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REPORT NO. EVT 4-89

MIL-STD-1660 TESTING OF
UNITIZATION PROCEDURES FOR
FIBER DRUMS

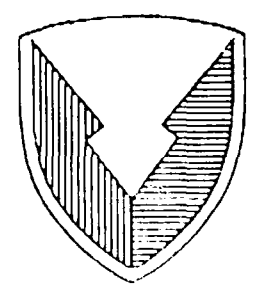
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SAVANNA, ILLINOIS 61074-9639

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The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division (SMCAC-DEV), has been tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC), Rock Island, IL, to test unitization procedures for shipping bulk propellant in fiberboard drums under project CA 190/1-82. The methods and results of Limited (Level C) testing of the unitization procedures developed by the Storage and Outloading Division (SMCAC-DEO) are contained within this report. As a result of these tests, the Evaluation Division is recommending that this unitization procedure be approved for Army-wide use in Limited (Level C) transportation and storage of bulk propellant in fiberboard drums.					
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U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
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REPORT NO. EVT 4-89
ENGINEERING TEST OF UNITIZATION PROCEDURES FOR
FIBER DRUMS

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INTRODUCTION

C. OBJECTIVE The objective of these tests is to assess the capability of the unitization procedures for fiberboard drums to meet Army functional/operational requirements for a Limited (Level C) Transportation and Storage Cycle. Acce

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PART 2

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PART 3

TEST PROCEDURES

The test procedures outlined in this section were extracted from MIL-STD-1660, Design Criteria for Ammunition Unit Loads (8 April 1977) and a modified MIL-STD-1660 for Limited (Level C) Transportation and Storage Cycle for Ammunition Components.

MIL-STD-1660 identifies four steps the unitized load must undergo if it is considered to be acceptable. These tests are synopsized below:

1. STACKING TESTS. The unit load shall be loaded to simulate a stack of identical unit loads stacked 16 feet high, for a period of one hour. This stacking load is simulated by subjecting the unit load to a compression of weight equal to an equivalent 16-foot stacking height. The compression load is calculated in the following manner. The unit load weight is divided by the unit load height in inches and multiplied by 192. The resulting number is the equivalent compressive load of a 16-foot-high unit stack.

2. REPETITIVE SHOCK TEST. The repetitive shock test shall be conducted in accordance with Method 5019, Federal Standard 101. The test procedure is as follows: The test specimen shall be placed on, but not fastened to, the platform. With the specimen in one position, vibrate the platform at 1/2-inch amplitude (1-inch double amplitude) starting at a frequency of about 3 cycles-per-second. Steadily increase the frequency until the package leaves the platform. The resonant frequency is achieved

when a 1/16-inch-thick feeler may be momentarily slid freely between every point on the specimen in contact with the platform at some instance during the cycle or a platform acceleration achieves a magnitude of ± 1 G. Midway into the testing period the specimen shall be rotated 90 degrees and the test continued for the duration. Unless failure occurs, the total time of vibration shall be two hours if the specimen is tested in one position; and, if tested in more than one position, the total time shall be three hours.

3. EDGEWISE DROP TEST. This test shall be conducted by using the procedures of Method 5008, Federal Standard 101. The procedure for the Edgewise Drop (Rotational) Test is as follows: The specimen shall be placed on its bottom with one end of the base of the container supported on a sill nominally 6 inches high. The height of the sill shall be increased, if necessary, to ensure that there will be no support for the base between the ends of the container when dropping takes place, but should not be high enough to cause the container to slide on the supports when the dropped end is raised. The unsupported end of the container shall then be raised and allowed to fall freely to the concrete, pavement, or similar underlying surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection shall conform to the following tabulation:

Table 1: Drop Levels

<u>GROSS WEIGHT</u> <u>NOT EXCEEDING</u>	<u>DIMENSIONS ON ANY EDGE</u> <u>NOT EXCEEDING</u>	<u>HEIGHT OF DROP LEVEL</u> <u>A PROTECTION</u>
600 lbs.	72 inches	36 inches
3,000 lbs.	no limit	24 inches
no limit	no limit	12 inches

4. IMPACT TEST. This test shall be conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the Incline-Impact Test is as follows: The specimen shall be placed on the carriage with the surface or edge which is to be impacted projecting at least 2 inches beyond the front end of the carriage. The carriage shall be brought to a predetermined position on the incline and released. If it is desired to concentrate the impact on any particular position on the container, a 4x4-inch timber may be attached to the bumper in the desired position before the test. No part of the timber shall be struck by the carriage. The position of the container on the carriage and the sequence in which surfaces and edges are subjected to impacts may be at the option of the testing activity and will depend upon the objective of the tests. When the test is to determine satisfactory requirements for a container or pack, and, unless otherwise specified, the specimen shall be subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at time of impact shall be 7-feet-per-second.

The steps for the Limited (Level C) Transportation and Storage Cycle were extracted from MIL-STD-2000 and modified to approximate the conditions in the real world.

subjected to during the transportation and storage cycle for a Level C protection. The steps involved in evaluation of a container for a minimum 100-mile per year transportation procedure are as follows:

1. STACKING TEST. The test specimen shall be loaded to simulate an actual stack of identical unit loads as high as expected to occur during storage. The stacking condition will be maintained for a period of one day minimum after which time observations shall be made and recorded.
2. REPETITIVE SHOCK TEST. The test specimen shall be placed on, but not fastened to, the platform. With the specimen in one position, vibrate the platform at 1/2-inch amplitude (1-inch double amplitude) starting at a frequency of about 3 cycles per second. Steadily increase the frequency until the package leaves the platform. The resonant frequency is achieved when a 1/16-inch-thick feeler may be momentarily slid freely between every point on the specimen in contact with the platform at some instance during the cycle or a platform acceleration achieves a magnitude of ± 1 G. Midway into the testing period the specimen shall be rotated 90 degrees and the test continued for the duration. Unless failure occurs, the total time of vibration shall be one hour if the specimen is tested in one position; and, if tested in more than one position, the total time shall be 30 minutes in each orientation. Unless failure occurs, the specimen should be subjected to a second series of vibration periods as described above. Observations of unit load conditions should be made and recorded after both series.

3. EDGEWISE-DROP TEST. The edgewise-drop test shall be performed on a smooth, level concrete surface. The unit load shall be positioned with one edge of the base supported on a sill approximately 6 inches high. The unsupported opposite edge shall then be raised and allowed to fall freely to the concrete surface from a height as determined below:

Table 2: Drop Heights for Level C Protection

<u>Gross Weight of Unit Load</u>	<u>Height of Raised Edge of Base/Pallet*</u>
600 lbs and less	$L/2.7 + 6$ inches
601-3,000 lbs	$L/8 + 6$ inches
3,001 lbs and greater	$L/16 + 6$ inches

*Note: L equals the length in inches of the pallet/skid edge which is perpendicular to the raised edge. Drop height should be calculated to the nearest 1/4 inch.

The test shall be applied once to each base edge of the unit load. If the size of the unit load and the location of the center of gravity are such that the drop cannot be made from the determined height, the greatest safe attainable height shall be substituted.

4. MECHANICAL HANDLING TEST. The unit load shall be lifted clear of the ground by a forklift truck of suitable size and capacity and transported in the level or back-tilt position for a distance of at least 100 feet. Part of the path which the forklift truck traverses should simulate ramps, dock plates, or whatever obstacles that would actually be encountered during the expected handling cycles.

Part 4

TEST EQUIPMENT

1. TEST SPECIMEN.

- a. Drawing Number: 19-48-4172/1
- b. Width: 51-1/2 inches
- c. Length: 45-5/8 inches
- d. Height: 33-1/2 inches
- e. Weight: 1,590 pounds

2. COMPRESSION TESTER.

- a. Manufacturer: Ormond Manufacturing
- b. Platform: 60 inches by 60 inches
- c. Compression Limit: 50,000 pounds
- d. Tension Limit: 50,000 pounds

3. TRANSPORTATION SIMULATOR.

- a. Manufacturer: Gaynes Laboratory
- b. Capacity: 6,000-pound pallet
- c. Displacement: 1/2 inch Amplitude
- d. Speed: 50 to 400 rpm
- e. Platform: 5 feet by 8 feet

4. INCLINED RAMP.

- a. Manufacturer: Conbar Incline
- b. Type: Impact Tester
- c. Grade: 30 percent Incline
- d. Length: 11 foot Incline

PART 5

TEST RESULTS

The unitization procedure for the fiberboard containers was initially conducted using the full MIL-STD-1660 test procedures. The pallet successfully passed the stacking test and the repetitive shock test. During the edgewise drop test, the pallet failed due to a broken pallet base. A request was then made by the Storage and Outloading Division that the pallet be tested under a reduced MIL-STD-1660 since the pallet was to be used to transport bulk ammunition from one plant to another utilizing only road shipment. The following is a list of the results from the second test that was conducted on a second test pallet.

1. STACKING TEST. The stacking test was performed using the usual MIL-STD-1660 test procedure instead of the Limited (Level C) Transportation and Storage Cycle since the MIL-STD-1660 stacking test is considered adequate for verifying the unitization procedures for stacking. During the stacking test, the test pallet was loaded to 9,200 pounds compression for a period of one hour. At the end of the one hour period, the compression load had not decreased and the load had not compressed.
2. REPETITIVE SHOCK TEST. The test pallet successfully passed both the longitudinal and lateral transportation simulation. Duration of the test was 60 minutes for each orientation of the pallet. In order to achieve the required 1/16-inch clearance between the pallet and the Transportation Simulator bed, the equipment was operated at

230 rpm for the longitudinal orientation and 235 rpm for the lateral orientation. There was no damage noted during the repetitive shock test.

3. EDGEWISE DROP TEST. Each side of the pallet base was placed on a beam displacing it 6 inches above the floor. The opposite side was raised to heights of 11.75 and 12.5 inches above the floor and then dropped. (See Test Procedures for Drop Height Calculations) This process was repeated in a clockwise direction until all four sides of the pallet had been tested. The pallet suffered no major damage. The only problem that occurred was the displacement of the side assemblies during the drops. After investigation, the problem was determined to be improper nail type and too few nails from what was called out in the specifications.

4. MECHANICAL HANDLING TEST. No additional testing was performed on the pallet for this step of the test due to the amount of forklift handling the pallet underwent during the above portions of the test.

PART 6

CONCLUSIONS AND RECOMMENDATIONS

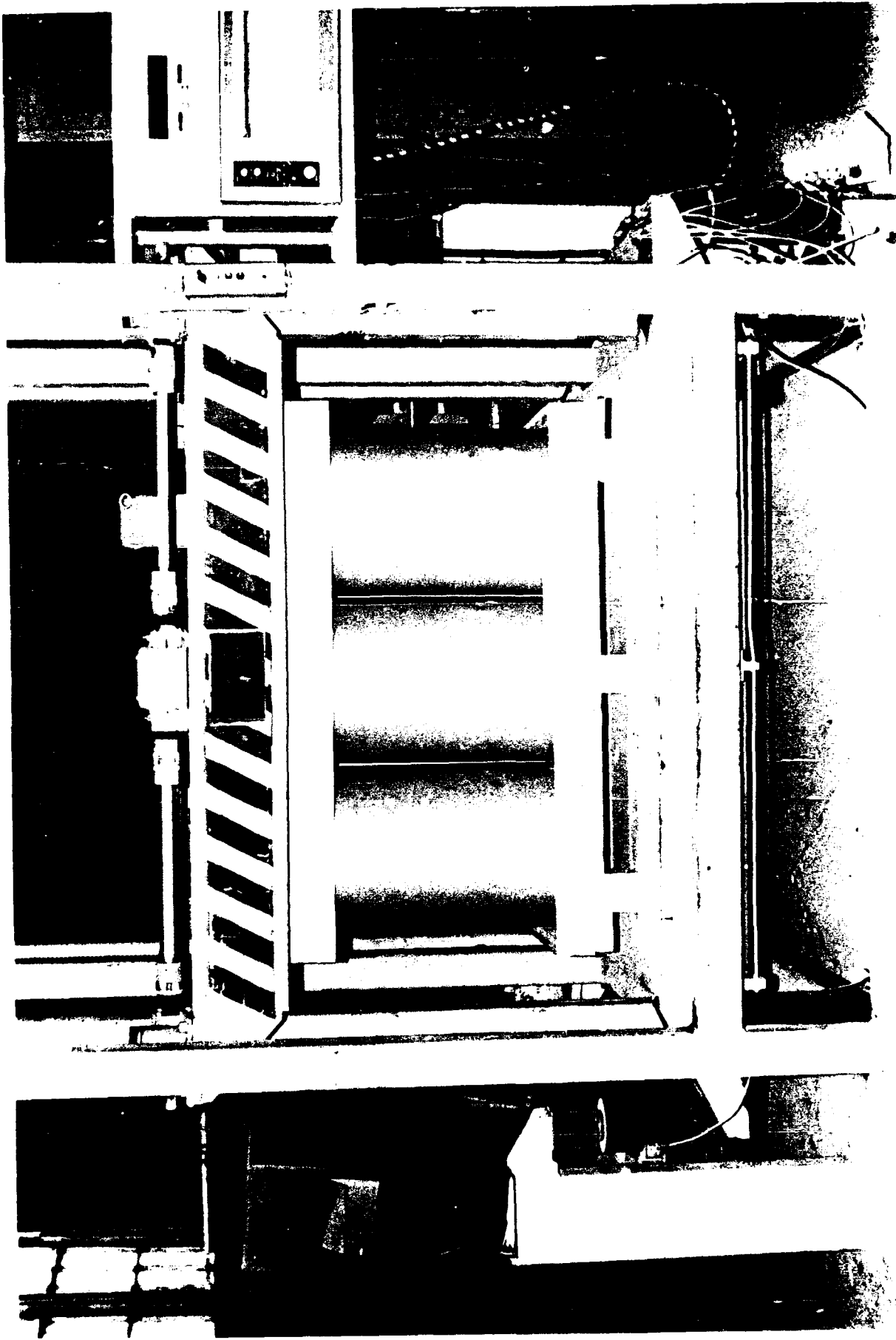
1. CONCLUSIONS. The test pallet that was used to verify unitization procedures for fiberboard drums was subjected to both the MIL-STD-1660 test procedures and a modified MIL-STD-1660 for Limited (Level C) Transportation and Storage of Ammunition Items. The test pallet failed the MIL-STD-1660 test procedure during the edgewise rotational drop test. A second pallet was then constructed and retested using the modified MIL-STD-1660 for Level C protection. The second pallet successfully passed the modified MIL-STD-1660 test without any major problems.
2. RECOMMENDATIONS. In the event that a unitization procedure for fiberboard drums is needed for areas that require a full MIL-STD-1660 certification, this unitization procedure could possibly be used if it were made from hardwoods rather than the softwoods (pine) which were used for these series of tests. Additional testing would be required to qualify this unitization procedure for a full MIL-STD-1660 certification.
3. APPROVAL. Since the unitization procedure failed the full MIL-STD-1660 test procedure but passed the modified MIL-STD-1660 for Level C protection, this procedure can not be approved for rail shipment. The unitization procedure is approved, however, for shipment that conforms to the following guidelines:
 - a. Items are to be used or consumed at the first destination.

b. Limited shock, vibration, and static loading will be encountered during the limited transportation cycle. (This guideline restricts the use of the pallet in rail shipments.)

c. Items will be stored in a favorable warehouse environment for a temporary period less than six months.

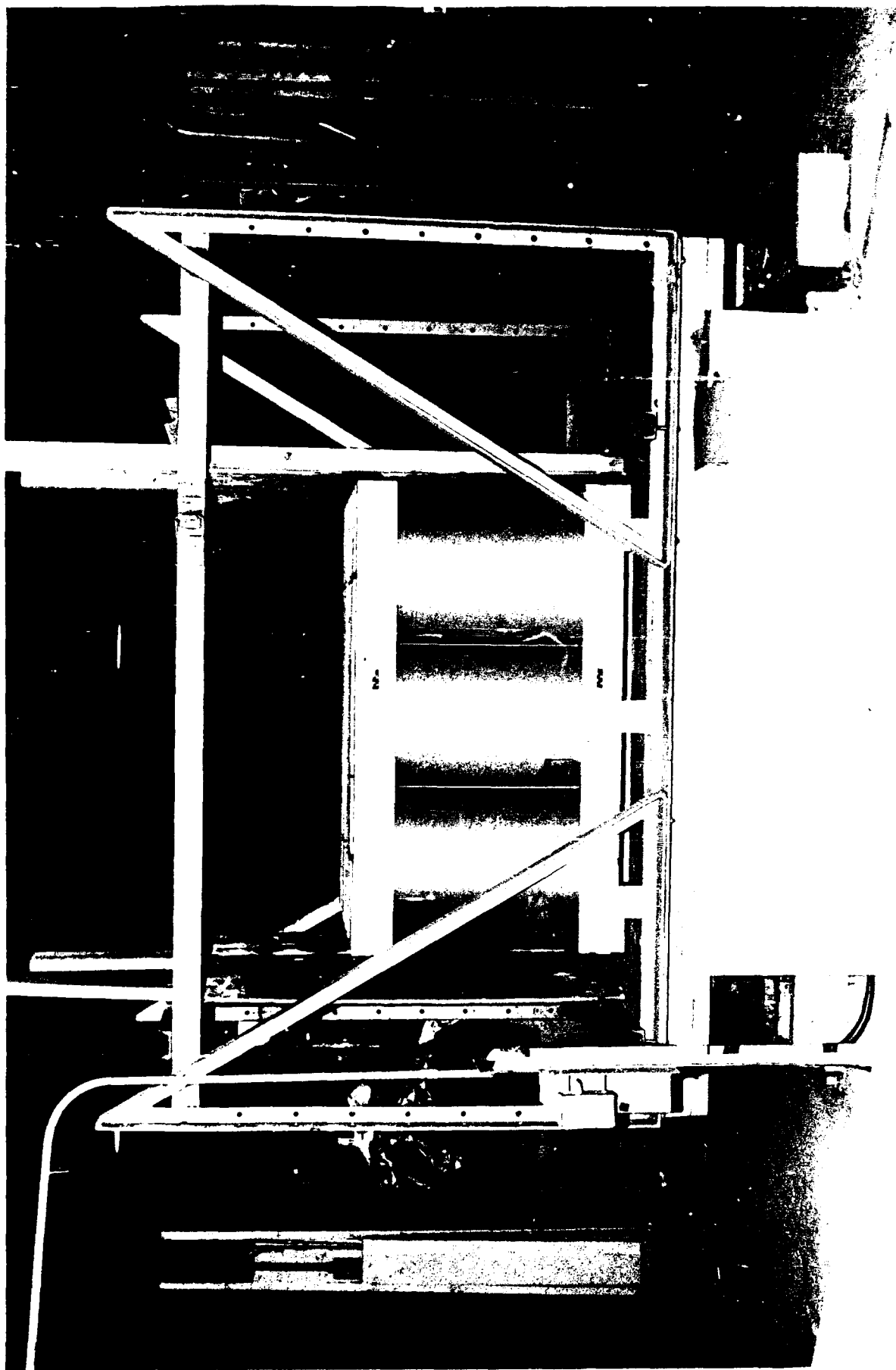
PART 7

PHOTOGRAPHS



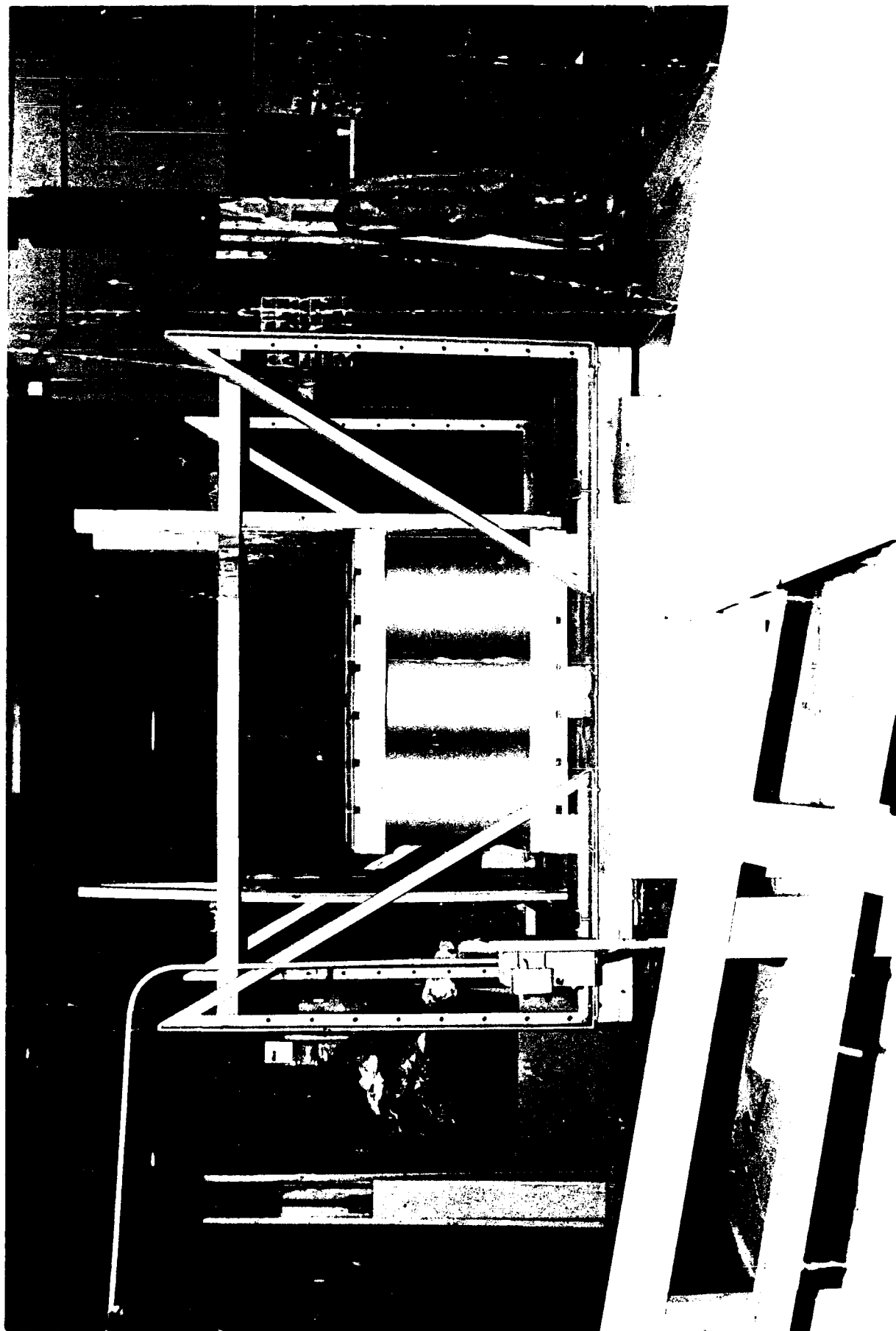
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Photograph No. 1. This photo shows pallet 1 in the Compression Tester.



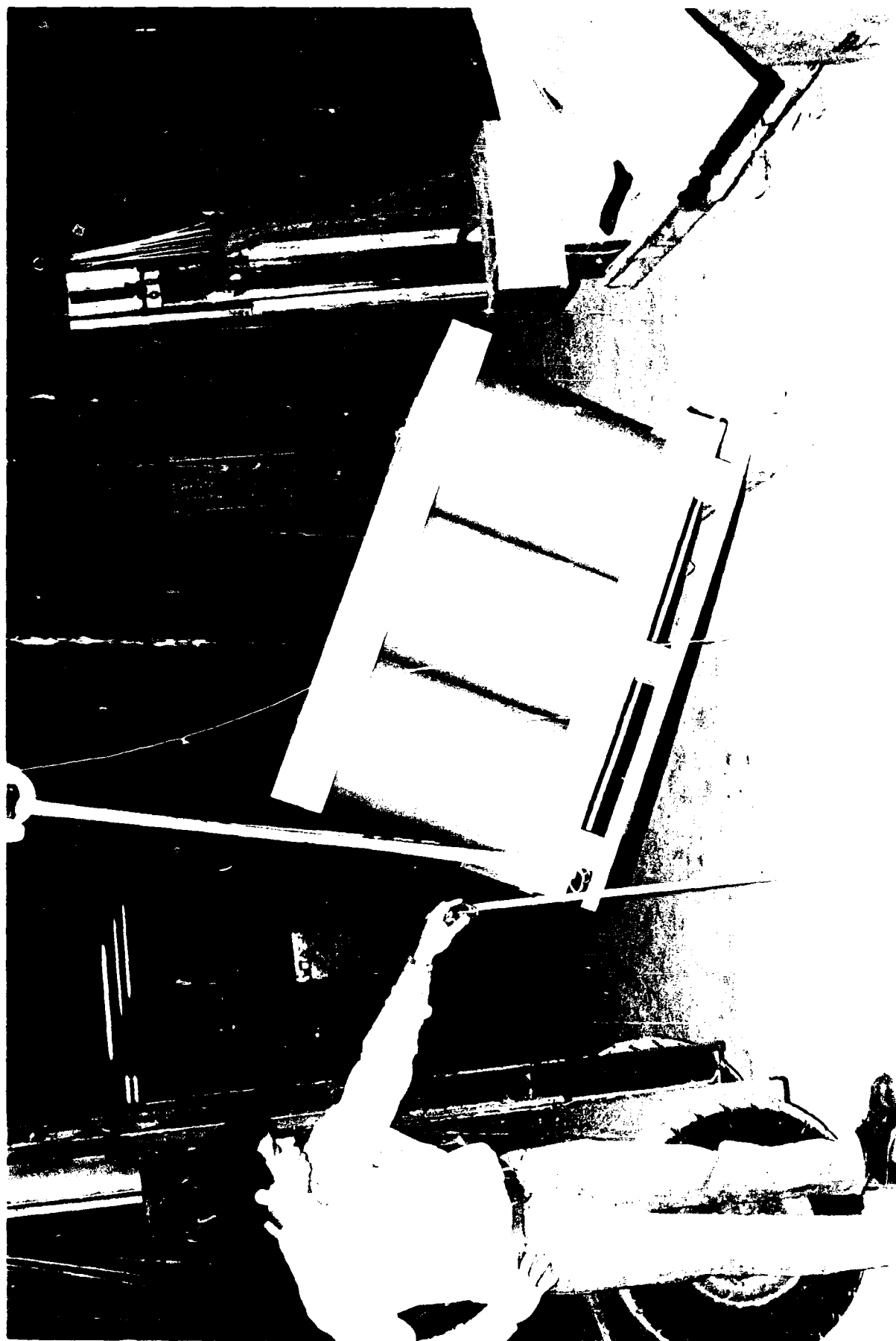
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Photograph No. 2. This photo shows pallet 1 in the Transportation Simulator in the Longitudinal Orientation.



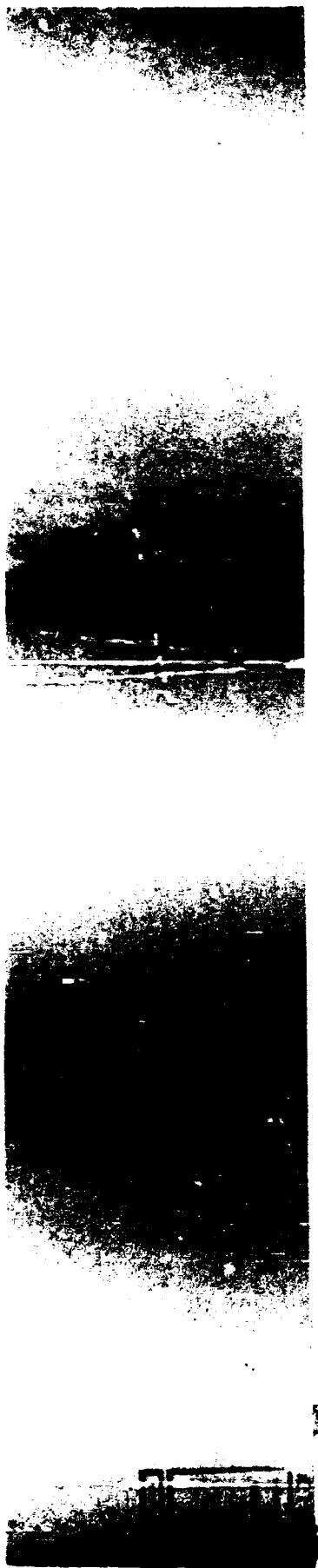
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Photograph No. 3. This photo shows pallet 1 in the Transportation Simulator in the Lateral Orientation.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photograph No. 4. This photo shows pallet 1 being raised 24 inches prior to the first edgewise rotational drop test.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photograph No. 5. This photo shows the damage pallet 1 sustained during the first edgewise rotational drop test.



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Photograph No. 6. This photo shows the damage the containers sustained during the first edgewise rotational drop test.



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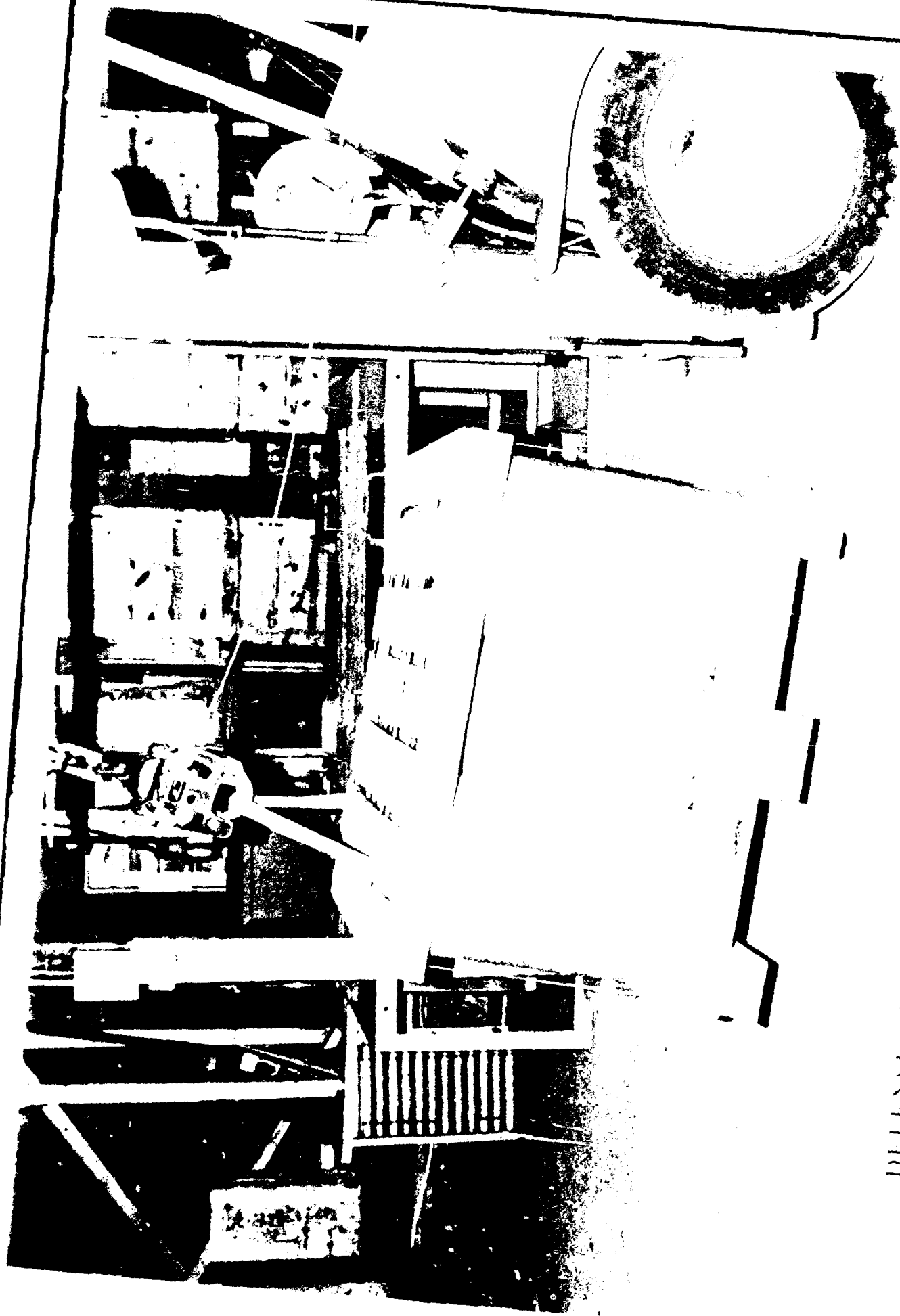
Photograph No. 7. This photo shows pallet 2 in the Transportation Simulator in the Forward Orientation.

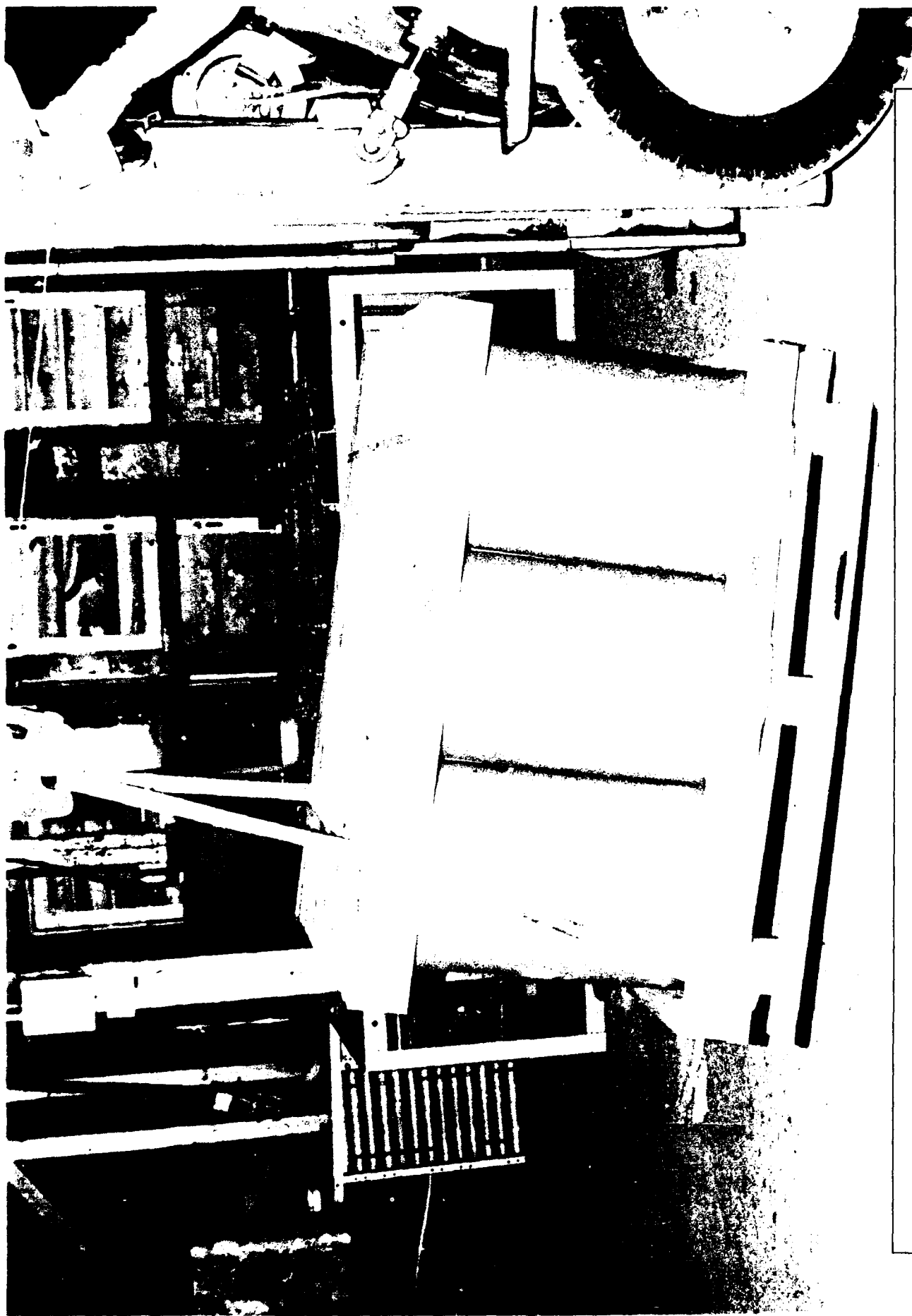


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27 ph No. 8 This photo shows pallet 1 in the Transportation Simulator in the Lateral Orientation.

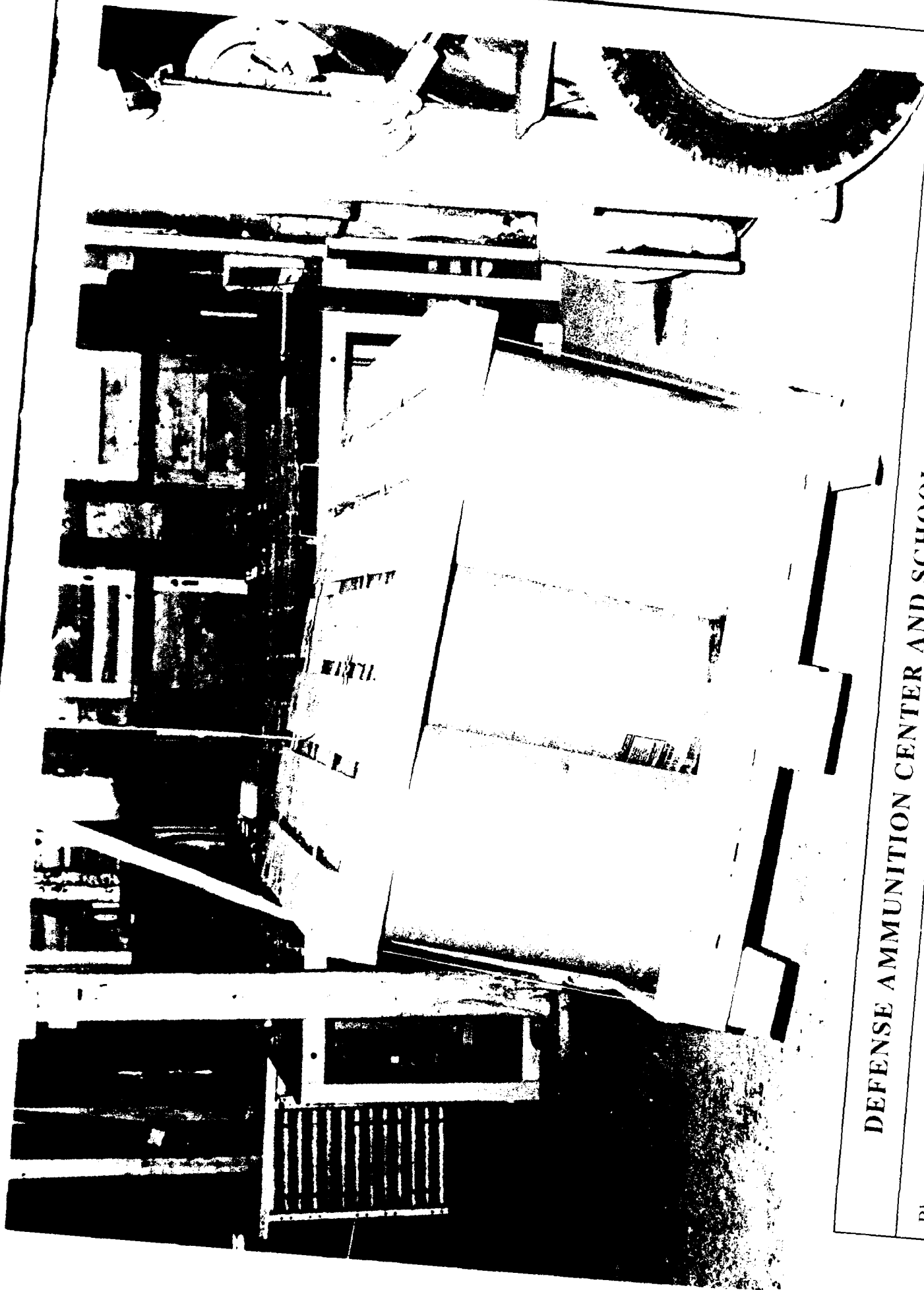
DEFENSE AMMUNITION CENTER AND SCHOOL SAVANNAH





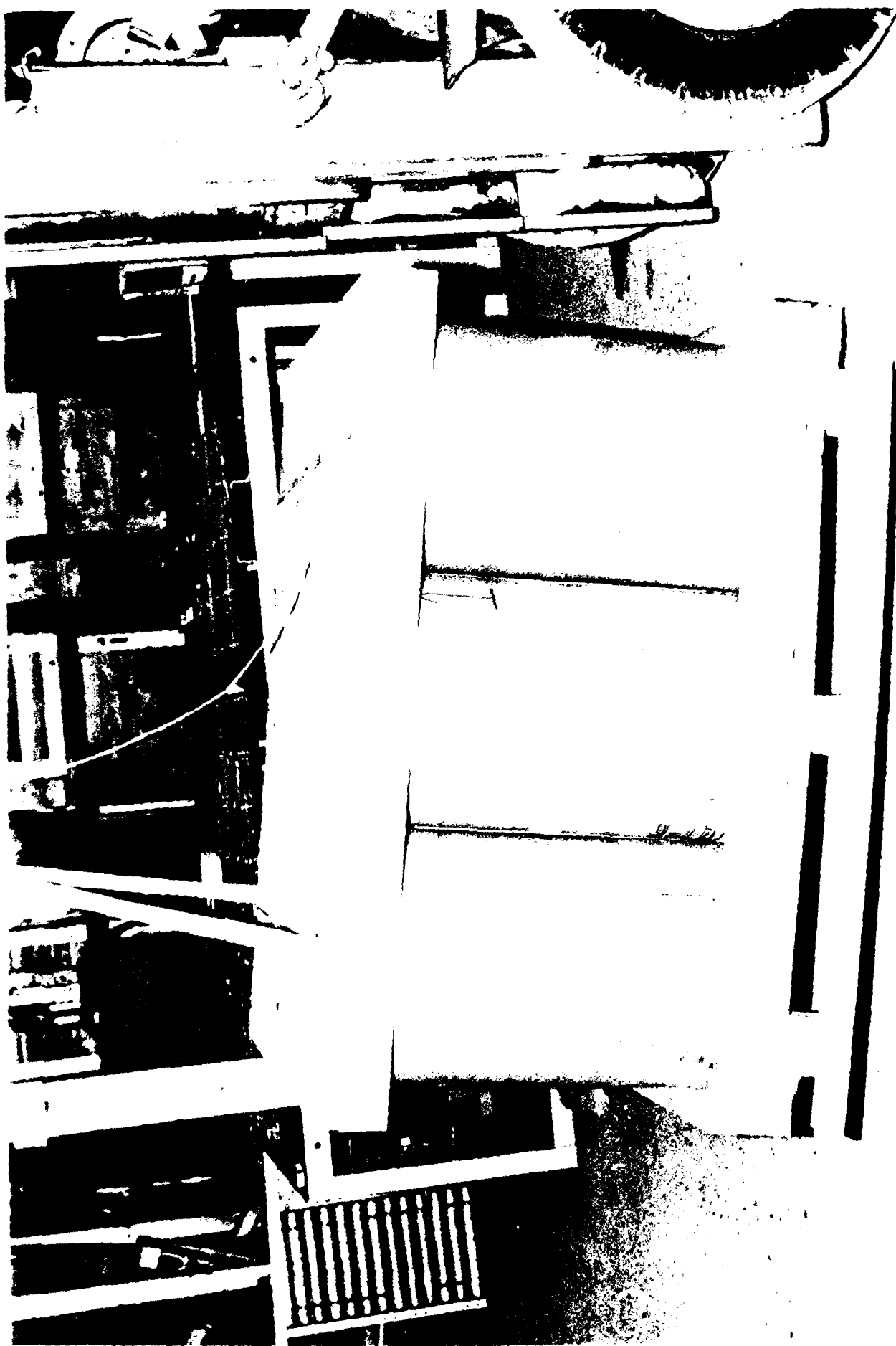
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Photograph No. 10. This photo shows pallet 2 raised 12-1/2 inches prior to the second edgewise rotational drop test.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photograph No. 11. This photo shows pallet 2 raised 11-1/3 inches prior to the third edgewise rotational drop test.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNAH, IL

Photograph No. 12. This photo shows pallet 2 raised 12-1/2 inches prior to the fourth edgewise rotational drop test.

PART 8

DRAWINGS

GENERAL NOTES

- A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1, AND AUGMENTS TM 743-200-1 (CHAPTER 5) AND CONFORMS TO MIL-STD-1600.
- B. DIMENSIONS, CUBE AND WEIGHT OF A PALLET UNIT WILL VARY SLIGHTLY DEPENDING UPON THE ACTUAL DIMENSIONS OF THE BOXES AND THE WEIGHT OF THE SPECIFIC ITEM BEING UNITIZED.
- C. FOR DETAILS OF THE 21-GALLON FIBERBOARD CONTAINER, SEE MILITARY SPECIFICATION MIL-C-70470.

CONTAINER DIAMETER ----- 16-1/2"
CONTAINER HEIGHT ----- 27-5/8"
GROSS WEIGHT ----- 178 LBS (APPROX)
- D. DUNNAGE LUMBER SPECIFIED IS OF A 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.
- E. UNLESS OTHERWISE SPECIFIED, A PLUS OR MINUS 1/4" IS ALLOWED ON OVERALL DIMENSIONS OF ANY DUNNAGE ASSEMBLY. SIMILAR PIECES IN AN ASSEMBLY, HOWEVER, MUST BE WITHIN 1/8" OF THE SAME DIMENSION.
- F. WHEN ASSEMBLING A PALLET UNIT, CARE SHALL BE TAKEN TO INSURE THAT THE CONTAINERS AND DUNNAGE ASSEMBLIES ARE EVENLY ALIGNED HORIZONTALLY AND VERTICALLY, AS APPLICABLE, SO THAT THE SIDES AND ENDS OF THE PALLET UNIT DO NOT EXCEED A 1/2" TOLERANCE.
- G. IN ORDER TO OBTAIN COMPACT (SOUND) PALLET UNITS, ALL STRAPS SHALL BE LOCATED IN PROPER ALIGNMENT AND TENSIONED UNTIL THEY CUT INTO THE EDGE OF THE TOP DUNNAGE ASSEMBLY AND THE PALLET DECK. AFTER TENSIONING, EACH STRAP WILL BE SECURED USING ONE SEAL AND TWO PAIR OF NOTCHES PER SEAL. ALL STRAPPING MUST BE STRAIGHT WITHIN 2" ON ANY SURFACE OF THE UNITIZED LOAD, I.E., TOP, BOTTOM, SIDES, OR ENDS THAT IT ENCOMPASSES.
- H. WHEN APPLYING ANY STRAP, CARE MUST BE EXERCISED TO ASSURE THAT THE END OF THE STRAP ON THE UNDERSIDE OF THE JOINT EXTENDS AT LEAST 6" BEYOND THE SEAL. THIS EXTRA MINIMUM LENGTH OF STRAP IS REQUIRED TO PERMIT SUBSEQUENT TIGHTENING OF LOOSENED STRAPPING. RETENSIONING CAN BE ACCOMPLISHED WITHOUT REPLACING STRAPPING OR SPLICING STRAPPING THROUGH THE USE OF A MANUAL OR PNEUMATIC FEEDWHEEL TYPE TENSIONING TOOL AND THE APPLICATION OF ONE ADDITIONAL SEAL.
- J. 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.
- K. INSTALL HORIZONTAL STRAPS TO ENCIRCLE THE DUNNAGE ASSEMBLIES AS SHOWN. HORIZONTAL STRAPS MUST BE TENSIONED AND SEALED PRIOR TO THE APPLICATION OF TIEDOWN STRAPS.
- L. INSTALL EACH TIEDOWN STRAP TO PASS UNDER THE TOP DECK BOARDS OF THE PALLET AND TO BE LOCATED AS SHOWN. TIEDOWN STRAPS WILL NOT BE APPLIED UNTIL THE HORIZONTAL STRAPS HAVE BEEN TENSIONED AND SEALED.
- M. THE FOLLOWING AMC (DARCOM) DRAWINGS ARE APPLICABLE FOR OUTLOADING AND STORAGE OF THE ITEMS COVERED BY THIS DRAWING.

CARLOADING ----- DRAWING 19-48-4115-5PA1062.
TRUCKLOADING ----- DRAWING 19-48-4117-11PA1003.
STORAGE ----- DRAWING 19-48-4118-1-2-3-4-14-22PA1002.
MILVAN ----- DRAWING 19-48-4166-15PA1003.
COMMERCIAL CONTAINER- DRAWING 19-48-4153-15PA1002.

- N. FOR METHOD OF SECURING A STRAP CUTTER TO THE PALLET UNIT, SEE DARCOM DRAWING 19-48-4127-20P1000.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

- PALLET ----- SPECIAL 4-WAY ENTRY, SIZE 45-3/4" X 51-1/2", PRESERVATIVE TREATED, SEE GENERAL NOTES "R" AND "S" ABOVE.
- LUMBER ----- SEE TM 743-200-1 (DUNNAGE LUMBER) AND FED SPEC MM-L-751, SEE GENERAL NOTES "R" AND "S" ABOVE.
- NAILS ----- FED SPEC FF-N-105; FOR FILLER AND DUNNAGE ASSEMBLIES, COMMON, CEMENT COATED OR CHEMICALLY ETCHED, ALT; ANNULAR-RING TYPE NAIL OR PALLET TYPE (MECHANICALLY DEFORMED) NAIL OF SAME SIZE; FOR PALLET, SEE KEY NUMBERS ON PAGE 4.
- STRAPPING, STEEL ----- FED SPEC QQ-S-781; CLASS I, TYPE I OR II, HEAVY DUTY, FINISH B (GRADE 2), SIZE 3/4" X .035" OR .031".
- SEAL STRAP ----- FED SPEC QQ-S-781; TYPE D, STYLE I, II, OR IV, CLASS H, FINISH B (GRADE 2).
- STAPLE, STRAP ----- FED SPEC FF-N-105; TYPE III, STYLE 3.

(GENERAL NOTES CONTINUED)

- O. IF LESS THAN SIX CONTAINERS ARE TO BE LOADED ON A PALLET, IT SHALL BE ACCOMPLISHED BY SUBSTITUTING FILLER ASSEMBLIES, AS DEPICTED ON PAGE 4, FOR THE OMITTED CONTAINERS.
- P. UNIT LOAD MARKING WILL BE ACCOMPLISHED IN ACCORDANCE WITH MIL-STD-129 (MARKING FOR SHIPMENT AND STORAGE). FULL IDENTIFICATION MARKINGS IN ACCORDANCE WITH MIL-STD-129, TO INCLUDE NSN AND DODIC, QUANTITY AND NOMENCLATURE, LOT NUMBER, AND GROSS WEIGHT OF THE LOAD SHALL BE MARKED ON TAGS LOCATED ON OPPOSITE UPPER CORNERS OF THE LOAD. BAR CODE LABELS ARE REQUIRED ON THE STRAPS OF OPPOSITE CORNERS, AS SPECIFIED IN MIL-STD-129.
- Q. THE PALLET AND ALL WOODEN DUNNAGE USED IN THE UNIT LOAD SHALL BE PRESERVATIVE TREATED IN ACCORDANCE WITH THE PROCEDURES SPECIFIED IN MILITARY SPECIFICATION MIL-B-2427 FOR CLEATED WOODEN BOXES. WHEN THE DUNNAGE CONSISTS OF MORE THAN ONE COMPONENT, IT MUST BE ASSEMBLED PRIOR TO TREATMENT. THE LETTERS PA DENOTING PC56 (COPPER QUINOLINOLATE), PB DENOTING M-GARD W550 (ZINC NAPHTHENE EMULSIFIABLE), OR PC DENOTING M-GARD W510 OR CUNAPSOI (COPPER NAPHTHATE) WILL BE APPLIED TO AN OUTER FACE OF A DUNNAGE ASSEMBLY AND TO THE OUTER FACE OF THE CENTER POST ON A 51-1/2" SIDE OF THE PALLET IN LETTERS AT LEAST ONE-INCH HIGH.
- R. THE WOODS USED FOR THE ASSEMBLY OF THE DUNNAGE ASSEMBLIES AND PALLET MUST BE SELECTED FROM GROUPS II, III AND/OR IV OF MIL-STD-731. ALL OTHER REQUIREMENTS SPECIFIED WITHIN MIL-STD-731 PERTAINING TO THE WOODS USED IN PALLET OR DUNNAGE ASSEMBLY CONSTRUCTION ARE TO BE FOLLOWED.
- S. ANY REQUEST FOR DEVIATION FROM THE PROCEDURES DELINEATED IN THIS DRAWING MUST BE DIRECTED TO THE COMMANDER, U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER, ATTN: SMCAR-ES, ROCK ISLAND, IL 61299-7300, FOR SPECIFIC APPROVAL. FOR EXAMPLE, SPECIFIC APPROVAL MUST BE OBTAINED FOR SUBSTITUTING A DIFFERENT TYPE OF STRAPPING THAN THE STRAPPING SPECIFIED.

SEAL FOR 3/4" STRAPPING
(4 REQD., 1 PER STRAP).
CRIMP EACH SEAL WITH
TWO PAIR OF NOTCHES.

STAPLE, 15/16" WIDE BY
3/4" LEG LENGTH (20
REQD., 4 PER TIEDOWN
STRAP AND 6 PER HORI-
ZONTAL STRAP).

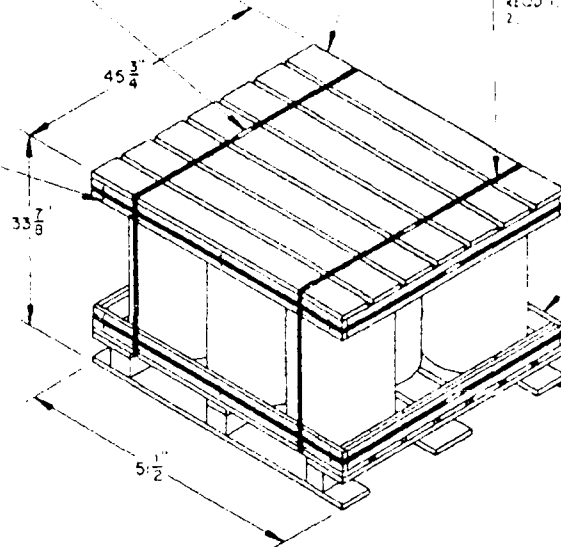
TOP ASSEMBLY (1 REQD.). SEE THE
DETAIL BELOW.

TIEDOWN STRAP, 3/4" X .035" OR .031"
X 10'-0" LONG STEEL STRAPPING (2
REQD.). SEE GENERAL NOTE "A" ON PAGE
2.

HORIZONTAL STRAP, 3/4" X .035" OR
.031" X 17'-3" LONG STEEL STRAPPING
(2 REQD.). SEE GENERAL NOTE "A"
ON PAGE 2.

SIDE ASSEMBLY (2 REQD.). SEE THE DETAIL
BELOW.

SPECIAL PALLET, 45-3/4" X 51-1/2".
SEE THE DETAIL ON PAGE 4.

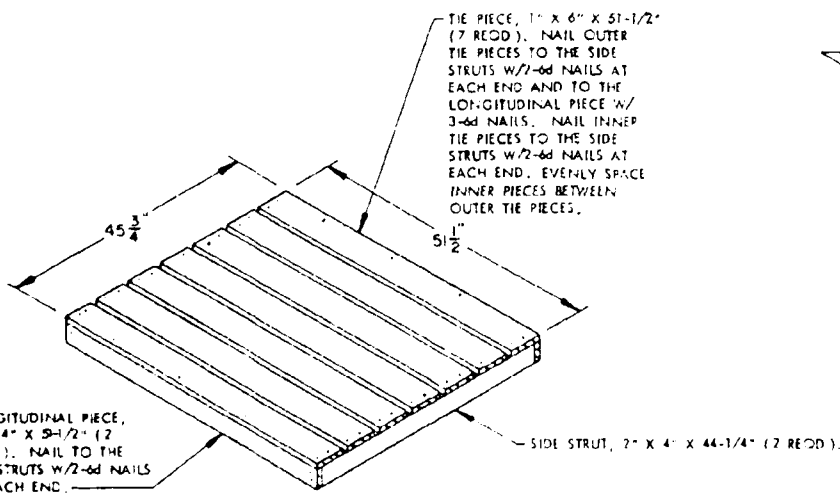


PALLET UNIT

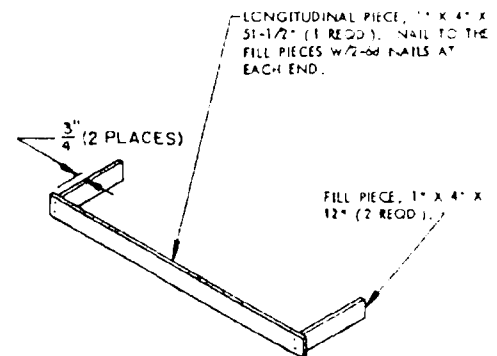
SEE GENERAL NOTE "B" ON PAGE 2

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	21.17	7.06
NAILS	NO. REQD.	POUNDS
6d (2")	50	0.29
PALLET, SPECIAL, 45-3/4" X 51-1/2" ----- 1 REQD. ----- 115 LBS		
STEEL STRAPPING, 3/4" X .031" OR .035" X 10'-0" REQD. ----- 4.39 LBS		
SEAL FOR 3/4" STRAPPING ----- 4 REQD. ----- NIL		
STAPLE, 15/16" X 3/4" ----- 20 REQD. ----- NIL		

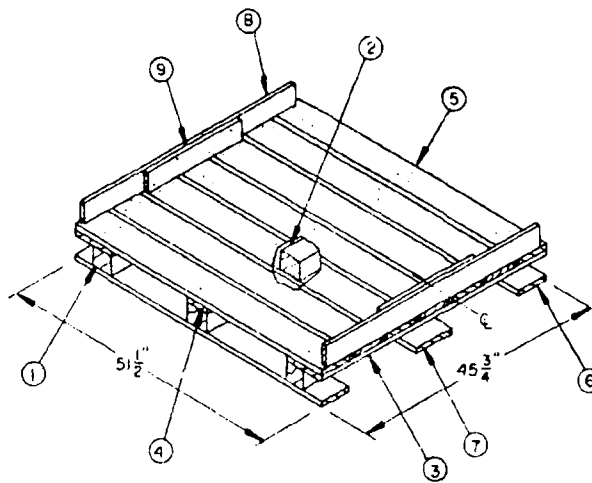
ITEM	WEIGHT
8 CONTAINERS OF BULK EXPLOSIVES @ 170 LBS ----- 1,360 LBS (APPROX.)	
DUTRAGE -----	19 LBS
PALLET -----	115 LBS
TOTAL WEIGHT -----	1,542 LBS (APPROX.)
CUBE -----	46.2 CU FT (APPROX.)



TOP ASSEMBLY



SIDE ASSEMBLY



SPECIAL PALLET DETAIL

KEY NUMBERS

- ① OUTER POST, 4" WIDE X 2-3/4" HIGH (ACTUAL) X 3-1/2" LONG (6 REQD).
- ② CENTER POST, 4" WIDE X 2-3/4" HIGH (ACTUAL) X 7-1/2" LONG (3 REQD).
- ③ OUTER STRINGER, 1" X 8" X 45-3/4" (2 REQD).
- ④ CENTER STRINGER, 1" X 4" X 45-3/4" (1 REQD).
- ⑤ TOP DECK BOARD, 1" X 6" X 51-1/2" (7 REQD). NAIL TO SIDE PIECE W/2 NAILS (TYPE II, STYLE 18), 2-1/4" LONG X .120" DIAMETER AT EACH END. NAIL OUTSIDE AND CENTER DECK BOARDS THRU THE STRINGERS INTO THE POSTS W/3 NAILS (TYPE II, STYLE 18), 3" OR 3-1/4" LONG X .135" DIAMETER AT EACH LOCATION. NAIL OTHER DECK BOARDS TO THE STRINGERS W/3 NAILS (TYPE II, STYLE 18), 1-1/2" LONG X .120" DIAMETER AT EACH LOCATION.
- ⑥ OUTER RUNNER, 1" X 6" X 51-1/2" (2 REQD). NAIL TO THE POSTS W/3 NAILS (TYPE II, STYLE 18), 2-1/4" LONG X .120" DIAMETER AT EACH JOINT.
- ⑦ CENTER RUNNER, 1" X 8" X 51-1/2" (1 REQD). NAIL TO THE POSTS W/3 NAILS (TYPE II, STYLE 18), 2-1/4" LONG X .120" DIAMETER AT EACH JOINT.
- ⑧ SIDE PIECE, 1" X 4" X 44-1/4" (2 REQD).
- ⑨ SPACER PIECE, 1" X 4" X 20-1/4" (2 REQD). CENTER ON THE SIDE PIECE AND LAMINATE W/4 NAILS (TYPE II, STYLE 18), 1-1/2" LONG X .120" DIAMETER.