IN SIDE-OPENING CONTAINER



FOR INFORMATION ONLY

TITLE	DWG NO	
30mm CONTAINERS IN SIDE-OPENING CONTAINER (2nd TEST)	90-023-0-T00019	
	VALIDATION ENGINEERING DIVISION	SHEET 2 OF 4

30mm CONTAINERS IN SIDE-OPENING CONTAINER

KEY NUMBERS

① BLOCKING ASSEMBLY (2 REQD). SEE DETAIL ON SHEET 4.

② SIDEWALL BUFFER (2 REQD). SEE DETAIL ON SHEET 5.

③ SEPARATOR GATE (2 REQD). SEE DETAIL ON SHEET 6.

④ CENTER FILL ASSEMBLY (1 REQD). SEE DETAIL ON SHEET 7.

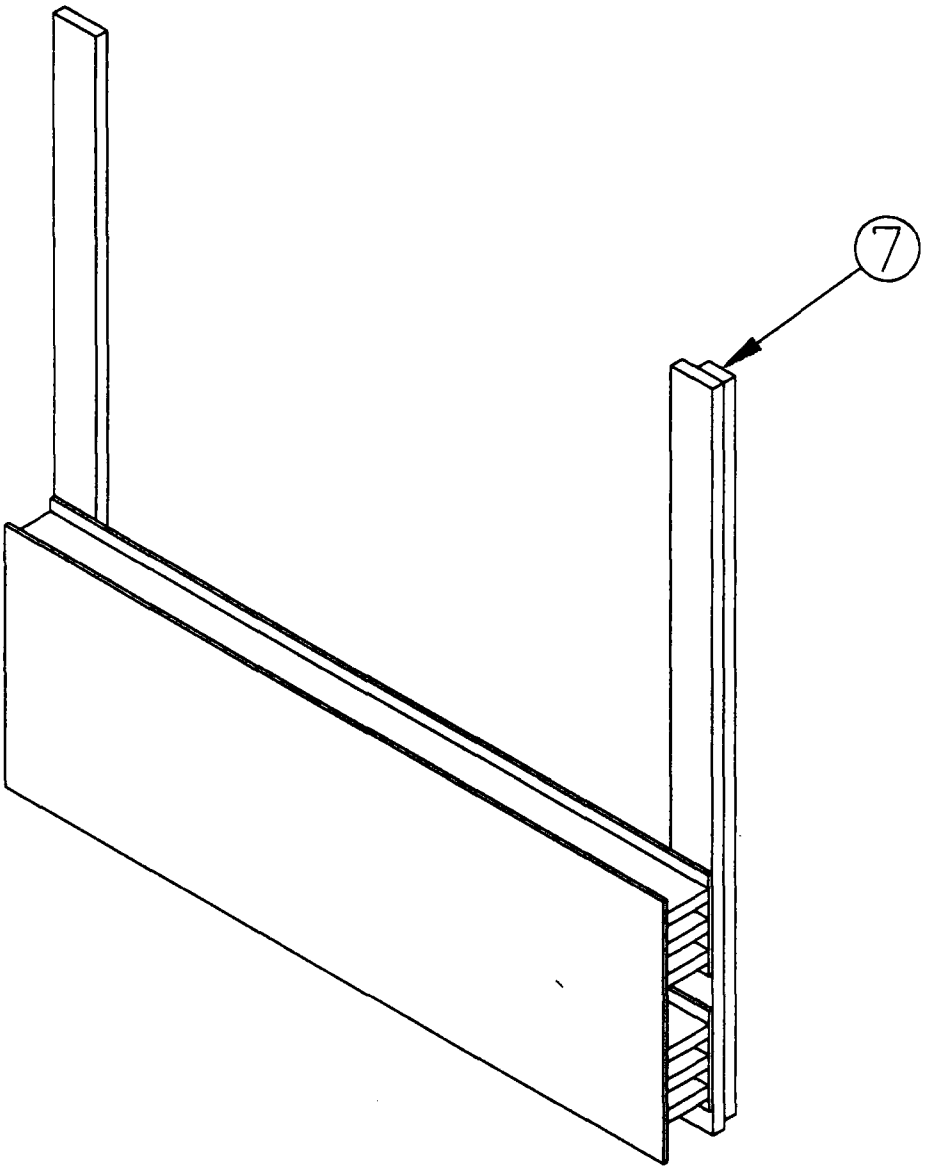
⑤ SIDE FILL ASSEMBLY (2 REQD). SEE DETAIL ON SHEET 8.

⑥ FILL MATERIAL, 4" WIDE X 42" LONG BY THICKNESS(ES) REQUIRED TO CONTACT THE DOORS WHEN THEY ARE CLOSED. LAMINATE TO THE VERTICAL PIECES OF THE SIDE FILL ASSEMBLY, PIECE MARKED ⑤.

⑦ FILL MATERIAL, 2" X 4" X 7'-1/2" (2 REQD). PLACE LIFTING RING IN A DOWNWARD POSITION, THEN NAIL TO BUFFER PIECE OF BLOCKING ASSEMBLY, PIECE MARKED ①, W/4-10d NAILS.

FOR INFORMATION ONLY

TITLE	DWG NO	
30mm CONTAINERS IN SIDE-OPENING CONTAINER (3rd TEST)	90-023-0-T00020	
	VALIDATION ENGINEERING DIVISION	SHEET 3 OF 4



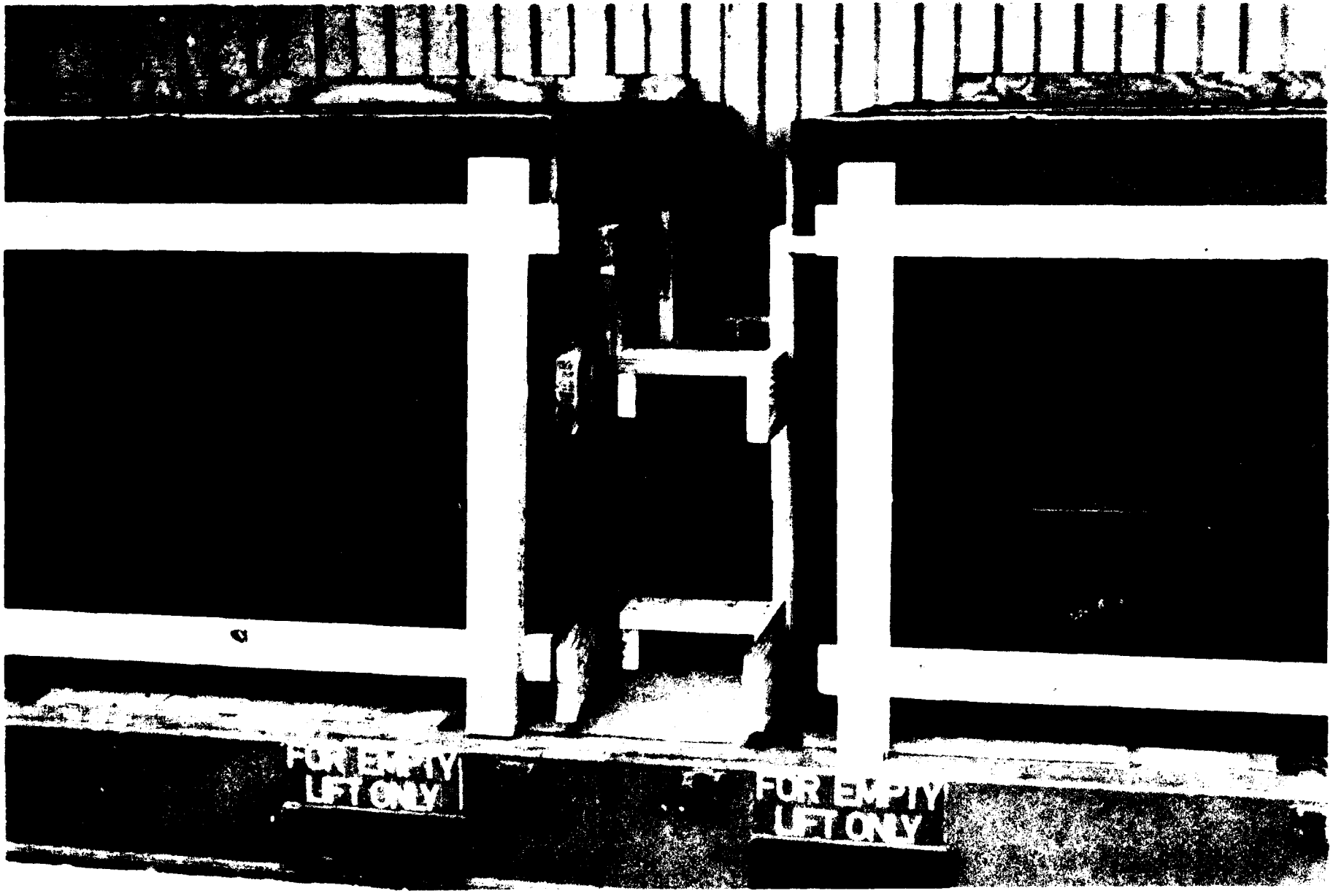
BLOCKING ASSEMBLY

FOR INFORMATION ONLY

TITLE	DWG NO	
30mm CONTAINERS IN SIDE-OPENINIG CONTAINER (3rd TEST)	90-023-0-T00021	
	VALIDATION ENGINEERING DIVISION	SHEET 4 OF 4

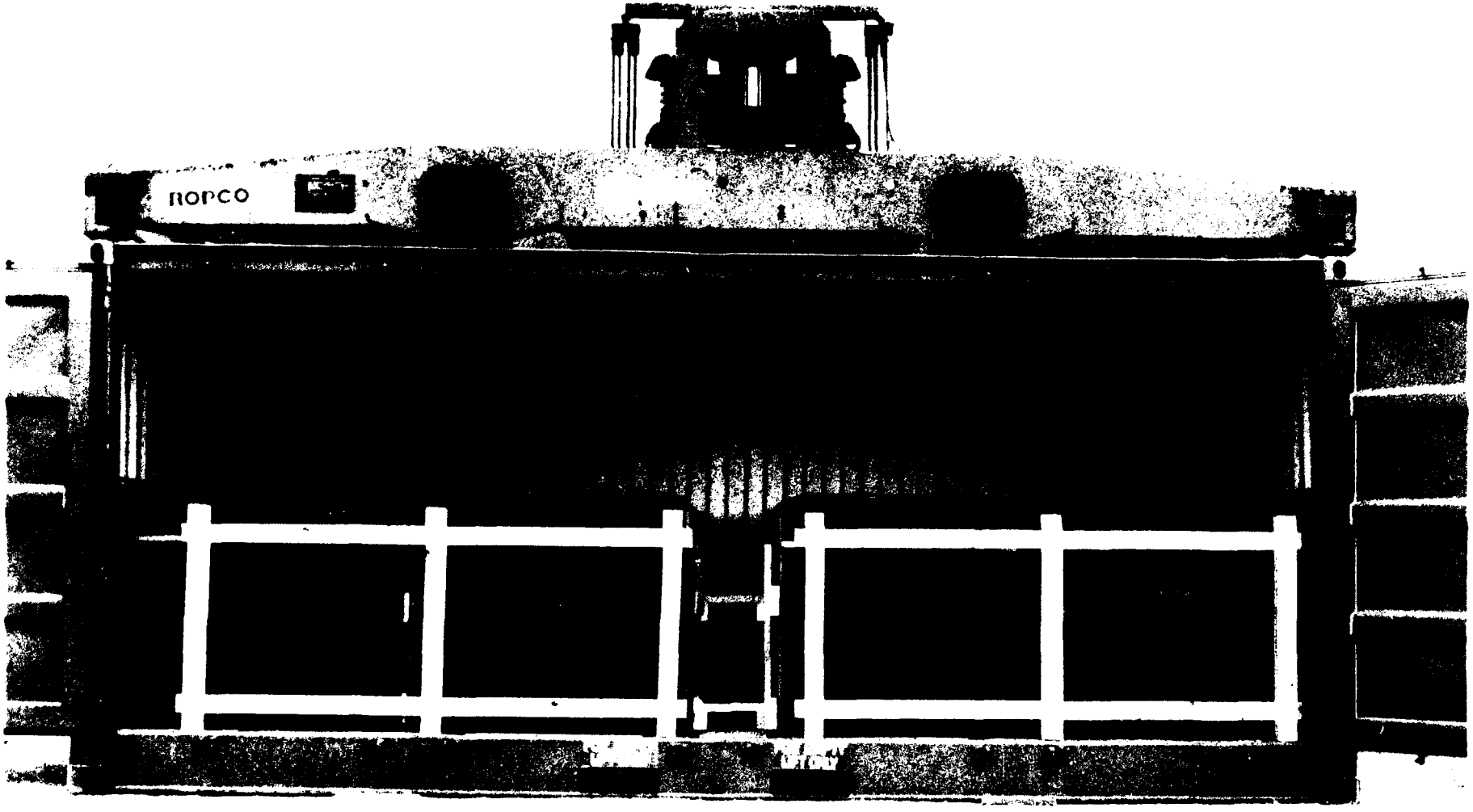
PART 6

PHOTOGRAPHS

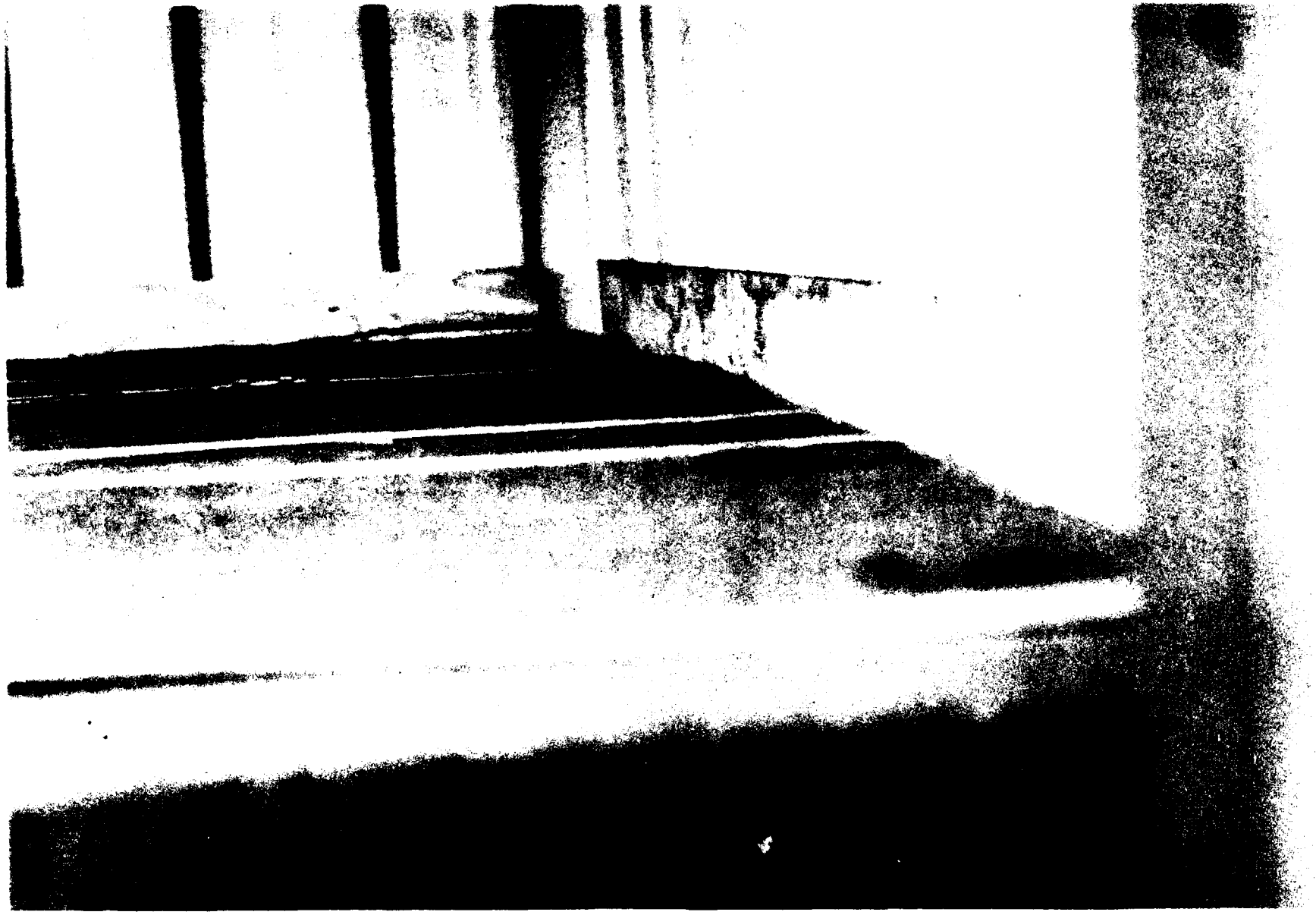


	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	

Photo No. AO317-SPN-90-289-5180 This photo shows the center gate used to maintain a fixed distance between 30mm ammunition containers. Note, broken load bearing pieces on the top and bottom of the assembly.

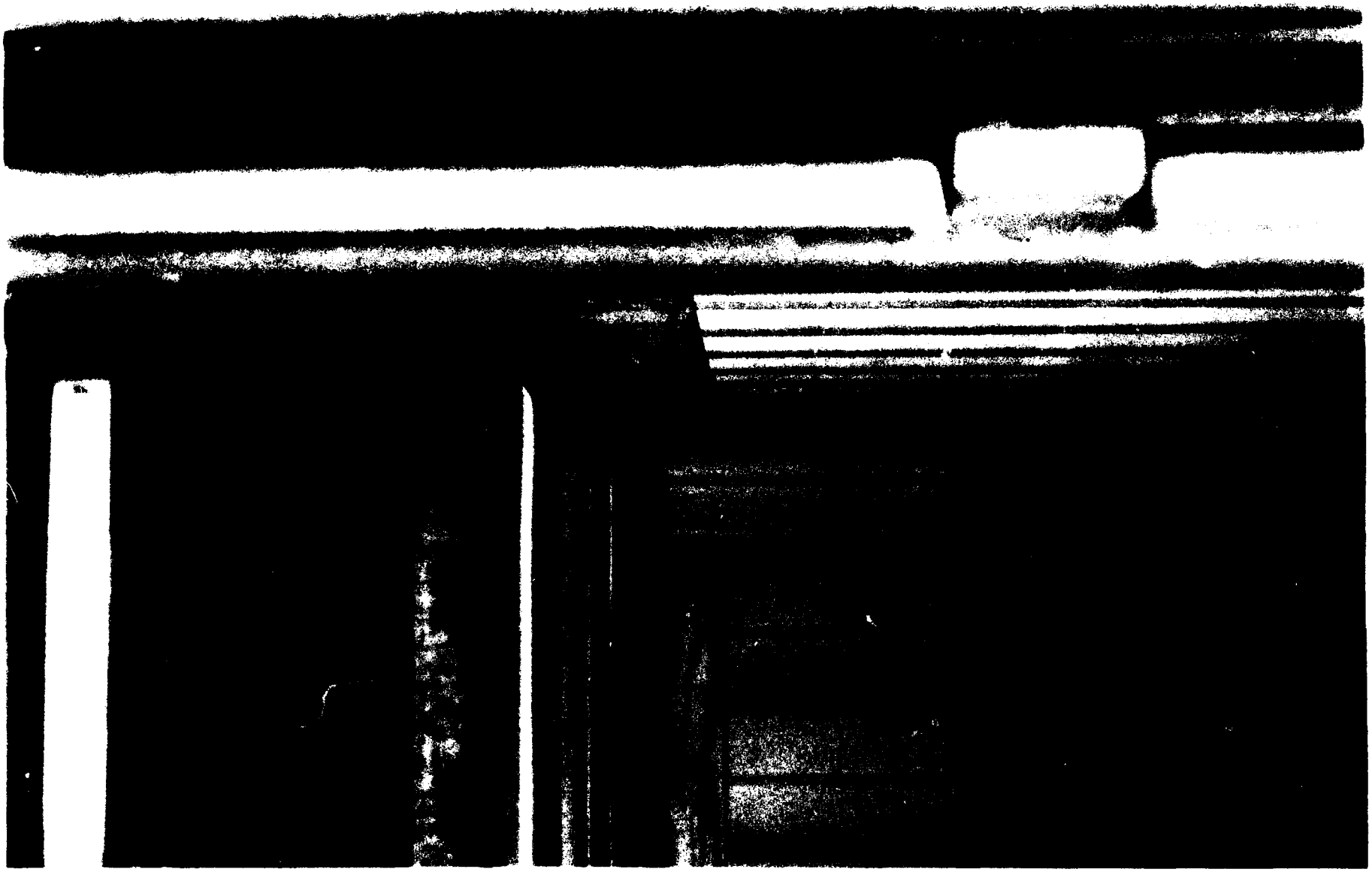


	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5185 This photo shows the 30mm inert-filled ammunition containers loaded in a side opening commercial container after being subjected to a rail impact test. Note, load standoff from left side and end wall deformation on the right side of the container. A single plywood sheet was used on each end wall buffer.		



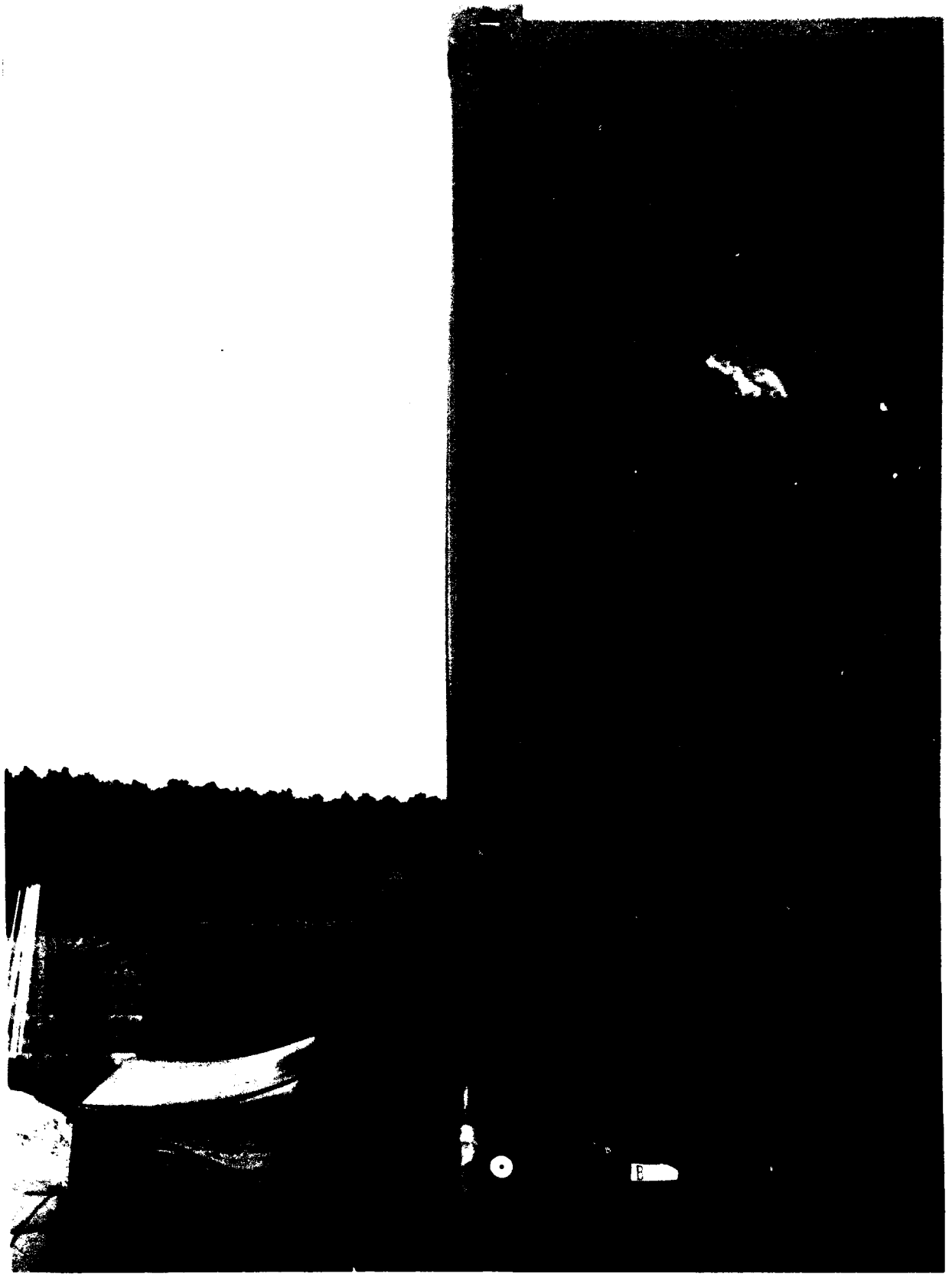
	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5181. This photo shows the 30mm ammunition containers and a single sheet end wall buffer. Note, deformation of the end wall. The deformation resulted in a 3-inch offset from the opposite end wall of the load.		

	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5183 This photo shows the standoff off displacement of the load after a rail impact. Normally, the load must remain within one inch of the end wall. The offset is approximately three inches.		



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5182 This photo shows the standoff off displacement of the load after a rail impact. Normally, the load must remain within one inch of the end wall. The offset is approximately three inches.		

	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5191 This is a profile of a side opening commercial container after a rail impact. Note, end wall deformation.		



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5190 This is a profile of a side opening commercial container after a rail impact. Note, end wall deformation.		

	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5195 This photo shows the test loads after a rail impact. The rear container has been opened for inspection of the load. This container is loaded with 30mm ammunition containers.		

	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
Photo No. AO317-SPN-90-289-5196. This photo shows two side opening commercial containers, mounted on a chassis and secured to a Trailer-on-flatcar (TOFC). This is a common rail shipment configuration used for the rail impact test.		