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REPORT NO. 96-11

ROCKET PROPELLED GRENADE (RPG), RPG-7VM, MIL-STD-1660 TESTS

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Foreign Materiel Intelligence Battalion
ATTN: IAM-T-CDR
Aberdeen Proving Ground, MD 21005-5301

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**VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639**



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19. ABSTRACT (Continue on reverse if necessary and identify by block number) The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Foreign Materiel Intelligence Battalion, IAM-T-CDR, to conduct MIL-STD-1660 tests on palletized Rocket Propelled Grenades (RPGs), RPG-7VM, used in training U.S. and Allied forces. This pallet passed all MIL-STD-1660, Design Criteria for Ammunition Unit Loads, tests. This report contains details of the tests conducted.					
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U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
VALIDATION ENGINEERING DIVISION
SAVANNA, IL 61074-9639

REPORT NO. 96-11

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Foreign Materiel Intelligence Battalion, IAM-T-CDR, to conduct MIL-STD-1660 tests on palletized Rocket Propelled Grenades (RPGs), RPG-7VM, used in training U.S. and Allied forces.

B. AUTHORITY. These tests were conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL.

C. OBJECTIVE. To determine whether foreign ammunition shipping boxes meet MIL-STD-1660, Design Criteria for Ammunition Unit Loads.

D. CONCLUSION. As tested, the palletized RPGs, RPG-7VM, met all design and testing requirements for MIL-STD-1660.

PART 2

AUGUST 1995

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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. This standard identifies nine steps that a unitized load must undergo if it is to be considered acceptable. The five tests that were conducted on the test pallets are summarized below.

A. SUPERIMPOSED LOAD TEST. The unit load was loaded to simulate a stack of identical unit loads stacked 16 feet high for a period of one hour. This stacking load was simulated by subjecting the unit load to a compression 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 minus the unit height in inches, then divided by the unit height in inches, then multiplied by a safety factor of two. The resulting number is the equivalent compressive force of a 16-foot-high load.

B. REPETITIVE SHOCK TEST. The repetitive shock test was conducted IAW Method 5019, Federal Standard 101. The test procedure was as follows: the test specimen was placed on, but not fastened to, the platform. With the specimen in one position, the platform was vibrated at 1/2-inch amplitude (1-inch double amplitude) starting at a frequency of approximately 3 cycles per second. The frequency was steadily increased until the package left the platform. The resonant frequency is achieved when a 1/16-inch-thick feeler gage 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 1 ± 0.1 G. Midway into the testing period, the specimen was rotated 90 degrees and the test continued for the duration. Unless failure occurs, the total time of vibration is two hours when the specimen is tested in one position. When the specimen is tested in more than one position, the total time is three hours.

C. EDGEWISE ROTATIONAL DROP TEST. This test was conducted using the procedures of Method 5008, Federal Standard 101. The procedure for the Edgewise Rotational Drop Test is as follows: The specimen was placed on its skids with one end of the pallet supported on a beam 4-1/2 inches high. The height of the beam was increased, when necessary, to ensure that there was no support for the skids between the ends of the pallet when dropping took place, but was not high enough to cause the pallet to slide on the supports when the dropped end was raised for the drops. The unsupported end of the pallet was then 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 conforms to the following tabulation:

GROSS WEIGHT NOT EXCEEDING (Pounds)	DIMENSIONS ON ANY EDGE NOT EXCEEDING (Inches)	HEIGHT OF DROP LEVEL A PROTECTION (Inches)
600	72	36
3,000	no limit	24
no limit	no limit	12

D. INCLINE-IMPACT TEST. This test was conducted 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 was placed on the carriage with the surface or edge to be impacted projecting at least 2 inches beyond the front end of the carriage. The carriage was 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 4- by 4-inch timber may be attached to the bumper in the desired position before the test. No part of the timber was struck by the carriage. The position of the container on the carriage and the sequence in which surfaces and edges were subjected to impacts was at the option of the testing activity and depended 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 was subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at the time of impact was 7 feet-per-second.

PART 4

TEST ITEM

Pallet Weight	1,000 pounds
Pallet Height	46-3/4 inches
Pallet Width	35 inches
Pallet Length	45-1/2 inches
Number of RPG-7VM Boxes	9

PART 5

TEST RESULTS

A. SUPERIMPOSED LOAD TEST. The pallet was loaded to 6,500 pounds compression for a period of 1 hour with the unitization straps remaining taut during the test. No problems were encountered during this test.

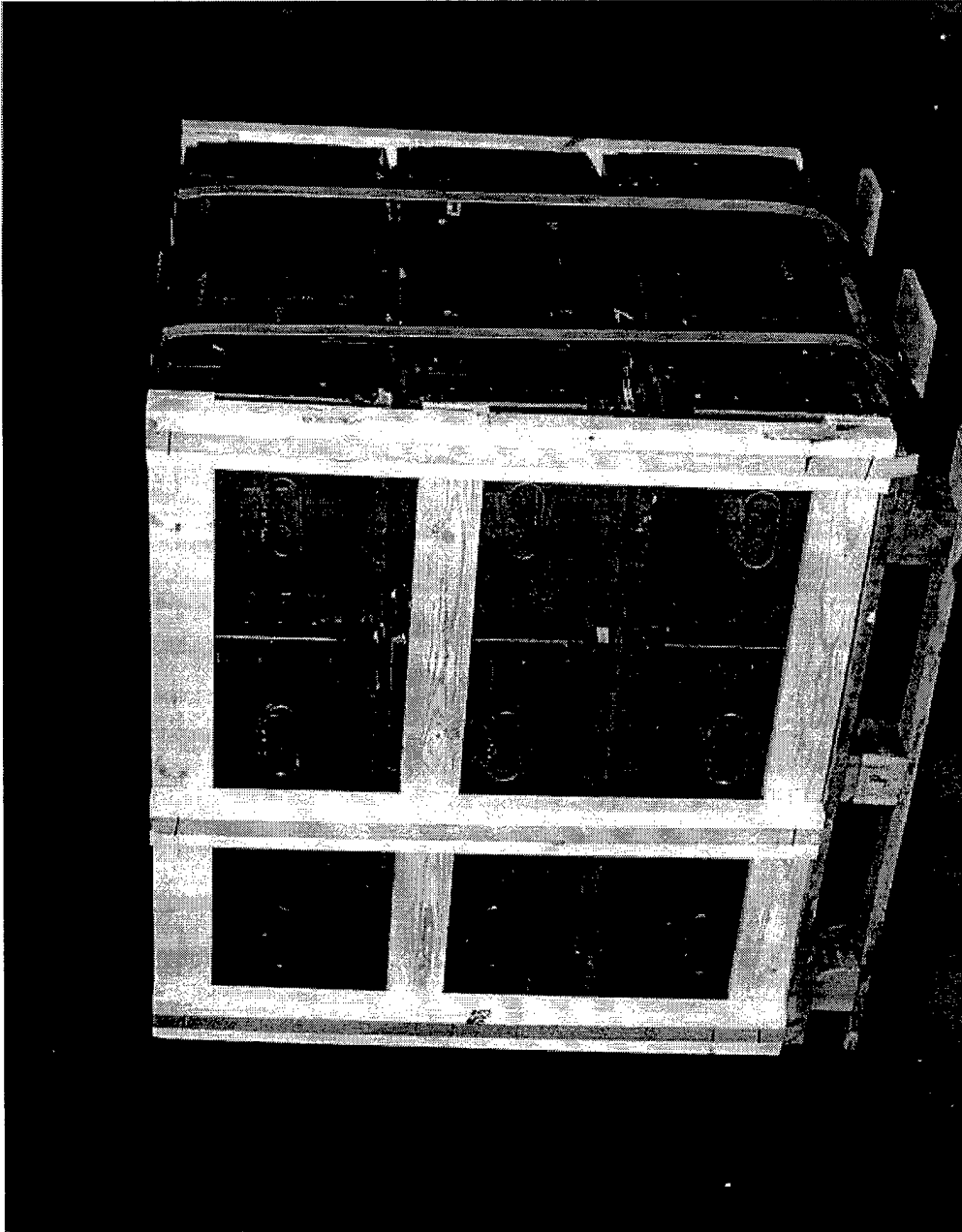
B. REPETITIVE SHOCK TEST. During the first 90 minutes of the test the vibration table was operated at 115 rpm. No problems were encountered. The pallet was rotated 90 degrees and the test repeated for an additional 90 minutes. This time, the vibration table was operated at 120 rpm, with no problems encountered.

C. EDGEWISE ROTATIONAL DROP TEST. Four edgewise rotational drops were conducted on this pallet from a height of 24 inches. After each drop, the pallet was rotated 90 degrees (clockwise) until all four drops were completed. No problems were encountered during this test.

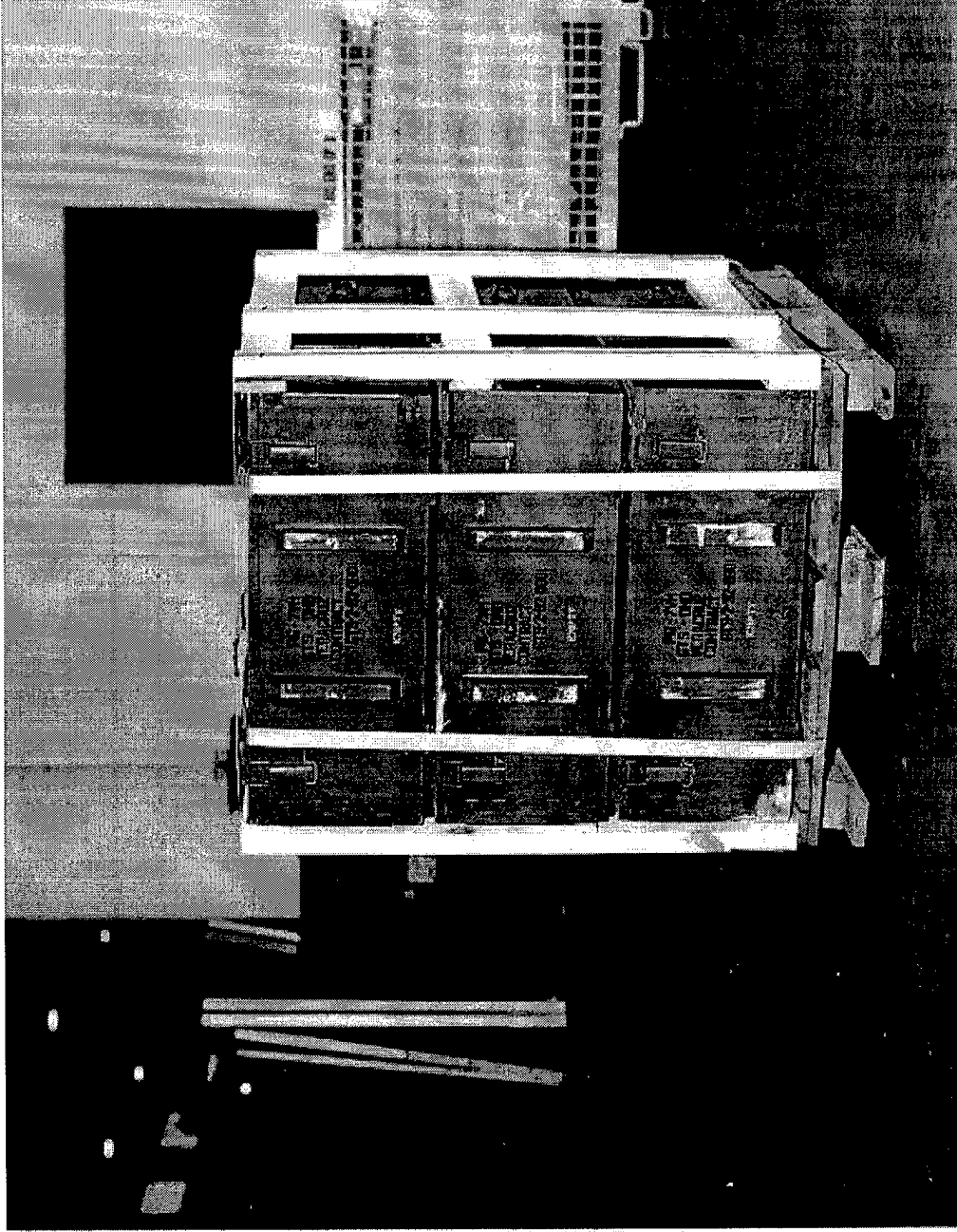
D. INCLINE-IMPACT TEST. Four impacts were conducted on this pallet. After each impact, the pallet was rotated 90 degrees (clockwise) until all four sides were tested. No problems were encountered during this test.

PART 6

PHOTOGRAPHS

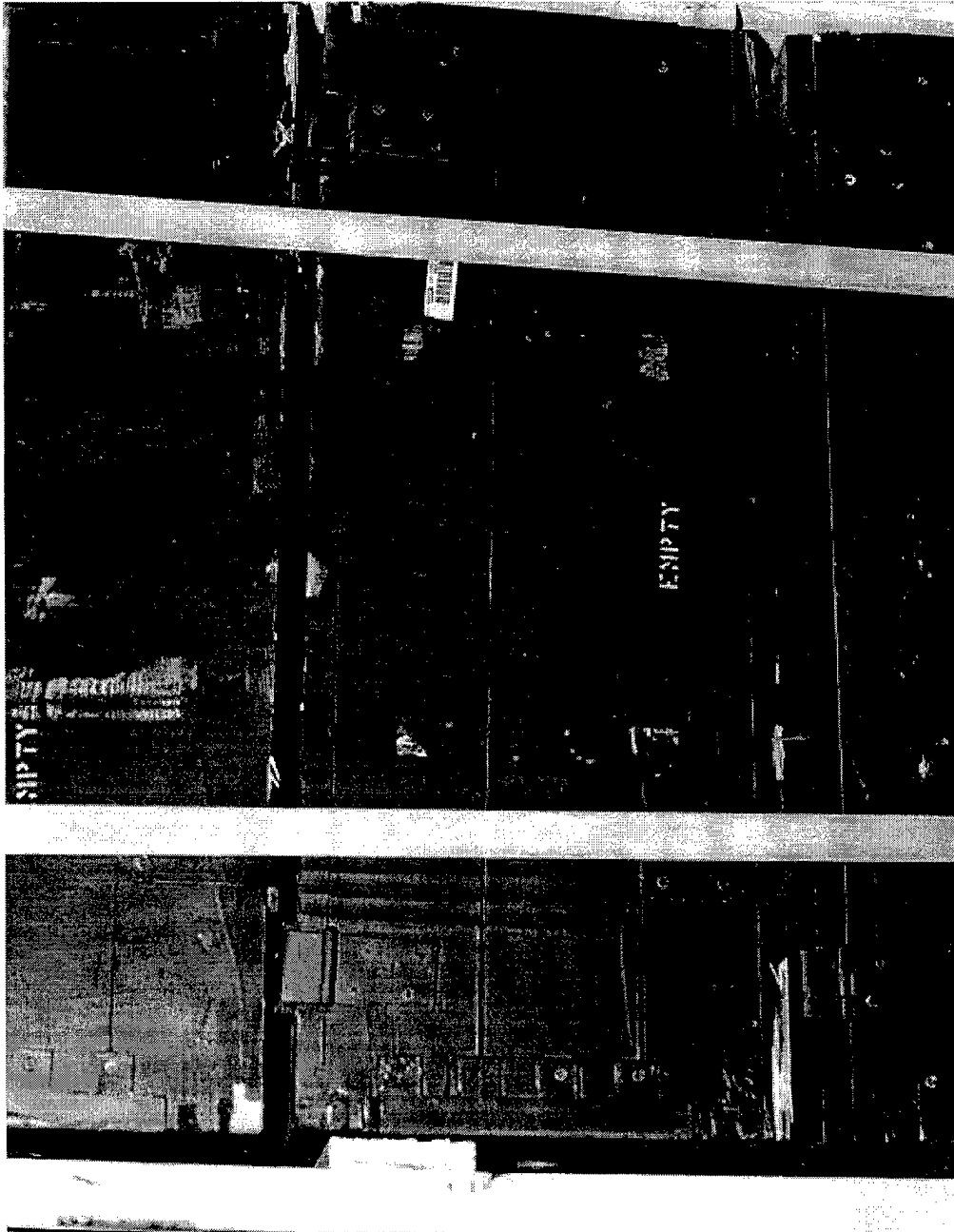


	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
AO317-SCN96-5-284. This photo shows an overall view of the pallet following testing.		



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

AO317-SCN96-5-283. This photo shows an overall view of the pallet following testing.



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
AO317-SCN96-5-281. This photo shows a closeup view of the pallet box following testing.		

PART 7

DRAWING

APPENDIX 1

UNITIZATION PROCEDURES FOR BOXED FOREIGN AMMUNITION AND COMPONENTS ON 4-WAY ENTRY PALLETS

ROCKET PROPELLED GRENADE (RPG), MODEL 7V,
WITHOUT LAUNCHER PACKED 9 PER WOODEN BOX
UNITIZED 9 BOXES PER 35" X 45-1/2" PALLET;
APPROX BOX SIZE 33-1/4" L X 15-7/8" W X
14-1/4" H

NOTICE: THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH
THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4116-20PA1002.

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MAY 1995

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DRAWING

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19

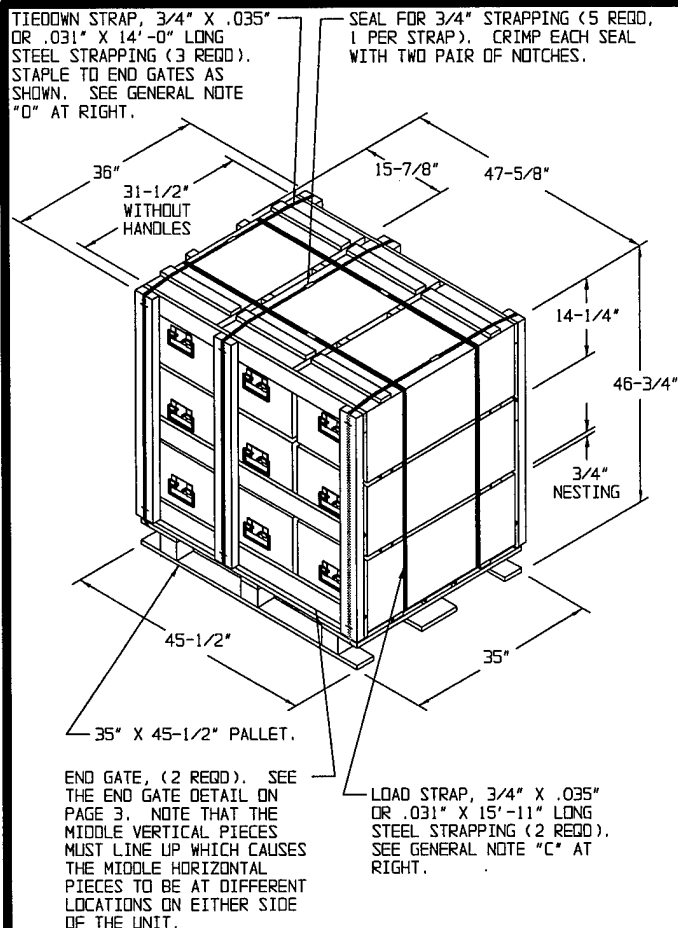
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4541/
1

20PA
1002

DO NOT SCALE

PROJECT CA 325/1-95



PALLET UNIT

SEE GENERAL NOTE "B" AT RIGHT

9 BOXES OF GRENADES (9 PER BOX) @ 88 LBS ----- 792 LBS (APPROX)
DUNNAGE ----- 49 LBS
PALLET ----- 65 LBS

TOTAL WEIGHT ----- 906 LBS (APPROX)
CUBE ----- 46.4 CU FT (APPROX)

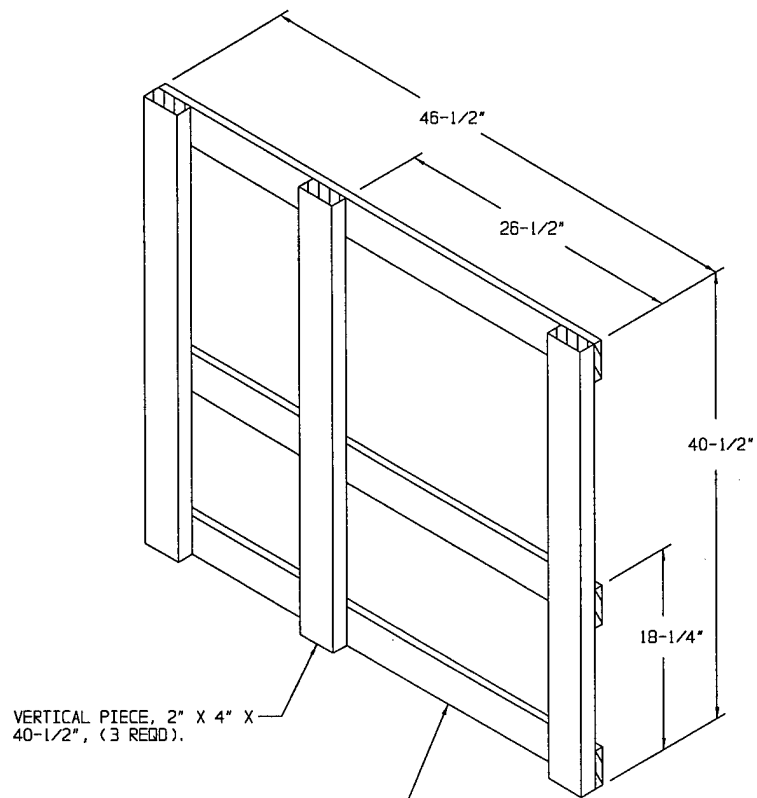
GENERAL NOTES

- A. THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4116-20PA1002. 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 BOXES AND THE WEIGHT OF THE SPECIFIC ITEM BEING UNITIZED.
- C. THE LOAD STRAPS MAY BE THREADED THROUGH THE STRAP SLOTS OF THE PALLET OR PRE-POSITIONED ON THE PALLET DECK PRIOR TO PLACING BOXES ON THE PALLET. LOAD STRAPS MUST BE TENSIONED AND SEALED PRIOR TO APPLICATION OF TIEDOWN STRAPS.
- D. INSTALL EACH TIEDOWN STRAP TO PASS UNDER THE DECK/STRINGER BOARDS OF THE PALLET AND TO BE LOCATED AS SHOWN. TIEDOWN STRAPS WILL NOT BE APPLIED UNTIL THE LOAD STRAPS HAVE BEEN TENSIONED AND SEALED.
- E. THE FOLLOWING AMC DRAWINGS ARE APPLICABLE FOR OUTLOADING AND STORAGE OF THE ITEMS COVERED BY THIS APPENDIX.

CARLOADING	-----	19-48-4115-5PA1002
TRUCKLOADING	-----	19-48-4117-11PA1003
STORAGE	-----	19-48-4118-1-2-3-4-14-22PA1002
END OPENING ISO		
CONTAINER	-----	19-48-4153-15PA1002
MILVAN	-----	19-48-4166-15PA1003
SIDE OPENING ISO		
CONTAINER	-----	19-48-4267-15PA1009
- F. FOR METHOD OF SECURING A STRAP CUTTER TO THE PALLET UNIT, SEE AMC DRAWING 19-48-4127-20P1000.
- G. IF ITEMS COVERED HEREIN ARE UNITIZED PRIOR TO ISSUANCE OF THIS APPENDIX, THE BOXES NEED NOT BE REUNITIZED SOLELY TO CONFORM TO THIS APPENDIX.
- H. THE UNITIZATION PROCEDURES DEPICTED HEREIN MAY ALSO BE USED FOR UNITIZING FOREIGN MUNITIONS OTHER THAN ROCKET PROPELLED GRENADES, PROVIDED THE BOX PACK DOES NOT VARY FROM WHAT IS DESCRIBED HEREIN AND IN SPECIAL PACKAGING INSTRUCTION (SPI) AOP-1330-FMIB-3.
- J. THE STYLE 1A PALLET DELINEATED IN THE DETAIL AT LEFT NEED NOT HAVE CHAMFERS OR STRAP SLOTS AS SPECIFIED WITHIN MILITARY SPECIFICATION MIL-P-15011 WHEN USED FOR THE UNITIZATION OF ITEMS COVERED BY THIS APPENDIX.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	23.25	7.75
2" X 4"	20.25	13.50
NAILS	NO. REQD	POUNDS
6d (2")	54	0.32
PALLET, 35" X 45-1/2"	1 REQD	65 LBS
STEEL STRAPPING, 3/4"	73.83' REQD	5.27 LBS
SEAL FOR 3/4" STRAPPING	5 REQD	NIL
STAPLE, 15/16" OR 1" X 3/4"	12 REQD	NIL



END GATE
(2 REQD)

NOTE: THE GATE WILL NOT EXTEND PAST THE EDGE OF THE BOX SO THE 1-1/8" CLEAT WILL NOT BE INCLUDED IN THE HORIZONTAL DIMENSION OF THE GATE.

PART 8

APPENDIX

POP TESTS

Box 1 With Wood Cradles

U.S. Army Defense Ammunition Center & School
SMCAC-DEV, Savanna, IL 61070
815-273-8090
W.R. Meyer

Test Report Number: 95-10	Service Code: AYA
Product FOM: 12-1330-3-70-1	Nomenclature: Rocket Propelled Grenade, RPG-7VM
Shipping Name: Rockets, with Bursting Charge	UN ID Number: 0181
Hazard Class: 1.1F	Packing Group: II
Physical State: Solid	NALC/DODAC: None
CAA Number: None	EX Number: None
CFR 49 Packaging Method: E0146(A)	
Net Explosive Weight: 0.877 kg (1.93 lbs)	

DESCRIPTION OF PACKAGINGS TO BE TESTED

EXTERIOR CONTAINER

Exterior Container: Natural Wood Box
CFR 49 Reference Number: 173.62
UN Code: 4C
NSN Exterior Container: N/A
Specifications: 4C (Foreign)
Net Quantity Weight: 24.06 kg (53 lbs)
Tested Gross Weight: 42.22 kg (93 lbs)
Dimensions Interior: L-30.0" X W-13.375" X H-11.25"
Manufacturer: Unknown

Year Container Manufactured: Unknown

Drawing Number(s): ADP 1330-FMIB-3

Cushioning: Wood Cradles (w/holes tapered and covered w/rubber pad)
Wood divider creates box to hold propulsion charges.
Wood spacers fill out box to hold propulsion charges.

Closure: Metal Latch/Hasp w/security wire tie
2 metal bands 5/8" X .023" w/double notch clip

INTERMEDIATE CONTAINER

Intermediate Container Description: None

Specification Number: Foreign

Container NSN: None

Intermediate Container Cushioning: None

Intermediate Container Closure Method: N/A

Intermediate Container Dimensions: N/A

Number Of Intermediate Containers: N/A

UNIT CONTAINER

Unit Container Description: Clear Plastic Barrier Bag

Unit Container Specification: Foreign

Unit Container NSN: N/A

Unit Container Cushioning: None

Unit Container Closure Method: Heat Sealed

Unit Container Dimensions: N/A

Number of Unit Containers: 9

SPECIAL NOTES

CAUTION:

The Box can not be used prior to modification of the box cradle support system. Modify the box as follows.

- 1) The side cleats on the box are removed and replaced by 5/8" plywood. The plywood should be cut to fit with the gap between the cleats and the cradle component not to exceed 1/16".
- 2) Wood fill is nailed to the top of the cradle so that the top of the fill when the rockets are already in place exceeds the top of the box by 1/2". This creates compression on the rockets, preventing them from sliding.

Rockets are packaged in 3 layers with each layer being 3 wide. The second row of rockets is in the reverse orientation (nose in the opposite direction) of the first and third rows.

All exterior and intermediate containers must be inspected prior to use. Inspect for physical damage and structural integrity of the containers.

SUPPLEMENTAL INFORMATION

Permitted Transportation Modes: Military or DoD licensed truck and rail,
Military or DoD licensed ship

Specific Gravity: N/A

Hydrostatic Test Pressure Applied: N/A

Leakproofness Test Pressure Applied: N/A

TEST PROCEDURES

Tests Conducted	Test Method	Test Results
(1) Pre-Conditioning (fiberboard)	Part 178.602	N/A
(2) Drop Test	Part 178.603(e) (1) (ii)	Pass
(3) Leakproofness Test	Part 178.604	N/A
(4) Hydrostatic Pressure Test	Part 178.605	N/A
(5) Stacking Test (1,100 lbs)	Part 178.606(c) (1)	Pass
(6) Vibration Test	Part 178.608(b) (3)	Pass

POP Marking

u 4C/Y42.22/S/*
n USA/DOD/AYA