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REPORT NO. EVT -16-87

MIL-STD-1660 TEST OF UNITIZATION
PROCEDURE 19-48-4042A/9-20 PM1001, PA37
CONTAINERS AND EXTERNAL BUNDLING STRAP

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4. TITLE (and Subtitle) MIL-STD-1660 Test of Unitization Procedure 19-48-4042A/9-20 PM1001, PA37 Containers and External Bundling Strap		5. TYPE OF REPORT & PERIOD COVERED
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) MIL-STD-1660 PA37 Unitization Procedure 19-48-4042A/9-20 External Bundling Strap		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The U.S. Army Defense Ammunition Center and School (USADACS) has previously tested the PA37 container unitizations (Reports EVT 7-78, and EVT 1-81) using various dunnage methods. Unitization Procedure 19-48-4042A/9-20 PM1001 shows the top dunnage assembly covering the unit bundling strap after the charges are palletized, making it difficult to retighten after the tiedown straps are added. The engineering change proposal (ECP) submitted to the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), SMCAR-ESK, by Indiana Army Ammunition Plant (INAAP) proposes the bundling strap be placed over (cont)over		

A

the top dunnage assembly for easier retightening access. To verify this unitization modification, a test load was fabricated and tested at USADACS in accordance with MIL-STD-1660 testing requirements. As a result of this testing, the external bundling strap maintained a satisfactory unitization.

no pay, shipping, units, etc.

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MIL-STD-1660 TEST OF UNITIZATION

PROCEDURE 19-48-4042A/9-20 PM1001, PA37

CONTAINERS AND EXTERNAL BUNDLING STRAP

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REPORT NO. EVT-16-87

MIL-STD-1660 TEST OF UNITIZATION
PROCEDURE 19-48-4042A/9-20 PM1001,
PA37 CONTAINERS AND EXTERNAL BUNDLING STRAP

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ABSTRACT

The U.S. Army Defense Ammunition Center and School (USADACS) has previously tested the PA37 container unitizations (Reports EVT 7-78, and EVT 1-81) using various dunnage methods. Unitization Procedure 19-48-4042A/9-20 PM1001 shows the top dunnage assembly covering the unit bundling strap after the charges are palletized, making it difficult to retighten after the tiedown straps are added. The engineering change proposal (ECP) submitted to the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), SMCAR-ESK, by Indiana Army Ammunition Plant (INAAP) proposes the bundling strap be placed over the top dunnage assembly for easier retightening access. To verify this unitization modification, a test load was fabricated and tested at USADACS in accordance with MIL-STD-1660 testing requirements. As a result of this testing, the external bundling strap maintained a satisfactory unitization.

PART I

A. INTRODUCTION. Unitization Procedure 19-48-4042A/9-20 PM1001 has been tested and approved for unitization of PA37 type containers. Data for previous tests can be found in Evaluation Division Reports EVT 7-78 and EVT 1-81 depicting various dunnage methods. In order to maintain a solid unitization, a bundling strap has been used around the containers before unitization is complete. This unitization procedure is proving difficult in maintaining adequate tension on the bundling strap. Because of this difficulty, Indiana Army Ammunition Plant has submitted an engineering change proposal to the U.S. Army Armament, Munitions and Chemical Command, ATTN: SMCAR-ESK requesting that this bundling strap be placed over the top dunnage assembly. In doing this, easier access is provided to the strap for retensioning. To verify this proposed unitization modification, the Evaluation Division fabricated a test load unitization of PA37 containers in accordance with the modified unitization procedure, and tested this configuration to MIL-STD-1660 testing requirements. The results of these tests are contained in this document.

B. AUTHORITY. This testing program was conducted in accordance with mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command.

C. OBJECTIVE. The objective of this series of tests is to verify that unitization modifications as indicated in the ECP will continue to meet the requirements of MIL-STD-1660.

PART II

ATTENDEES

NAME	ADDRESS
Alfred C. McIntosh, Jr. General Engineer	U.S. Army Defense Ammunition Center and School ATTN: SMCAC-DEV Savanna, IL 61074-9639 Phone: AV 585-8989
Laura Fieffer Engineer	U.S. Army Defense Ammunition Center and School ATTN: SMCAC-DEO Savanna, IL 61074-9639 Phone: AV 585-8927

PART III
TEST PROCEDURES

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 force of a 16-foot high load.

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 one plus or minus zero point one G. Midway into the testing period the specimen shall be rotated 90 degrees and the test continued for the duration. If 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 for the drops. 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.

GROSS WEIGHT NOT EXCEEDING	DIMENSIONS ON ANY EDGE NOT EXCEEDING	HEIGHT OF DROP LEVEL A PROTECTION
Pounds	Inches	Inches
500	72	36
3,000	no limit	24
no limit	no limit	12

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.

PART IV
TEST EQUIPMENT

1. Test Specimen.
 - a. Drawing Number 19-48-4042A/9-20 PM1001.
 - b. Pallet Width: 35-3/4 in
 - c. Pallet Length: 47-1/2 in
 - d. Pallet Height: 38-1/2 in
 - e. Pallet Weight: 1,365 lbs
2. Compression Tester.
 - a. Manufacturer: Ormond Scientific
 - b. Platform: 60 in by 60 in
 - c. Compression Limit: 50,000 lbs
 - d. Tension Limit: 50,000 lbs
3. Transportation Simulator.
 - a. Manufacturer: Gaynes Laboratory
 - b. Capacity: 6,000 lb pallet
 - c. 1/2-in amplitude
 - d. Speed: 50 to 3,000 cpm
 - e. Platform: 5 ft by 8 ft
4. Inclined Ramp.
 - a. Manufacturer: Conbur Incline
 - b. Impact Tester
 - c. 10 percent incline
 - d. 12-ft incline

PART V

TEST RESULTS

1. STACKING TEST. The pallet weight is 1,365 lbs. The pallet height is 38-1/2 inches and the test load weight is 7,000 lbs. The subject pallet was loaded to 7,500 lbs compression for a period of one hour. At the end of that period of time the compression load decreased to 7,000 lbs. When the test specimen was removed from the compression testor, no major deformation was realized.
2. REPETITIVE SHOCK TEST. The subject pallet successfully passed a longitudinal transportation test in a 90-minute test period. Rotating the pallet 90 degrees and subjecting it to a second 90-minute period caused no damage to the pallet or strapping. Operational speed for the transportation simulator was 180 rpm for the duration of the test.
3. EDGEWISE DROP TEST. Each side of the pallet base is placed on a beam, in turn displacing it six inches above the floor. The opposite side is raised to a height of 24 inches above the floor and then dropped. In the longitudinal orientation for drops numbers one and three, no damage occurred to the unitization. In the lateral position drops two and four, damage occurred to the outer pallet skids.
4. INCLINED IMPACT. The inclined impact consisted of impacting the unitization four times in turn down a ten-degree incline. The unitized load is placed on the carriage such that two inches of the pallet project beyond its front. Each side of the pallet is impacted in turn. After impacting the first side, the 2 X 2 end-blocks in the intervening dunnage separated from the longitudinal members. After the second impact, there was a minimal

shift in the container positions. After the third impact, an additional 2 X 2 was pulled out of the intervening dunnage. At the fourth impact, the kens and unit load reoriented itself to a normal configuration. At the completion of this test, lateral strapping was satisfactory and the bundling strap loosened.

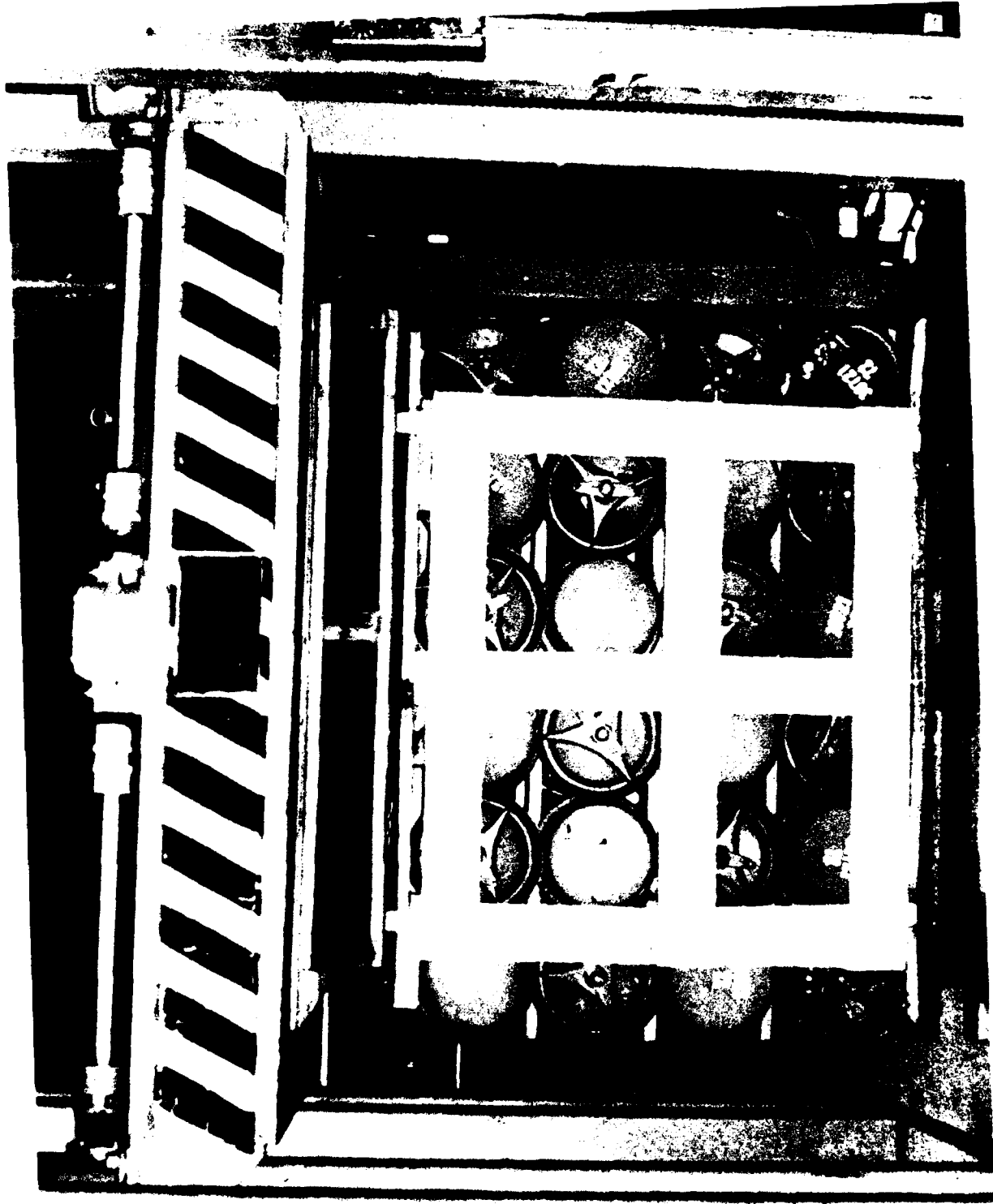
PART VI

CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS. Unitization procedure 19-48-4042A/9-20 PM1001, as modified, to the engineering change proposal submitted by Indiana Army Ammunition Plant placing the bundling strap over the top dunnage assembly does not degrade the unitization procedure. As a result of this testing sequence, no physical damage occurred to the PA37 containers. There was some loosening of the end-stops on the intermediate dunnage as a result of the inclined impact test. The unit as a whole has been considered satisfactory in conforming to the test requirements of MIL-STD-1660.
2. RECOMMENDATIONS. It is recommended that this pallet configuration be acceptable for future unitizations.

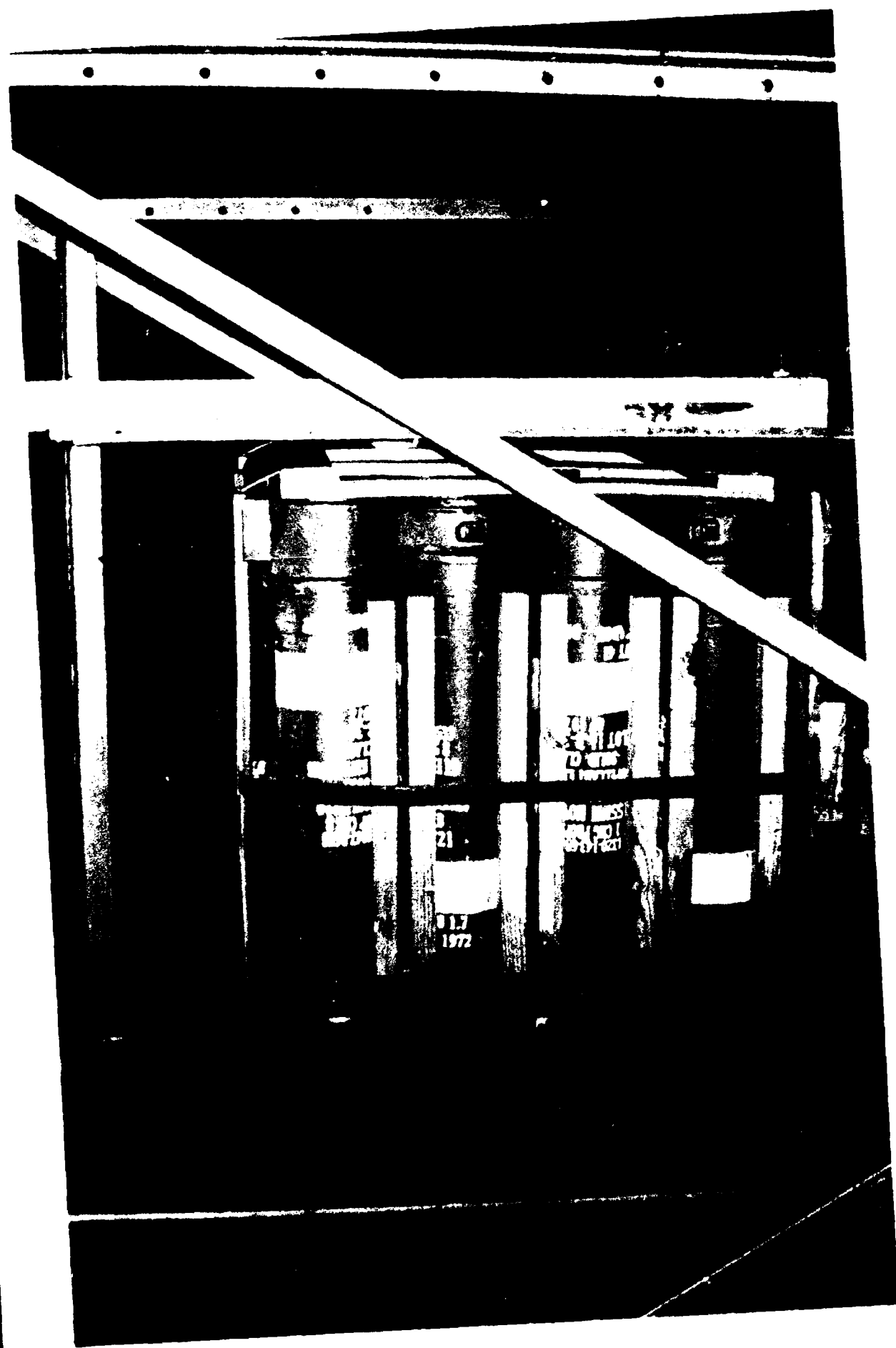
PART VII

PHOTOGRAPHS



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo 1. This photo shows the PA37 unitization with the external bundling strap in the compression tester.

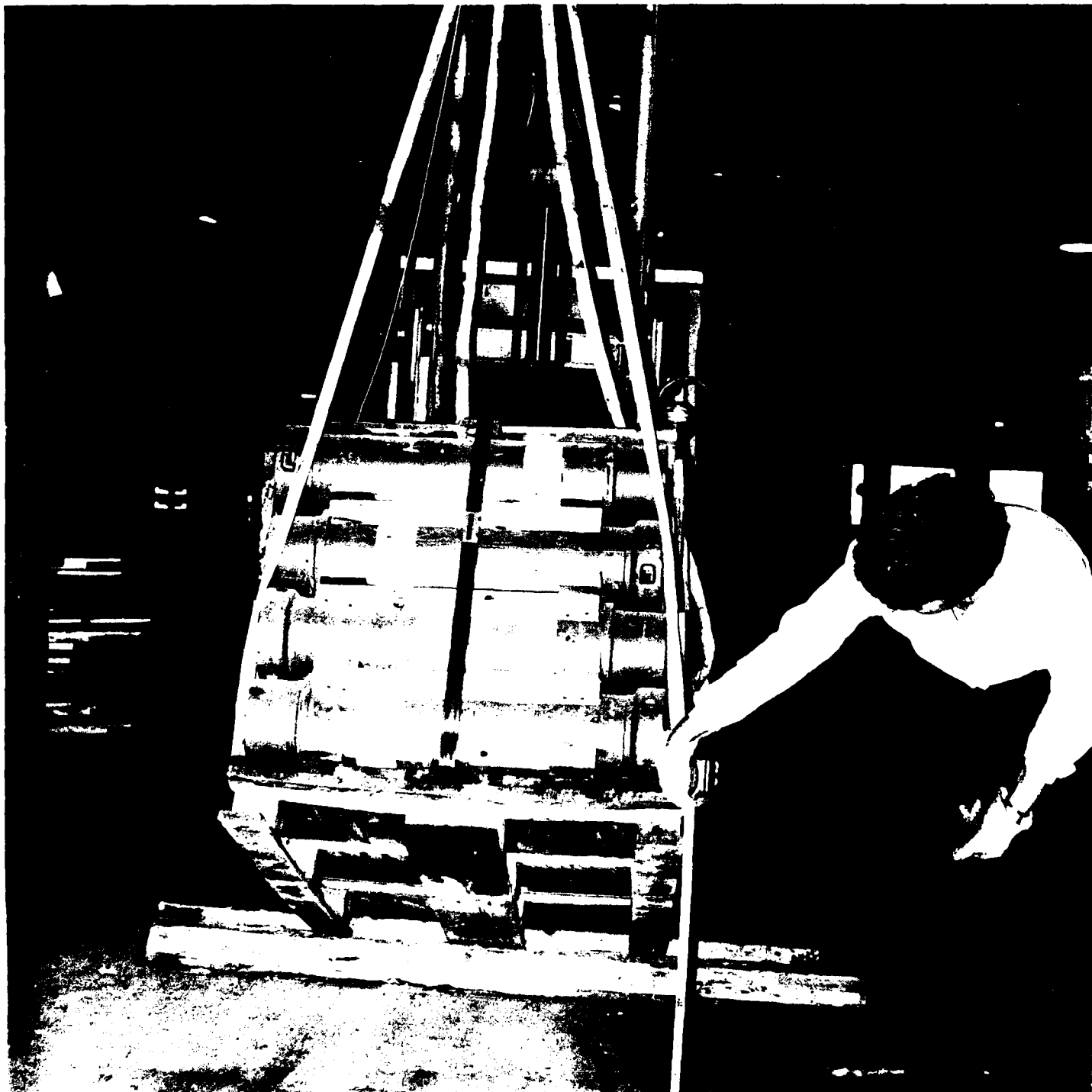


DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo 2. This photo shows the PA37 unitization in the lateral position placed on the transportation simulator.

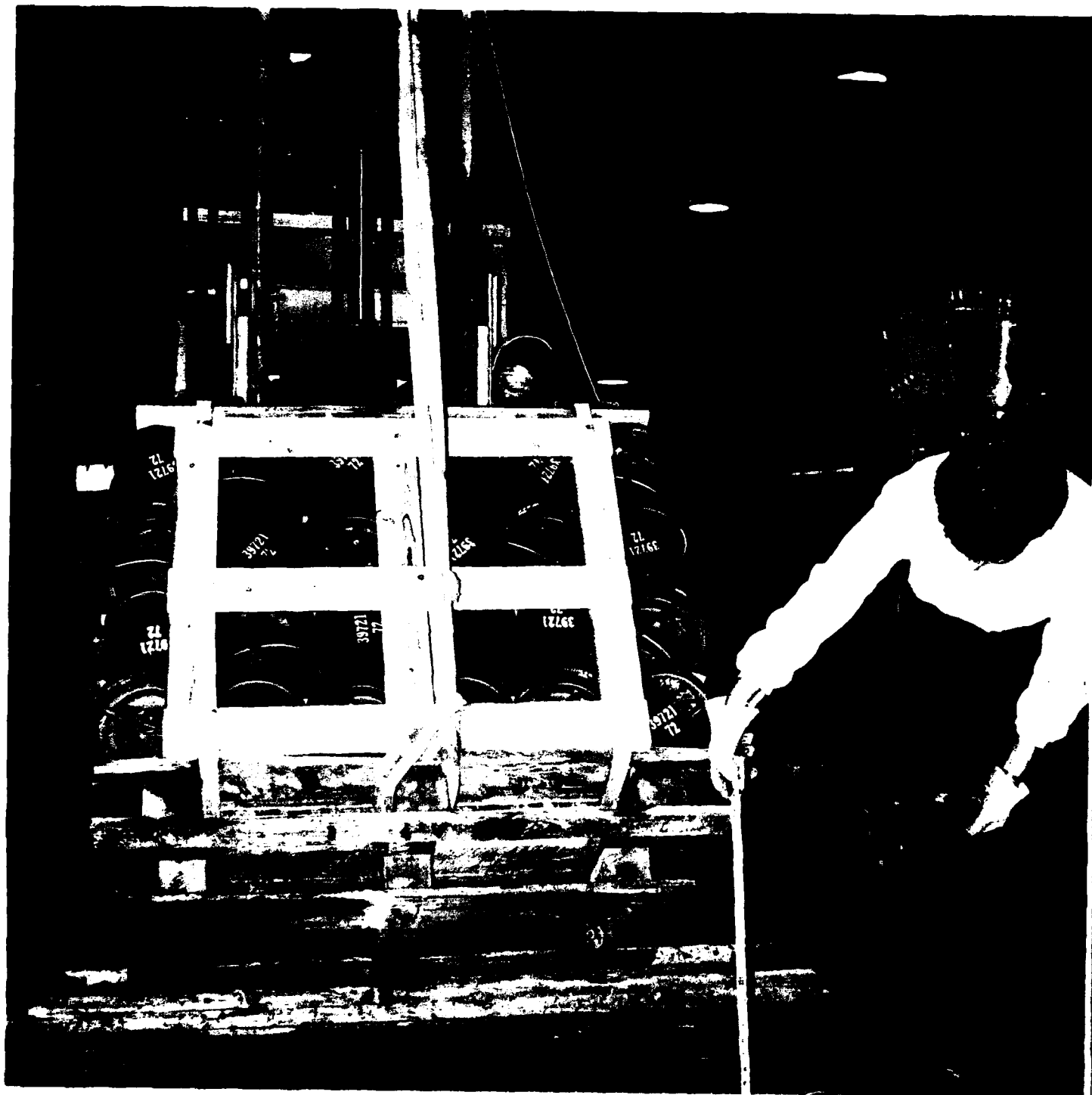
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

This photo shows the PA37 utilization device in the edrowine
test in the first side. Dr. height is 44 inches.



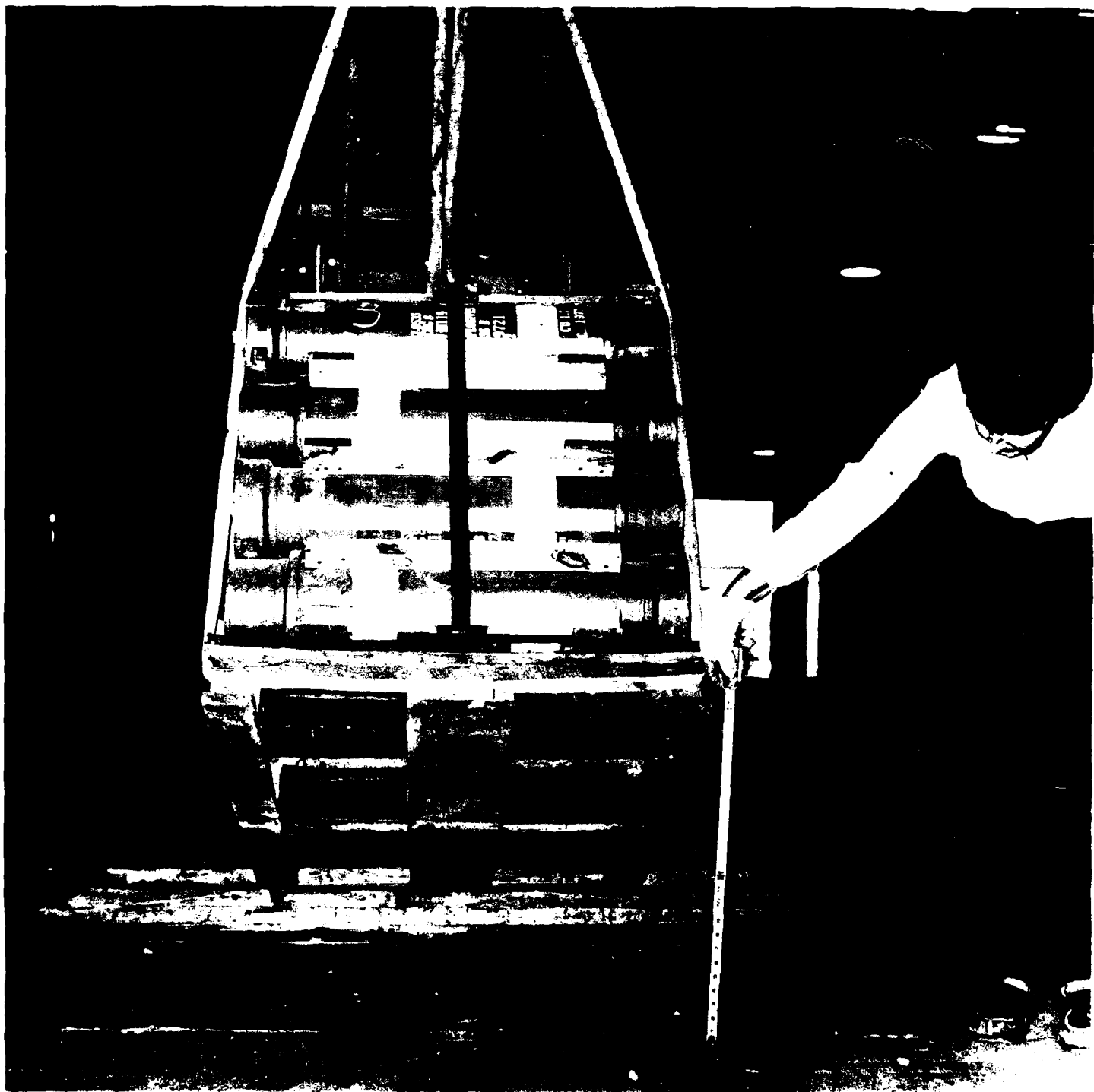
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo 4. This photo shows the PA37 unitization ready to be dropped 24 inches on the second side. The outside skid cracked when it was dropped.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo 5. This photo shows the PA37 unitization being held prior to dropping on the third side. Drop height is 24 inches. No additional damage occurred during this drop.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo 6. This photo shows the PA37 unitization being held for dropping on the fourth and final side. Drop height is 24 inches. Damage occurred to the skid on which the pallet landed in that it cracked.



PARTVIII
UNITIZATION PROCEDURE

APPENDIX 9

UNITIZING PROCEDURES FOR PROPELLING CHARGES PACKED IN CYLINDRICAL METAL CONTAINERS ON 4-WAY ENTRY PALLETS

PA37 SERIES CONTAINERS

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PALLET UNIT DATA						
ITEMS INCLUDED		HAZARD CLASSIFICATION ①				WEIGHT
NSN	DODIC	DOT CLASS	CG CLASS	QD CLASS	COMP GROUP	(LBS)
1320-00-143-6847 01-093-6856	D533	B	II-A	1.3	C	1,160
	D533	B	II-A	1.3	C	1,452

REVISIONS

REVISION NO. 1, DATED FEBRUARY 1981, CONSISTS OF:

1. ADDING FIVE CONTAINERS TO UNIT B (FLAT DUNNAGE) AND CHANGING UNITIZATION PROCEDURES.
2. CHANGING DIMENSIONS ON FILLER ASSEMBLIES FOR FLAT AND ROUTED DUNNAGE UNITS.
3. ADDING SPECIAL NOTE 2 ON PAGES 4, 8 AND 10.

REVISION NO. 2, DATED MARCH 1984, CONSISTS OF:

1. ADDING ITEM BY NATIONAL STOCK NUMBER TO THE "PALLET UNIT DATA" CHART.

2. ADDING HAZARD CLASSIFICATION NOTE.

REVISION NO. 3, DATED OCTOBER 1985, CONSISTS OF:

1. CHANGING CONTAINER WEIGHT.
2. UPDATING PALLET UNITS TO CONFORM TO 1 ABOVE.

① HAZARD CLASSIFICATION DATA CONTAINED IN THE CHART AT LEFT IS FOR GUIDANCE AND INFORMATIONAL PURPOSES ONLY. VERIFICATION OF THE SPECIFIED DATA SHOULD BE MADE BY CONSULTING THE MOST RECENT JOINT HAZARD CLASSIFICATION SYSTEM LISTING OR OTHER APPROVED LISTING(S).

THIS DRAWING SUPERSEDES PART OF DRAWING 19-48-4042-1-2-5-11-14PM1000, DATED 8 FEBRUARY 1965, AND REVISION 1, THERETO, DATED 25 AUGUST 1969.

NOTICE: THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4042-20PM1001.

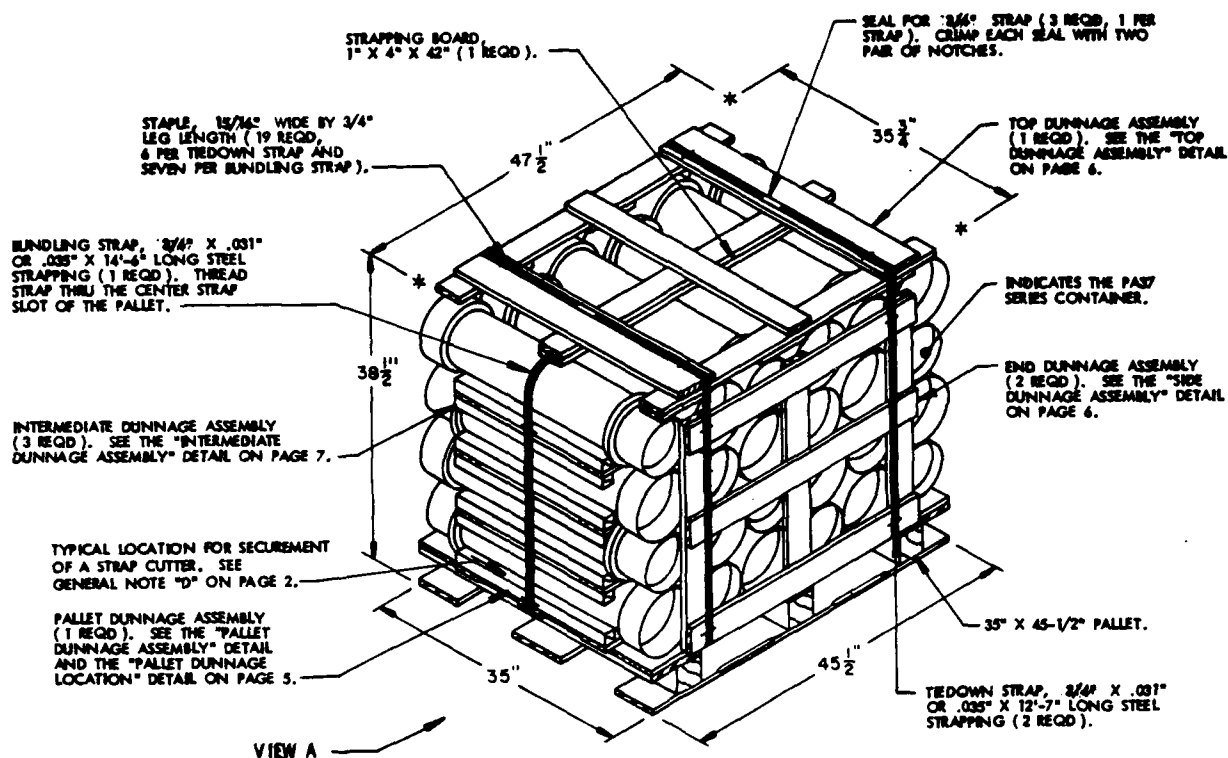
REVISIONS				APPROVED BY		DATE	
1	FEB 81	WRE/MND	WRE/MND	WRE/MND	WRE/MND	WRE/MND	WRE/MND
2	MAR 84	WRE/MND	WRE/MND	WRE/MND	WRE/MND	WRE/MND	WRE/MND
3	OCT 85	WRE/MND	WRE/MND	WRE/MND	WRE/MND	WRE/MND	WRE/MND
				U.S. ARMY DARCOM DRAWING			
				OCTOBER 1979			
				CLASS	DIVISION	DRAWING	FILE
				19	48	4042A/9	20PM 1001

DO NOT SCALE

GENERAL NOTES

- A. THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZING PROCEDURES DRAWING 19-48-4042-20PM1001. TO PRODUCE AN APPROVED UNIT LOAD, ALL PERTINENT PROCEDURES, SPECIFICATIONS AND CRITERIA SET FORTH WITHIN THE BASIC DRAWING WILL APPLY TO THE PROCEDURES DELINEATED IN THIS APPENDIX. ANY EXCEPTIONS TO THE BASIC PROCEDURES ARE SPECIFIED IN THIS APPENDIX.
- B. DIMENSIONS, CUBE, AND WEIGHT OF A PALLET UNIT WILL VARY SLIGHTLY DEPENDING UPON THE ACTUAL DIMENSIONS OF THE CONTAINER, WEIGHT OF THE SPECIFIC ITEM, AND METHOD OF UNITIZATION.
- C. FOR OUTLOADING AND STORAGE OF THE ITEMS COVERED BY THIS APPENDIX, SEE DARCOM DRAWING 19-48-4042-1-2-5-11-14PM1000, REVISION NO. 1.
- D. FOR METHOD OF SECURING A STRAP CUTTER TO THE PALLET UNIT, SEE DARCOM DRAWING 19-48-4127-20P1000.
- E. IF ITEMS COVERED HEREIN ARE UNITIZED PRIOR TO ISSUANCE OF THIS APPENDIX, THE CONTAINERS NEED NOT BE REUNITIZED SOLELY TO CONFORM TO THIS APPENDIX.
- F. THE UNITIZATION PROCEDURES DEPICTED HEREIN MAY ALSO BE USED FOR UNITIZING PROPELLING CHARGES WHEN IDENTIFIED BY DIFFERENT NATIONAL STOCK NUMBERS (NSN) THAN THOSE SHOWN ON THE COVER PAGE, PROVIDED THE ITEM IS PACKED IN THE PAS7 SERIES CONTAINER. THE EXPLOSIVE CLASSIFICATION OF OTHER ITEMS MAY BE DIFFERENT THAN THOSE SHOWN.
- G. FOR DETAILS OF THE PAS7 SERIES CONTAINER SEE PICATINNY ARSENAL DRAWING NO. 9234357.
- CONTAINER DIMENSIONS ————— 32-3/4" LONG BY 8-13/32" DIAMETER.
CONTAINER CUBE ————— 1.1 CUBIC FEET.
CONTAINER WEIGHT (WITH CHARGE) — 42 LBS (APPROX).
- H. THE SPECIFIED UNITIZING PROCEDURES SHOWN HEREIN DEPICT THREE DIFFERENT METHODS FOR UNITIZING THE PAS7 SERIES CONTAINERS:
1. UNIT "A" DEPICTS CONTAINERS UNITIZED ON FLAT DUNNAGE WITH EVERY OTHER CONTAINER ALTERNATED (BASE END, BELL END, BASE END) INDIVIDUALLY AND BY LAYERS. SEE DETAILS ON PAGES 4 THRU 7.
 2. UNIT "B" DEPICTS CONTAINERS UNITIZED ON FLAT DUNNAGE. SEE DETAILS ON PAGES 8 AND 9.
 3. UNIT "C" DEPICTS CONTAINERS UNITIZED ON ROUTED DUNNAGE. SEE DETAILS ON PAGES 10 AND 11.
- ALTHOUGH UNIT "A" DEPICTS THE PREFERRED METHOD OF UNITIZING THE PAS7 SERIES CONTAINERS, ALL THREE METHODS ARE APPROVED FOR USE.
- J. IF DEEMED MORE ECONOMICAL FOR SHIPPING AND STORAGE BY THE RESPONSIBLE COMMAND, THE UNITS DEPICTED ON THE FOLLOWING PAGES MAY HAVE ONE COMPLETE LAYER OF CONTAINERS EITHER ADDED OR DELETED, WHICHEVER IS APPLICABLE. FOR FURTHER UNITIZATION GUIDANCE, SEE SPECIAL NOTE 1 ON PAGES 4, 8, AND 10.

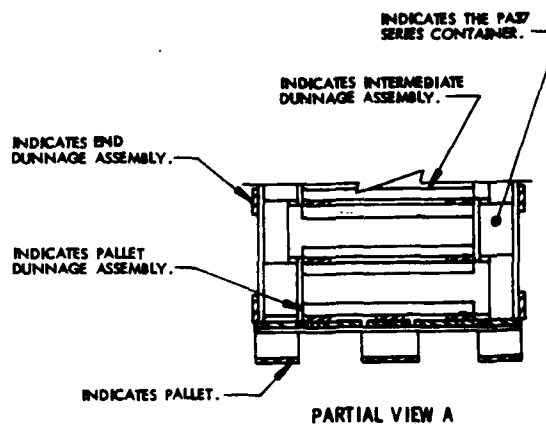
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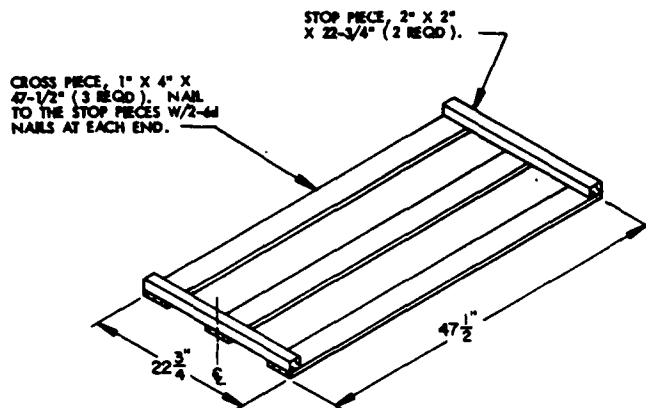


ISOMETRIC VIEW

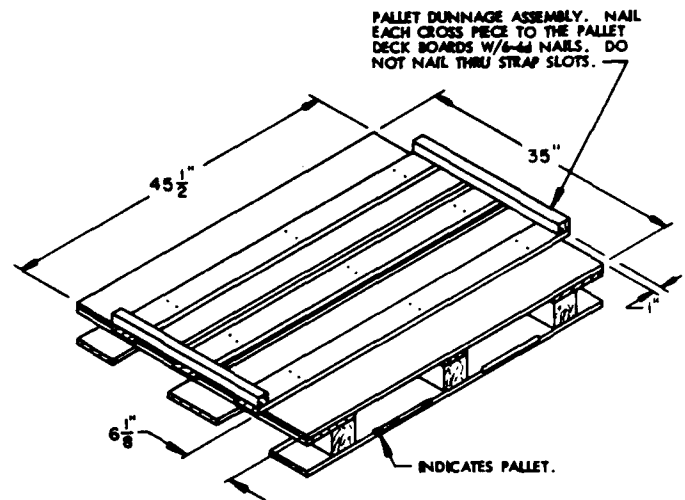
SPECIAL NOTE:

1. THE UNIT DEPICTED ABOVE MAY BE INCREASED BY ONE COMPLETE LAYER OF CONTAINERS BY THE ADDITION OF ONE INTERMEDIATE DUNNAGE ASSEMBLY AND SIX CONTAINERS, BY MODIFYING TOP AND END DUNNAGE ASSEMBLIES APPROPRIATELY, AND BY INCREASING THE STRAP LENGTHS APPROPRIATELY. THIS WILL RESULT IN AN OVERALL UNIT HEIGHT OF 46-1/8".
2. DIMENSIONS GIVEN FOR DUNNAGE PIECES OR DUNNAGE ASSEMBLIES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY TO THE PALLET UNIT. CONTAINERS MUST FIT SNUGLY IN THE DUNNAGE ASSEMBLIES. ALSO, DUE TO THE VARIANCE OF CONTAINER DIMENSIONS, ADJUSTMENTS MAY BE REQUIRED AS TO THE LOCATION OF CERTAIN PIECES OF DUNNAGE IN A DUNNAGE ASSEMBLY.





PALLET DUNNAGE ASSEMBLY
(1 REQD)



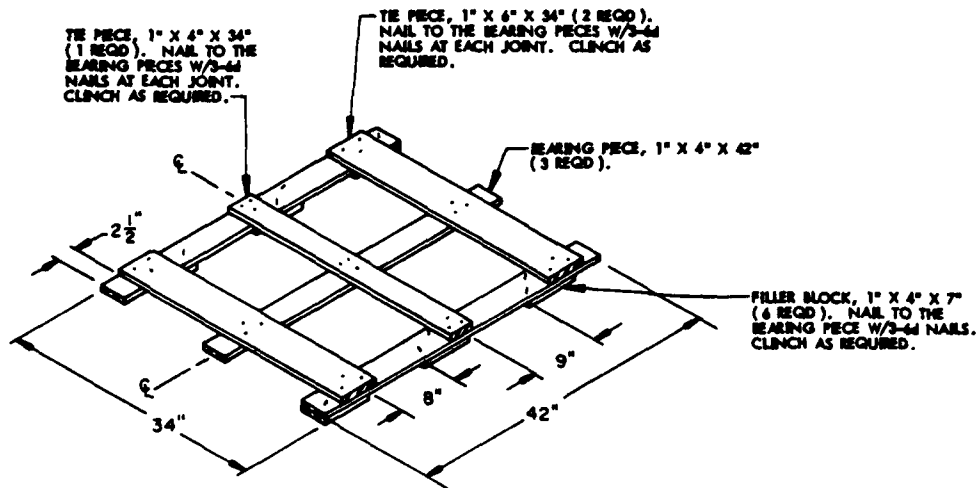
PALLET DUNNAGE LOCATION

BILL OF MATERIAL			
LUMBER	NO. REQD	LINEAR FEET	BOARD FEET
1" X 4" X 7"	6	3.50	1.17
1" X 4" X 30"	6	15.00	5.00
1" X 4" X 34"	1	2.83	0.94
1" X 4" X 35"	6	17.50	5.83
1" X 4" X 42"	4	14.00	4.67
1" X 4" X 47-1/2"	9	35.63	11.88
1" X 6" X 34"	2	5.67	2.83
2" X 2" X 22-3/4"	14	26.54	8.85
NAILS	NO. REQD	POUNDS	
6d (2")	129	0.76	
8d (2-1/2")	48	0.51	
PALLET, 35" X 45-1/2"		1 REQD	65 LBS
STEEL STRAPPING, 3/4" X .031" OR .035" ---		39.67 REQD	2.88 LBS
SEAL FOR 3/4" STRAP ---		3 REQD	NIL
STAPLE, 15/16" X 3/4" ---		19 REQD	NIL

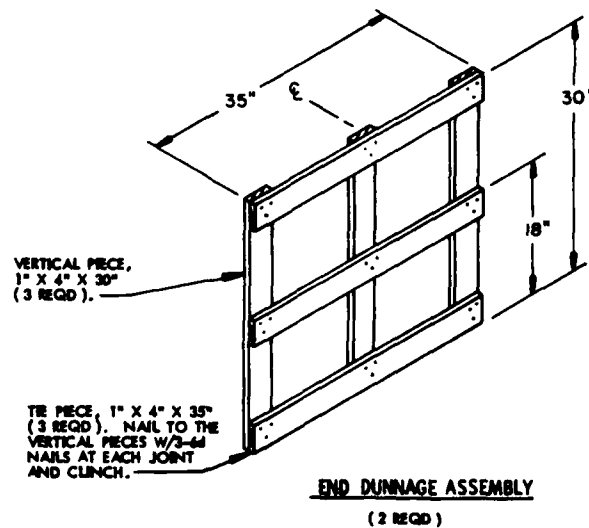
UNIT DATA

WEIGHT

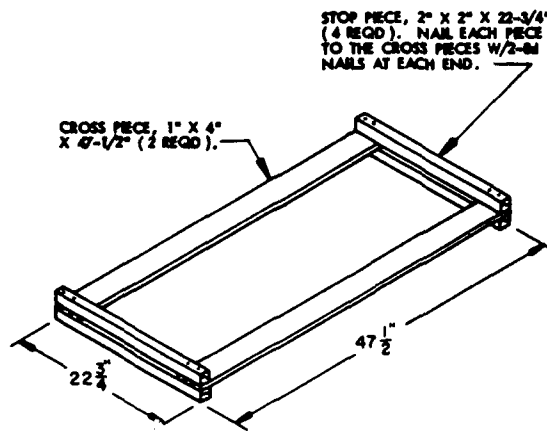
CUBE	37.8 CUBIC FEET (APPROX)	
CONTAINER, PA37 SERIES	24 EACH @ 42 LBS	1,008 LBS (APPROX)
DUNNAGE		87 LBS
PALLET		65 LBS
TOTAL WEIGHT		1,160 LBS (APPROX)



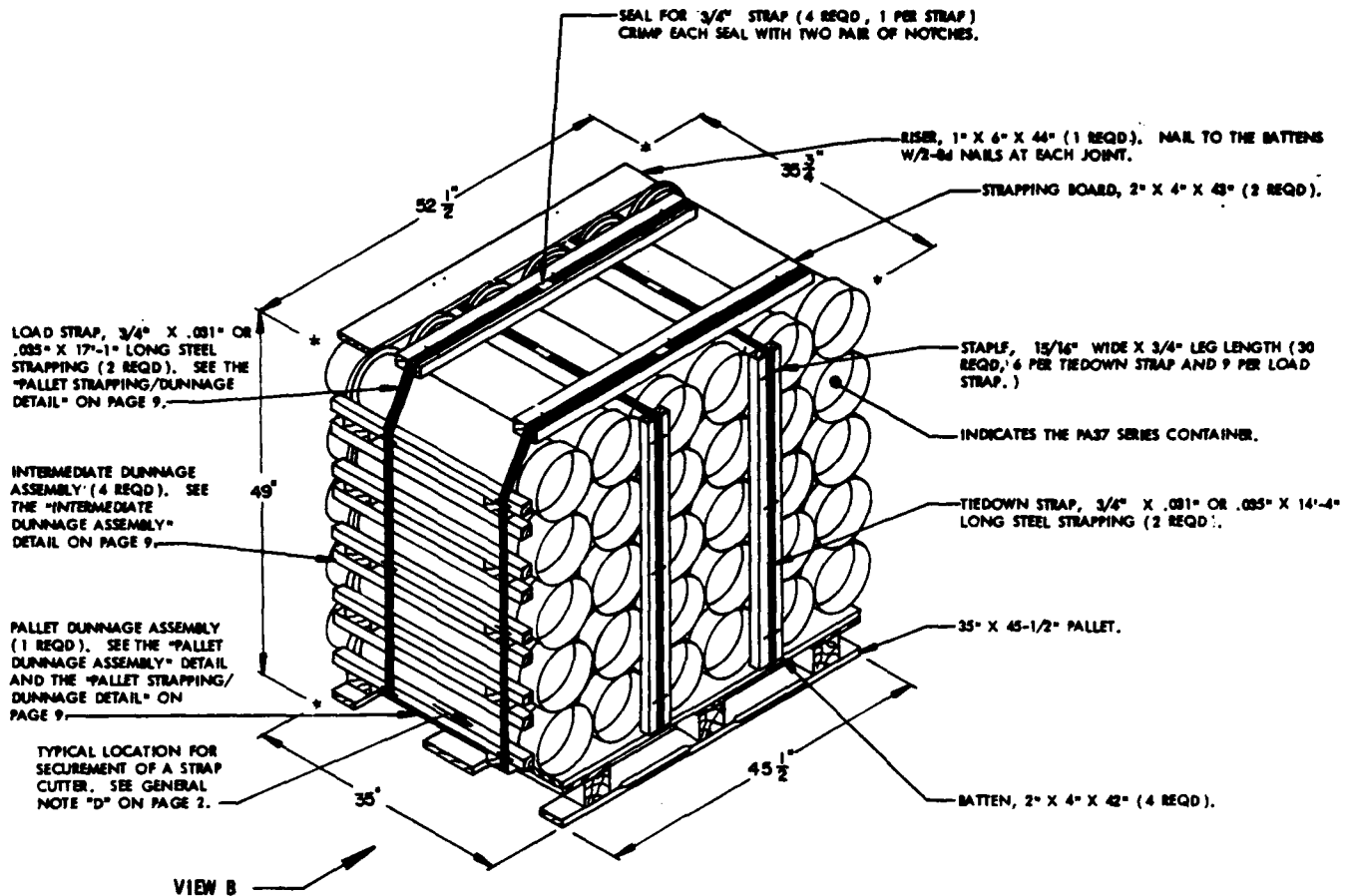
TOP DUNNAGE ASSEMBLY
(1 REQD)



END DUNNAGE ASSEMBLY
(2 REQD)



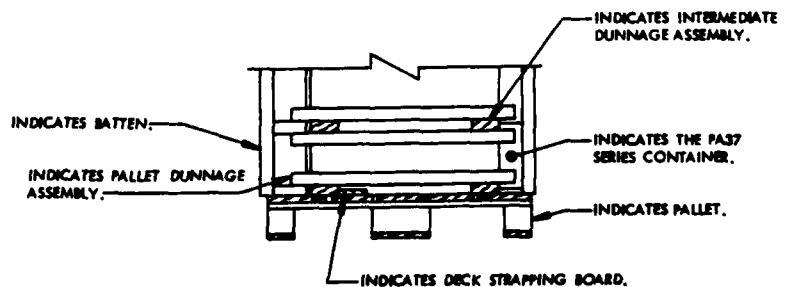
INTERMEDIATE DUNNAGE ASSEMBLY
(3 REQD)



ISOMETRIC VIEW

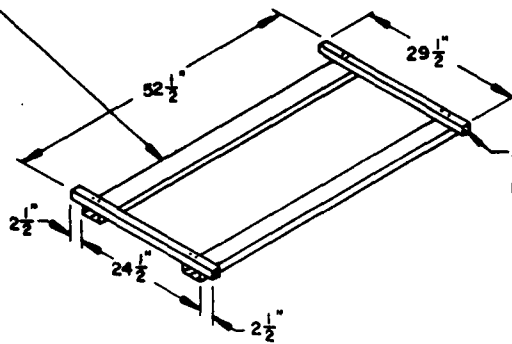
SPECIAL NOTES:

1. THE UNIT DEPICTED ABOVE MAY BE REDUCED BY ONE COMPLETE LAYER OF CONTAINERS BY THE DELETION OF ONE INTERMEDIATE DUNNAGE ASSEMBLY AND SIX CONTAINERS, AND BY DECREASING STRAP LENGTHS APPROPRIATELY. THIS WILL RESULT IN AN OVERALL UNIT HEIGHT OF 40-5/8\".
2. DIMENSIONS GIVEN FOR DUNNAGE PIECES OR DUNNAGE ASSEMBLIES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY TO THE PALLET UNIT. CONTAINERS MUST FIT SNUGLY IN THE DUNNAGE ASSEMBLIES. ALSO, DUE TO THE VARIANCE OF THE CONTAINER DIMENSIONS, ADJUSTMENTS MAY BE REQUIRED AS TO THE LOCATION OF CERTAIN PIECES OF DUNNAGE IN A DUNNAGE ASSEMBLY.



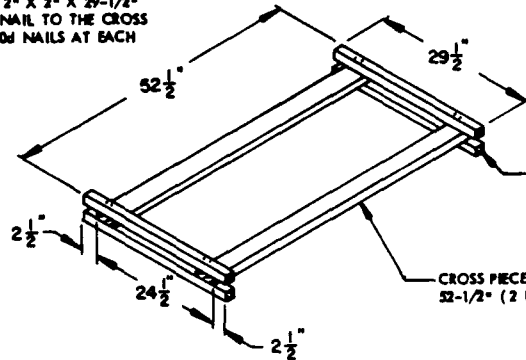
PARTIAL VIEW B

CROSS PIECE, 2" X 4" X 52-1/2" (2 REQD).



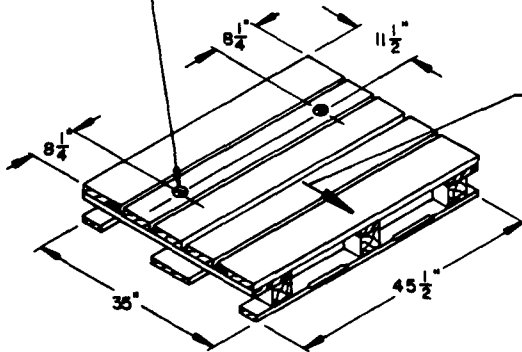
PALLET DUNNAGE ASSEMBLY
(1 REQD)

STOP PIECE, 2" X 2" X 29-1/2" (2 REQD). NAIL TO THE CROSS PIECES W/2-10d NAILS AT EACH JOINT.



INTERMEDIATE DUNNAGE ASSEMBLY
(4 REQD)

2" DIAMETER HOLE, 2 PLACES. HOLES MUST BE DRILLED PRIOR TO NAILING THE DUNNAGE ON THE PALLET DECK.



PALLET WITH PREDRILLED HOLES

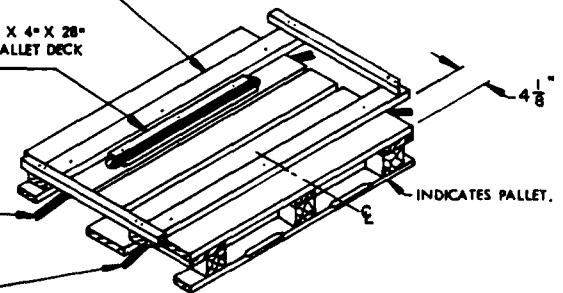
INDICATES RELL END OF CONTAINER.

PALLET DUNNAGE ASSEMBLY. NAIL EACH CROSS PIECE TO THE PALLET DECK W/3-8d NAILS. DO NOT NAIL THRU THE STRAP SLOTS.

DECK STRAPPING BOARD, 1" X 4" X 28" (1 REQD). NAIL TO THE PALLET DECK W/3-6d NAILS.

LOAD STRAP POSITIONED PRIOR TO PLACING THE CONTAINERS ON THE PALLET.

LOAD STRAP THREADED THRU STRAP SLOT.



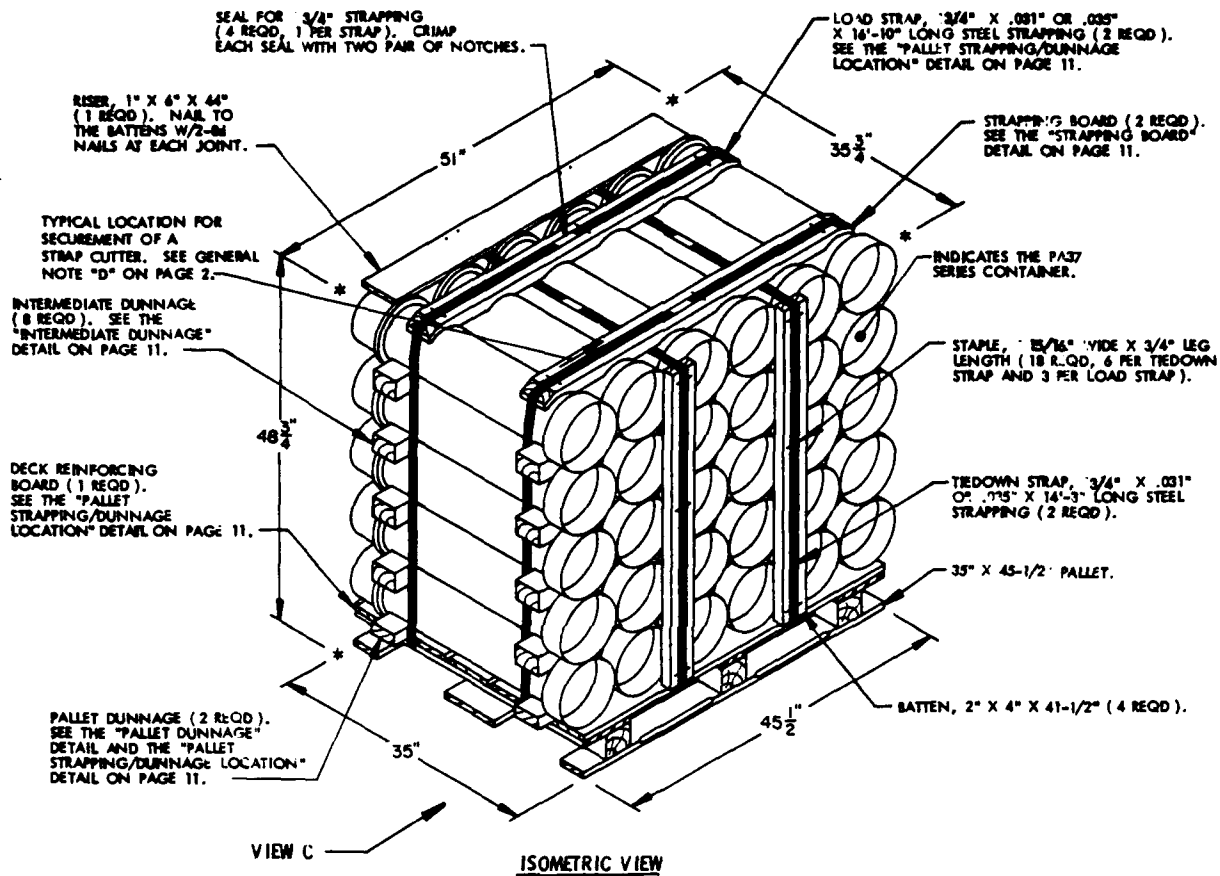
PALLET STRAPPING/DUNNAGE DETAIL

BILL OF MATERIAL			
LUMBER	NO. REQD	LINEAR FEET	BOARD FEET
1" X 4" X 28"	1	2.33	0.78
1" X 4" X 44"	1	3.67	1.84
2" X 2" X 29-1/2"	18	44.25	14.75
2" X 4" X 42"	4	14.00	9.33
2" X 4" X 43"	2	7.17	4.78
2" X 4" X 52-1/2"	10	49.75	29.17
NAILS		NO. REQD	POUNDS
6d (2")	3		0.02
8d (2-1/2")	10		0.11
10d (3")	72		1.11
PALLET, 35" X 45-1/2" 1 REQD-----65 LBS			
STEEL STRAPPING, 3/4" X .081" OR .085" 42.83' REQD-----4.49 LBS			
SEAL FOR 3/4" STRAP 4 REQD-----NIL			
STAPLE, 15/16" X 3/4" 30 REQD-----NIL			

UNIT DATA

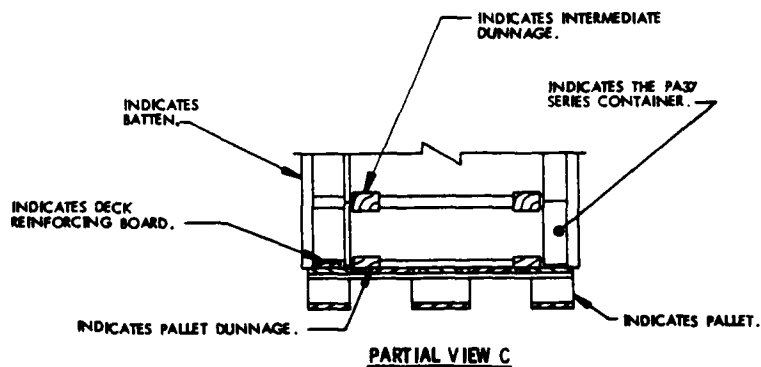
CUBE-----53.2 CUBIC FEET (APPROX)
CONTAINER, PA37 SERIES---30 EACH @ 42 LBS-----1,260 LBS (APPROX)
DUNNAGE-----127 LBS
PALLET-----65 LBS

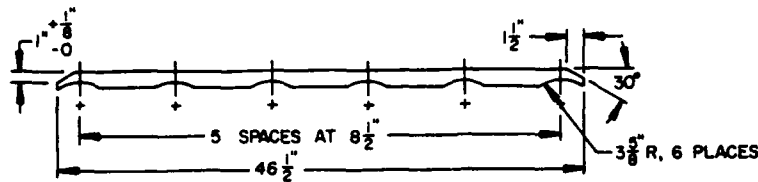
TOTAL WEIGHT-----1,452 LBS (APPROX)



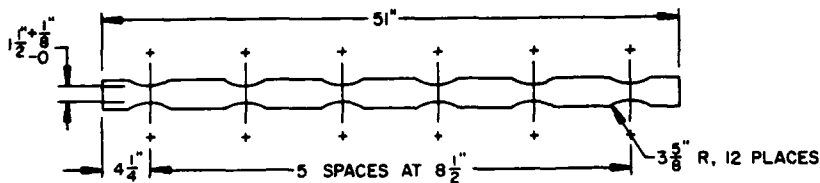
SPECIAL NOTE:

1. THE UNIT DEPICTED ABOVE MAY BE REDUCED BY ONE COMPLETE LAYER OF CONTAINERS BY THE DELETION OF TWO INTERMEDIATE DUNNAGE PIECES AND SIX CONTAINERS, AND BY DECREASING STRAP LENGTHS APPROPRIATELY. THIS WILL RESULT IN AN OVERALL UNIT HEIGHT OF 40-3/8".
2. DIMENSIONS GIVEN FOR DUNNAGE PIECES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY TO THE PALLET UNIT. CONTAINERS MUST FIT SNUGLY IN THE DUNNAGE PIECES. ALSO, DUE TO THE VARIANCE OF CONTAINER DIMENSIONS, ADJUSTMENTS MAY BE REQUIRED AS TO THE LOCATION OF CERTAIN PIECES OF DUNNAGE.

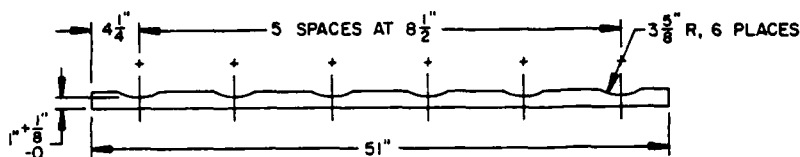




STRAPPING BOARD 2" X 4" MATERIAL (2 REQD)

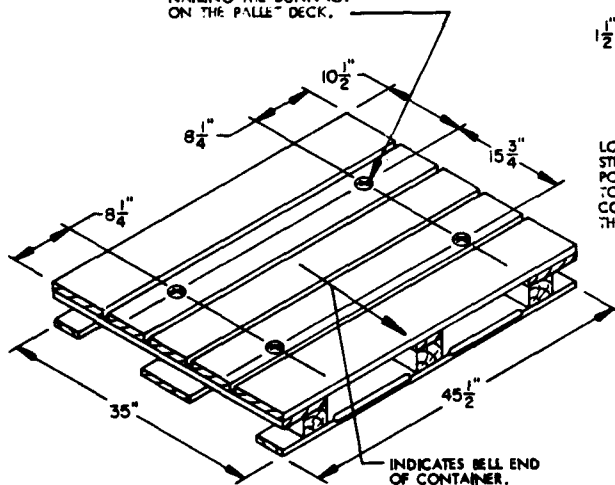


INTERMEDIATE DUNNAGE 3" X 4" MATERIAL (8 REQD)



PALLET DUNNAGE
2" X 4" MATERIAL (2 REQD)

2" DIAMETER HOLE, 4 PLACES. HOLES MUST BE DRILLED PRIOR TO NAILING THE DUNNAGE ON THE PALLET DECK.

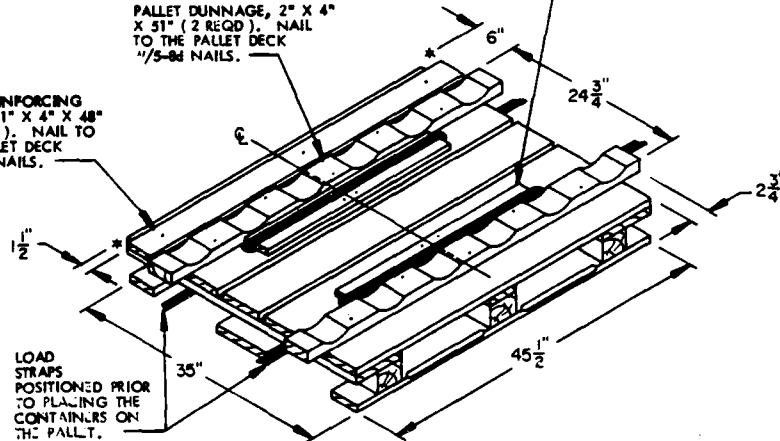


PALLET WITH PREDRILLED HOLES

DECK REINFORCING BOARD, 1" X 4" X 48" (1 REQD). NAIL TO THE PALLET DECK W/3-6d NAILS.

PALLET DUNNAGE, 2" X 4" X 51" (2 REQD). NAIL TO THE PALLET DECK W/5-6d NAILS.

DECK REINFORCING STRAPPING BOARD, 1" X 4" X 28" (2 REQD). NAIL TO THE PALLET DECK W/2-6d NAILS.



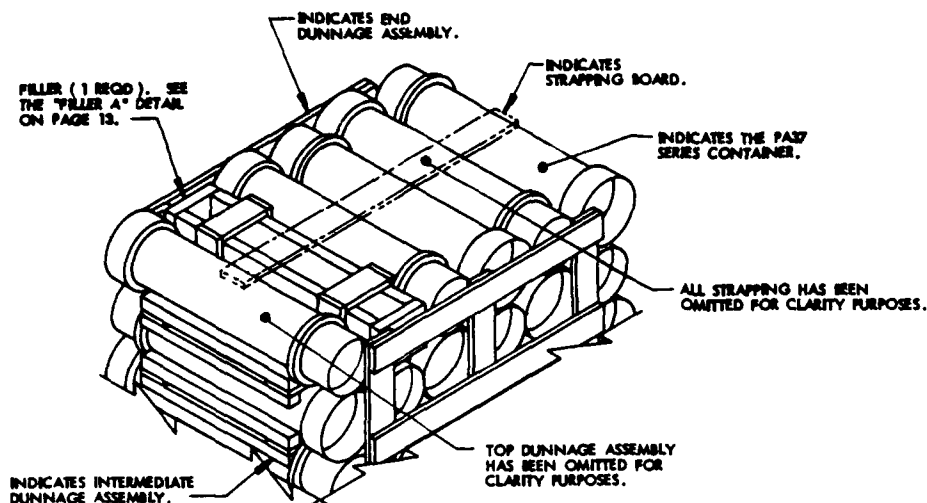
PALLET STRAPPING/DUNNAGE DETAIL

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	8.67	2.89
1" X 6"	3.67	1.83
2" X 4"	15.72	10.61
3" X 4"	34.00	34.00
NAILS	NO. REQD	POUNDS
6d (2")	7	0.04
8d (2-1/2")	14	0.15
PALLET, 35" X 45-1/2"	1 REQD	65 LBS
STEEL STRAPPING, 3/4"	62.17 REQD	4.44 LBS
SEAL FOR STRAPPING, 3/4"	4 REQD	NIL
STRAP STAPLE, 15/16"	18 REQD	NIL

UNIT DATA

WEIGHT

CUBE	51.4 CUBIC FEET (APPROX)	
CONTAINER, PAS7 SERIES	30 EACH @ 42 LBS	1,260 LBS (APPROX)
DUNNAGE		104 LBS
PALLET		65 LBS
TOTAL WEIGHT		1,429 LBS (APPROX)

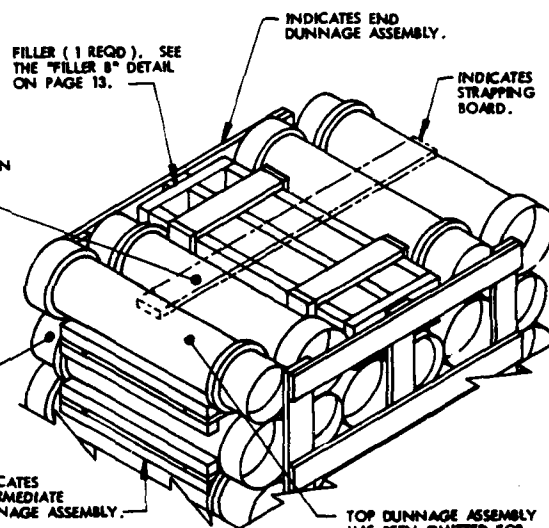


DETAIL A

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS ONE CONTAINER IS TO BE UNITIZED. THIS ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

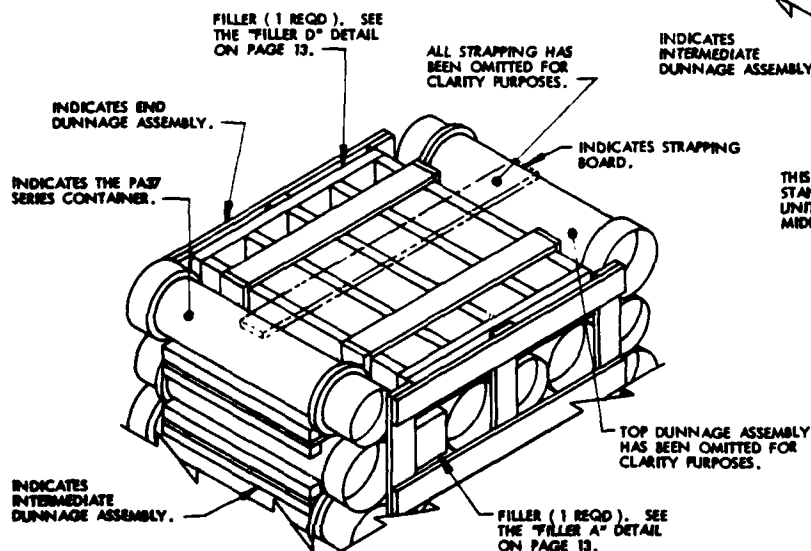
ALL STRAPPING HAS BEEN OMITTED FOR CLARITY PURPOSES.

INDICATES THE P&H SERIES CONTAINER.



DETAIL B

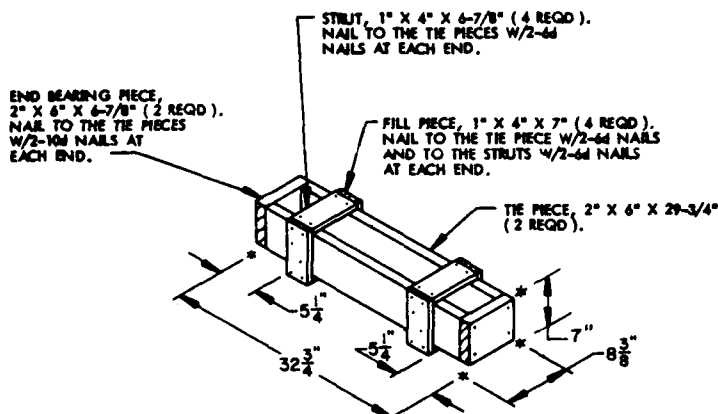
THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS TWO CONTAINERS IS TO BE UNITIZED. THIS ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.



DETAIL C

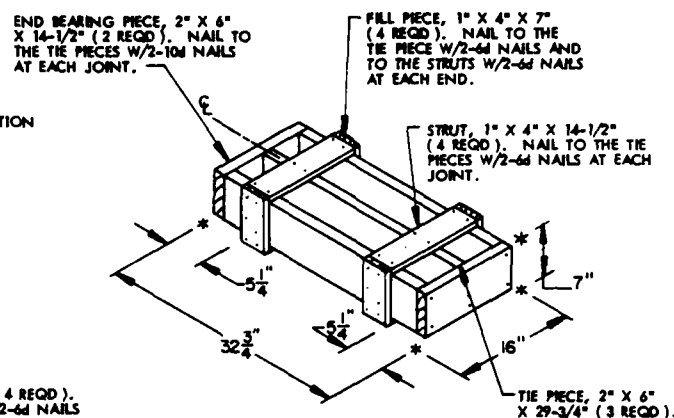
THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS FIVE CONTAINERS IS TO BE UNITIZED. THESE ASSEMBLIES MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OR LAYERS OF A PALLET UNIT. WHEN SIX CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, A COMPLETE LAYER OF CONTAINERS MUST BE OMITTED. A COMBINATION OF FILLERS MUST BE USED WHEN FIVE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT. A COMBINATION OF FILLERS OR ONE OF THE FILLERS DEPICTED ON PAGE 13 MAY BE USED WHEN FOUR OR LESS CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT. ALL FILLER ASSEMBLIES MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OR LAYERS OF A PALLET UNIT.

FILLERS AND INSTALLATION PROCEDURES FOR OMITTED CONTAINERS (ALTERNATED CONTAINERS)



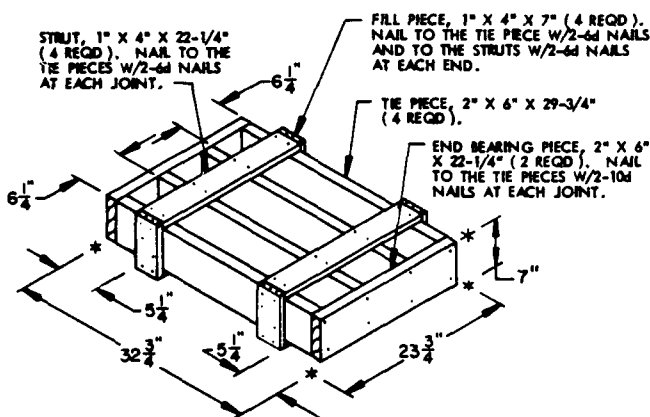
FILLER A

THIS FILLER IS TO BE USED WHEN ONE CONTAINER IS TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



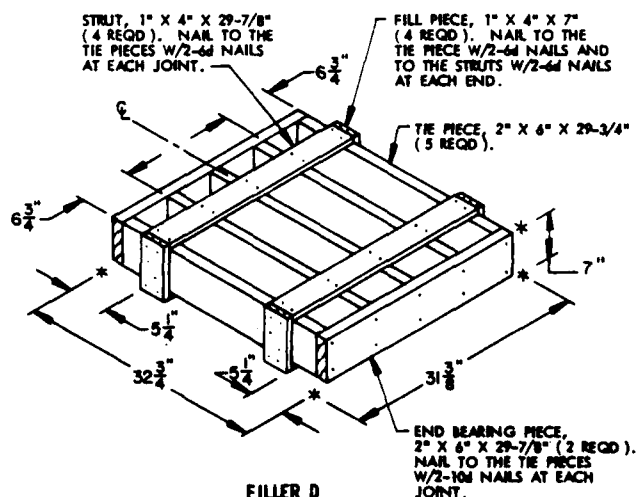
FILLER B

THIS FILLER IS TO BE USED WHEN TWO CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



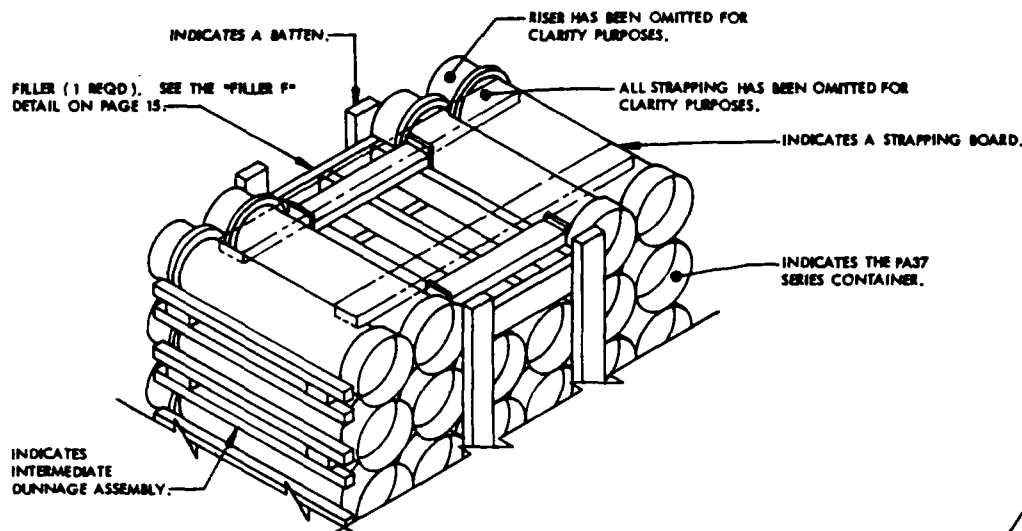
FILLER C

THIS FILLER IS TO BE USED WHEN THREE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



FILLER D

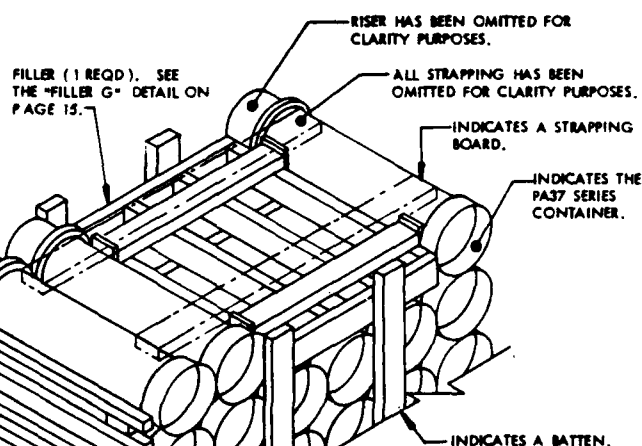
THIS FILLER IS TO BE USED WHEN FOUR CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



DETAIL D

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS TWO CONTAINERS IS TO BE UNITIZED. THIS ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

INDICATES INTERMEDIATE DUNNAGE ASSEMBLY.

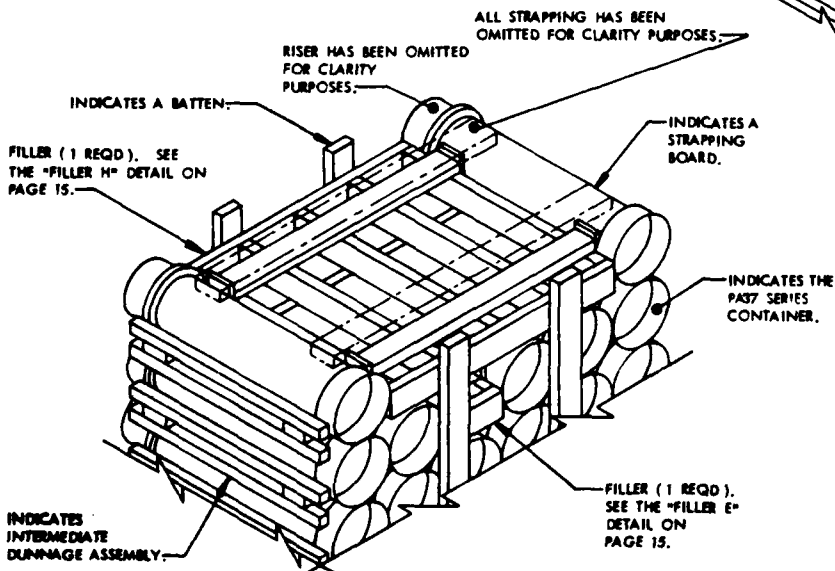


DETAIL E

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS THREE CONTAINERS IS TO BE UNITIZED. THIS ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

SPECIAL NOTES:

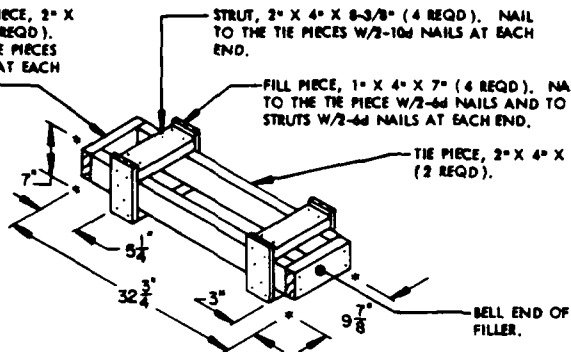
1. WHEN SIX CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, A COMPLETE LAYER OF CONTAINERS MUST BE OMITTED. A COMBINATION OF FILLERS MUST BE USED WHEN FIVE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT. A COMBINATION OF FILLERS OR ONE OF THE FILLERS DEPICTED ON PAGE 15 MAY BE USED WHEN FOUR OR LESS CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT. ALL FILLERS MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OR LAYERS OF A PALLET UNIT.
2. WHEN USING FILLER ASSEMBLIES FOR OMITTED CONTAINERS IN A PALLET UNIT, THE LENGTH OF THE BATTENS MUST BE ADJUSTED SO THAT TIGHTENING OF THE TIEDOWN STRAPS DOES NOT DAMAGE (I.E. BREAK OR SPLIT) THE ENDS OF THE BATTENS.



DETAIL F

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS FIVE CONTAINERS IS TO BE UNITIZED. THESE ASSEMBLIES MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OR LAYERS OF A PALLET UNIT.

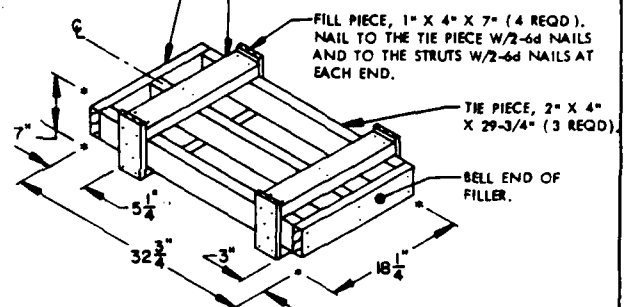
END BEARING PIECE, 2" X 4" X 8-3/8" (2 REQD). NAIL TO THE TIE PIECES W/2-10d NAILS AT EACH END.



FILLER E

THIS FILLER IS TO BE USED WHEN ONE CONTAINER IS TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.

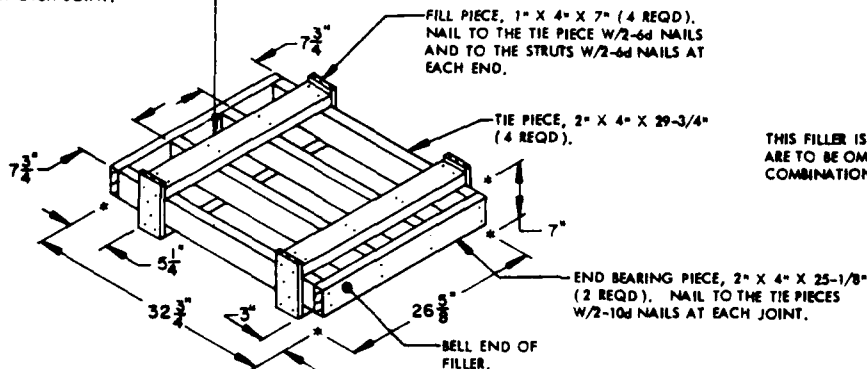
END BEARING PIECE, 2" X 4" X 16-3/4" (2 REQD). NAIL TO THE TIE PIECES W/2-10d NAILS AT EACH JOINT.



FILLER F

THIS FILLER IS TO BE USED WHEN TWO CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.

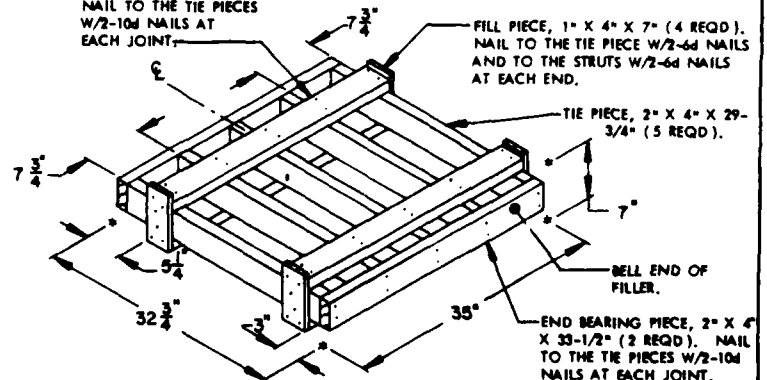
STRUT, 2" X 4" X 25-1/8" (4 REQD). NAIL TO THE TIE PIECES W/2-10d NAILS AT EACH JOINT.



FILLER G

THIS FILLER IS TO BE USED WHEN THREE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.

STRUT, 2" X 4" X 33-1/2" (4 REQD). NAIL TO THE TIE PIECES W/2-10d NAILS AT EACH JOINT.



FILLER H

THIS FILLER IS TO BE USED WHEN FOUR CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.

FILLER (1 REQD.). SEE THE "FILLER J" DETAIL ON PAGE 17.

RISER HAS BEEN OMITTED FOR CLARITY PURPOSES.

ALL STRAPPING HAS BEEN OMITTED FOR CLARITY PURPOSES.

INDICATES A STRAPPING BOARD.

INDICATES THE PA37 SERIES CONTAINER.

INDICATES INTERMEDIATE DUNNAGE.

INDICATES A BATTEN.

DETAIL G

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS ONE CONTAINER IS TO BE UNITIZED. THIS ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

FILLER (1 REQD.). SEE THE "FILLER K" DETAIL ON PAGE 17.

INDICATES INTERMEDIATE DUNNAGE.

ALL STRAPPING HAS BEEN OMITTED FOR CLARITY PURPOSES.

RISER HAS BEEN OMITTED FOR CLARITY PURPOSES.

INDICATES A STRAPPING BOARD.

INDICATES A BATTEN.

INDICATES THE PA37 SERIES CONTAINER.

DETAIL H

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS TWO CONTAINERS IS TO BE UNITIZED. THIS ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

FILLER (1 REQD.). SEE THE "FILLER L" DETAIL ON PAGE 17.

RISER HAS BEEN OMITTED FOR CLARITY PURPOSES.

INDICATES A STRAPPING BOARD.

INDICATES A BATTEN.

INDICATES THE PA37 SERIES CONTAINER.

INDICATES INTERMEDIATE DUNNAGE.

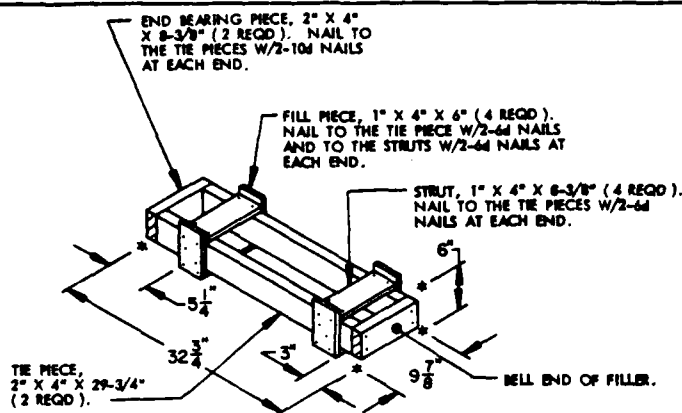
ALL STRAPPING HAS BEEN OMITTED FOR CLARITY PURPOSES.

DETAIL J

THIS DETAIL DEPICTS PROCEDURES TO BE USED WHEN A STANDARD UNIT MINUS THREE CONTAINERS IS TO BE UNITIZED. THIS ASSEMBLY MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OF THE PALLET UNIT.

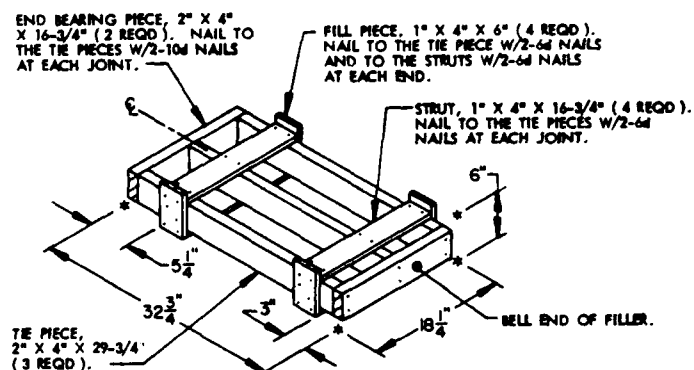
SPECIAL NOTES:

1. WHEN SIX CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, A COMPLETE LAYER OF CONTAINERS MUST BE OMITTED. A COMBINATION OF FILLERS MUST BE USED WHEN FIVE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT. A COMBINATION OF FILLERS OR ONE OF THE FILLERS DEPICTED ON PAGE 17 MAY BE USED WHEN FOUR OR LESS CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT. ALL FILLERS MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER OR LAYERS OF A PALLET UNIT.
2. WHEN USING FILLER ASSEMBLIES FOR OMITTED CONTAINERS IN A PALLET UNIT, THE LENGTH OF THE BATTENS MUST BE ADJUSTED SO THAT TIGHTENING OF THE TIEDOWN STRAPS DOES NOT DAMAGE (I.E., BREAK OR SPLIT) THE ENDS OF THE BATTENS.



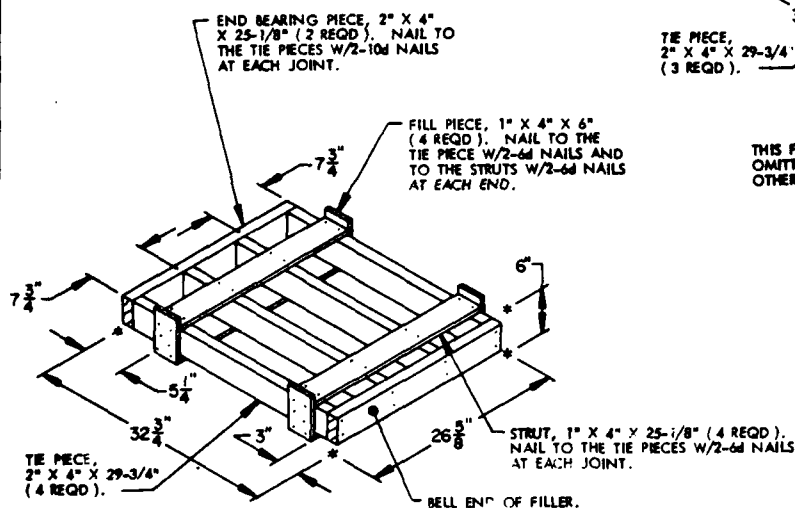
FILLER J

THIS FILLER IS TO BE USED WHEN ONE CONTAINER IS TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



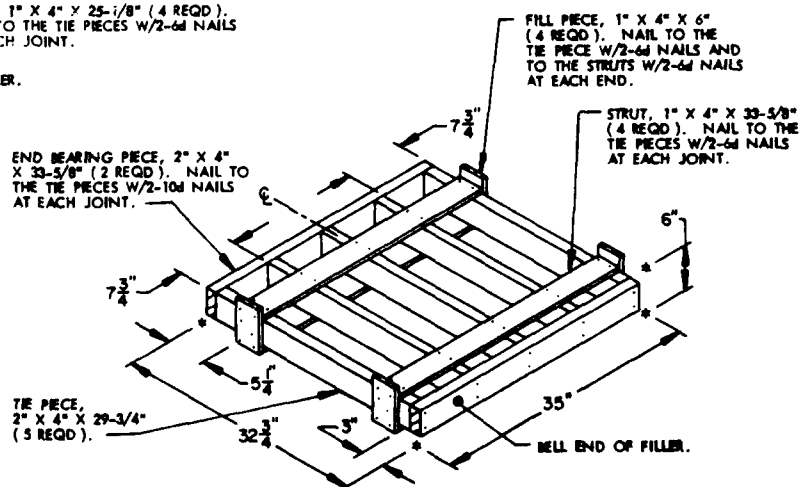
FILLER K

THIS FILLER IS TO BE USED WHEN TWO CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



FILLER L

THIS FILLER IS TO BE USED WHEN THREE CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.



FILLER M

THIS FILLER IS TO BE USED WHEN FOUR CONTAINERS ARE TO BE OMITTED FROM A PALLET UNIT, OR IN COMBINATION WITH OTHER FILLER ASSEMBLIES.

