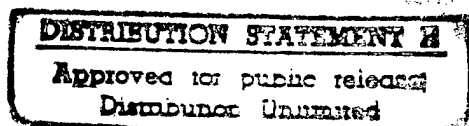


FINAL REPORT
AUGUST 1996

REPORT NO. 96-70

40MM (M781) PROJECTILES IN
WIREBOUND BOX
UNITED NATIONS (UN)
PERFORMANCE ORIENTED
PACKAGING (POP) TESTS



Prepared for:
U.S. Army Armament Research, Development
and Engineering Center
ATTN: AMSTA-AR-ESK
Rock Island, IL 61299-7300

19970616 035



VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639

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FIELD	GROUP	SUB-GROUP			
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 U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct United Nations (UN) Performance Oriented Packaging (POP) tests on 40MM (M781) projectiles in a wirebound box so this item can be shipped IAW UN POP requirements. This report contains the test results.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL JEROME H. KROHN		22b. TELEPHONE (Include Area Code) 815-273-8929		22c. OFFICE SYMBOL SIOAC-DEV	

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

REPORT NO. 96-70

40MM (M781) PROJECTILES IN WIREBOUND BOX UNITED NATIONS (UN)
PERFORMANCE ORIENTED PACKAGING (POP) TESTS

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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 U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct United Nations (UN) Performance Oriented Packaging (POP) tests on 40mm (M781) projectiles in a wirebound box for compliance with UN POP requirements.

B. AUTHORITY. This program was conducted IAW mission responsibilities delegated by the U.S. Army Materiel Command (AMC), Logistics Support Activity Packaging, Storage, and Containerization Center (LOGSAPSCC). Effective 9 July 1993, the three letter designator "DEV" was assigned for use when conducting UN POP tests. Effective 9 August 1994 this designation was included in the Joint Regulation AR 700-143, Performance Oriented Packaging of Hazardous Materials.

C. OBJECTIVE. To determine if this item meets UN POP requirements.

D. CONCLUSION. As tested, the 40mm (M781) projectiles in a wire boundbox met all UN POP requirements with no problems encountered during testing.

PART 2

AUGUST 1996

ATTENDEES

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General Engineer
DSN 585-8090
815-273-8090

Bradley J. Haas
Mechanical Engineer
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Director
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Savanna, IL 61074-9639

Director
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PART 3

TEST PROCEDURES

The test procedures outlined herein were extracted and summarized from the Bureau of Explosives (BOE) Tariff No. BOE-6000-L, Subpart M, Section 178.600. All tests were conducted to Packing Group II requirements.

A. Drop Test. Each package will be dropped onto a nonyielding surface from the height and orientations listed below. The drop height is measured as the vertical distance from the target to the lowest point on the package. The drop height for Packing Group I is 1.8 meters (5.9 feet), for Packing Group II it is 1.2 meters (3.9 feet), and Packing Group III is 0.8 meters (2.6 feet).

Packaging	No. of tests	Drop orientation of samples
Steel drums, Aluminum drums, Metal drums (other than steel or aluminum), Steel jerricans, Plywood drums, Wooden barrels, Fiber drums, Plastic drums and jerricans, Composite packagings which are in the shape of a drum.	Six — (three for each drop)	First drop (using three samples): The package must strike the target diagonally on the chime or, if the packaging has no chime, on the circumferential seam or an edge. Second drop (using the other three samples): The package must strike the target on the weakest part not tested by the first drop, for example a closure or, for some cylindrical drums, the welded longitudinal seam of the drum body.
Boxes of natural wood, Plywood boxes, Reconstituted wood boxes, Fiberboard boxes, Plastic boxes, Steel or aluminum boxes, Composite packagings which are in the shape of a box.	Five — (one for each drop)	First drop: Flat on the bottom (using the first sample). Second drop: Flat on the top (using the second sample). Third drop: Flat on the long side (using the third sample). Fourth drop: Flat on the short side (using the fourth sample). Fifth drop: On a corner (using the fifth sample).
Bags — single-ply with a side seam.	Three — (three drops per bag) .	First drop: Flat on a wide face (using all three samples). Second drop: Flat on a narrow face (using all three samples). Third drop: On an end of the bag (using all three samples).
Bags — single-ply without a side seam, or multi-ply	Three — (three drops per bag) .	First drop: Flat on a wide face (using all three samples). Second drop: On an end of the bag (using all three samples).

B. Stacking Test. The test sample must be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages which might be stacked on it during transport. The minimum height of the stack, including the test sample, must be 3.0 meters (10 feet). The duration of the test must be 24 hours, except that plastic drums, jerricans, and composite packaging 6HH, intended for liquids, shall be subjected to the stacking test for a period of 28 days at a temperature of not less than 40 degrees Celsius (104 degrees Fahrenheit). Alternative test methods which yield equivalent results may be used if approved by the Associate Administrator for Hazardous Materials Safety.

C. Vibration Test. Three sample packagings, selected at random, must be filled and closed as for shipment. The three samples must be placed on a vibrating platform that has a vertical or

rotary double-amplitude (peak-to-peak displacement) of one inch. The packages should be constrained horizontally to prevent them from falling off the platform, but must be left free to move vertically, bounce and rotate. The test must be performed for one hour at a frequency that causes the package to be raised from the vibrating platform to such a degree that a piece of material approximately 1.6 mm (0.063 inch) thickness (such as steel strapping or paperboard) can be passed between the bottom of any package and the platform.

D. Pass/Fail Criteria. A package passes the above tests if there is no rupture or leakage from any of the samples. No test sample should show any deformation which could adversely affect transportation safety or any distortion liable to reduce packaging strength.

PART 4

UN POP TESTS

40mm (M781) Projectiles in Wirebound Box
United Nations (UN) Performance Oriented Packaging (POP) Tests

U.S. Army Defense Ammunition Center and School

SIOAC-DEV, Savanna, IL 61074-9639

815-273-8908

Jerome H. Krohn

Test Report Number: 96-70	Service Code: DEV
Product NSN: 1310-01-211-8073	Nomenclature: 40mm (M781) Projectiles in Wirebound Box
Shipping Name: Cartridge small arms	UN ID Number: 0339
Hazard Class: 1.4C	Packing Group: II
Physical State: Solid	NALC/DODAC: None
CAA Number: None	EX Number: None
CFR 49 Packaging Method: US005	
Net Explosive Weight: .000373 kg (.000823 lbs)	

DESCRIPTION OF PACKAGINGS TO BE TESTED

EXTERIOR CONTAINER

Exterior Container: Natural Wood Wirebound Box
CFR 49 Reference Number: 173.62
UN Code: 4C1
NSN Exterior Container: None
Specifications: MIL-B-46506 Drawing Number: N/A

Net Quantity Weight: 30 kg (65 lbs)

Tested Gross Weight: 35 kg (76 lbs)

Dimensions Interior: L-22-1/2" X W-10" X H-11"

Manufacturer: Unknown

Year Container Manufactured: Unknown

Drawing Number(s): 9381657

Cushioning: Cardboard fill as required to form a tight pack.

Closure: 3 wire fasteners

INTERMEDIATE CONTAINER

Intermediate Container Description: Fiberboard boxes

Specification Number: ASTM D 5118

Container NSN: N/A

Intermediate Container Cushioning: Partition - 9325892, 9325893

Intermediate Container Closure Method: Tape

Intermediate Container Dimensions: L-9" X W-9" X H-4-3/4"

Number Of Intermediate Containers: 4

UNIT CONTAINER

Unit Container Description: N/A

Unit Container Specification: N/A

Unit Container NSN: N/A

Unit Container Cushioning: N/A

Unit Container Closure Method: N/A

Unit Container Dimensions: N/A

Number of Unit Containers: N/A

SPECIAL NOTES

All exterior, intermediate, and unit 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,
Military or DOT licensed aircraft

Specific Gravity: N/A

Hydrostatic Test Pressure Applied: N/A

Leakproofness Test Pressure Applied: N/A

TEST PROCEDURES

<u>Tests Conducted</u>	<u>Test Method</u>	<u>Test Results</u>
(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 (1,500 lbs)	Part 178.606(c)(1)	Pass
(6) Vibration Test	Part 178.608(b)(3)	Pass

POP Marking

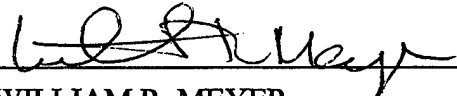
u 4C1/Y35/S/**


n USA/DOD/DEV

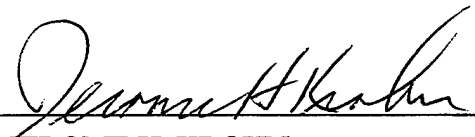
** Year of Manufacture

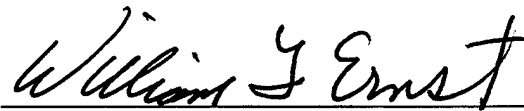
CERTIFICATION

Unless expressly stated to the contrary, we certify that all of the above applicable tests have been performed in strict conformance to CFR 49, Subpart M, Parts 178.600 - 178.608. Based on the successful test results shown above, this container is deemed suitable for transport of the hazardous material described herein, provided that maximum tested weights and quantities are not exceeded and the packaging is assembled as tested. The use of other packaging methods or components may make this test invalid.

PREPARED BY:  DATE: 19-MAR-97
WILLIAM R. MEYER
Test Engineer

PREPARED BY:  DATE: 19 March 97
BRADLEY J. HAAS
Test Engineer

SUBMITTED BY:  DATE: 19 March 97
JEROME H. KROHN
Chief, Validation Engineering Division

APPROVED BY:  DATE: 19 MARCH 97
WILLIAM F. ERNST
Chief, Logistics Engineering Office

PART 5

PACKAGING DRAWINGS

PACKING COMPONENTS

- 4 - BOX INNER - 9325894
- BOX, WIREBOUND, PACKING - 9381657
- FILLER, END - 9325896 - 1
- 9 - 1/8 X 8.7/8 - 1/8
- NOTES: 2, 3

FILLER, TOP/BOTTOM/SIDE - 9325896-2
9 - 3/8 - 1/8 X 9 - 1/8
NOTES: 2, 3

NOTES:

- 1 - SPEC MIL - A-2550 APPLIES.
- 2 - QUANTITY: - AS REQUIRED.
- 3 - MATERIAL: - FILLER, SHEET FORM, SPEC MIL - F-50449.

MARKING INSTRUCTIONS.

- M1 - THE BOX SHALL BE MARKED IN ACCORDANCE WITH DWG. 8796522.
- M2 - THE DESCRIPTIVE NOMENCLATURE SHALL BE:
100-CARTRIDGE 40MM PRACTICE M781
- M3 - NSN AND DODIC SHALL BE:
1310-01-148-8981-8519
OR
1310-01-211-8073-8519
AS APPLICABLE
- M4 - PROPER SHIPPING NAME AND IDENTIFICATION NUMBER SHALL BE:
CARTRIDGES FOR WEAPONS, INERT PROJECTILE UN Q335

PACKING INSTRUCTIONS

- P1 - REMOVE ALL LOOSE SPLINTERS FROM INSIDE THE BOX.
- P2 - ASSEMBLE THE WIREBOUND BOX AND PLACE A FILLER INTO THE BOTTOM OF THE BOX.
- P3 - PLACE THE FOUR BAGGED BOXES ON THEIR SIDES INTO THE CONTAINER.
- P4 - PLACE AN END FILLER ON EACH END, A SIDE FILLER ON EACH SIDE, AND A TOP FILLER ON TOP.
- P5 - PLACE ADDITIONAL FILLERS ON ENDS, SIDES AND TOP AS REQUIRED TO FORM A TIGHT PACK.
- P6 - CLOSE AND SEAL THE BOX IN ACCORDANCE WITH DRAWING 8796522.
- P7 - FOR PACKING OF LIGHT BOXES SEE DRAWING 9325874.

REUSE

REUSE OF PACKING MATERIALS (EXCEPT FOR BARRIER BAGS) IS PERMISSIBLE IF CONSIDERED ECONOMICALLY FEASIBLE AND IN REUSEABLE CONDITION BY THE PROCURING ACTIVITY. FOR REUSE INSTRUCTIONS SEE DRAWING 8796522.

THE CUBICAL DISPLACEMENT SHALL BE: 1.5

M5 - POP MARKING, IAW DRAWING 8796522, SHALL BE

MARKED WITH THE FOLLOWING INFORMATION:
 (U) 4G1Y28/S/LAST TWO DIGITS OF YEAR PACKED)
 (N) USA/DOD/AYD

DISTRIBUTION STATEMENT X.
 DISTRIBUTION AUTHORIZED TO US GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH CONTROLLING DOD OFFICE IN DOD 5230-25; 92-03-08; ARDEC, SMCAR - ESW - A. ROCK ISLAND, IL.

DTM	DESCRIPTION	DATE	APPROVAL
D	REPLACES REV C WITH CHANGE NOR A532005 850424	850715	[Signature]
E	ERR1Z9Z1293H ECPMOK3005 900823	901113	[Signature]
F	NOR MIK2070 910605	910701	[Signature]
G	NOR M2K3003 920909	921003	[Signature]

PART NO. 9325896

WEIGHTS (ESTIMATED)		INDIVIDUAL PRIORITIES		DO NOT SCALE DRAWING UNLESS OTHERWISE INDICATED DIMENSIONS ARE IN INCHES TOLERANCES ON DIMENSIONS IN PARENTS ARE IN INCHES		ORIGINAL DATE OF DRAWING	
NO	NAME OF PART	Y1	Y2	Y3	Y4	DATE	BY
1	BAGGED INNER BOXES 48.0					77-08-30	JIM SPILMAN
2	WIREBOUND PACKING BOX 12.0						PHILIP KORMAN
3	FILLERS 1.0						
4	TOTAL 61.0						

FOR BOX, PACKING

FSCM NO 9325896

APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL
9325893	X781	-	ENR A7K2524	77-08-30	GH
		A	NDR ABS2521 78-12-14	79-3-8	GH



5 X 5 PATTERN
 CELL SIZE 1 21/32 SQUARE X 3 1/2 HIGH

- NOTES:-
- 1- SPEC MIL-A-2550 APPLIES.
 - 2- MATERIAL:- FIBERBOARD, TYPE CF, CLASS DOMESTIC, VARIETY SW, GRADE 125, 1/8" FLUTE, SPEC PPP-F-320.
 - 3- PARTITION SHALL BE SNUG SLIDE FIT IN INNER BOX, 9325893.

CODE IDENT NO.
19200

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
 DOWR, NEW JERSEY 07901

PART NO. 9325892

ORIGINAL DATE OF DRAWING 77-08-30		US ARMY MUNITIONS COMMAND PICATINNY ARSENAL DOWR, NEW JERSEY 07901	
DRAFTSMAN EBS	CHECKER	PARTITION, HALF-SLOTTED	
ENGR GH	ENGR		
ENGR	ENGR		
		SIZE A	CODE IDENT NO. 19200 9325892
		SCALE	UNIT WT SHEET

APPLICATION			REVISIONS		
WEEK ASST	USED ON	SYM	DESCRIPTION	DATE	APPROVAL
9325894	M7BI	B	NOR M5Q2017 / 950424	950809	DR
<p>INSIDE DIMENSIONS 8 13/16 SQUARE X 4 1/4</p> <p>TOLERANCES ON INSIDE DIMENSIONS + 1/16</p> <p>ADVISORY OUTSIDE DIMENSIONS 9 1/8 SQUARE X 4 3/4</p>					
<p><u>NOTES:</u></p> <p>1- SPEC MIL-A-2550 APPLIES.</p> <p>2- MATERIAL- BOX, FIBERBOARD, TYPE CF, CLASS DOMESTIC, VARIETY SW, GRADE 125, "B" OR "C" FLUTE, STYLE RSC/Q201, ASTM D5118.</p>					
					CODE IDENT NO. 19200
DISTRIBUTION STATEMENT A. APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND DOVER, NEW JERSEY 07801		
ORIGINAL DATE OF DRAWING 77-08-30			US ARMY MUNITIONS COMMAND PICATINNY ARSENAL, DOVER, NEW JERSEY 07801		
DRAFTSMAN <i>ES</i>	CHECKER	BOX, INNER			
ENGR <i>ES</i>	ENGR				
ENGR	ENGR				
<i>Tom Spilman</i> <i>Philip Norma</i>		SIZE A	CODE IDENT NO. 19203	9325893	
		SCALE	UNIT WT		

PART 6

HAZARD CLASSIFICATION

USATCES JOINT HAZARD CLASSIFICATION SYSTEM
 LIST OF DATA FROM QUERY BY NSN

Query Date - Aug 08, 1996

COM TSC -----NSM----- DODIC -----ITEM NOMENCLATURE-----
 A Y 1310-01-211-8073 B519 CARTRIDGE, 40MM, PRACTICE, M781, 100 RDS/WBO BOX

IBO HCD CG L1 L2 L3 UNS DER HEW-LBS HEW-KGS NPW-LBS NPW-KGS
 1.4 C 4 0339 8904055 .000051 .000023 .000772 .000350

NEW-LBS NEW-KGS NEWQD-LBS NEWQD-KGS HSC PART-OR-DWG-NO-1 PART-OR-DWG-NO-2
 .000823 .000373 .000823 .000373 9322240 9395853

PART-OR-DWG-NO-3 TECHNICAL NAME PACKAGING CAA
 3325896

PROPER SHIPPING DESCRIPTION
 CARTRIDGES FOR WEAPONS, INERT PROJECTILE or CARTRIDGES, SMALL ARMS 1.4C UN 0339 PGII

ISN COM DOD COMPONENT TSC TRI-SERVICE COORDINATION
 1310-01-211-8073 A ARMY Y YES

DL1 DL2 DL3 DOT LABEL
 4 EXPLOSIVE 1.4

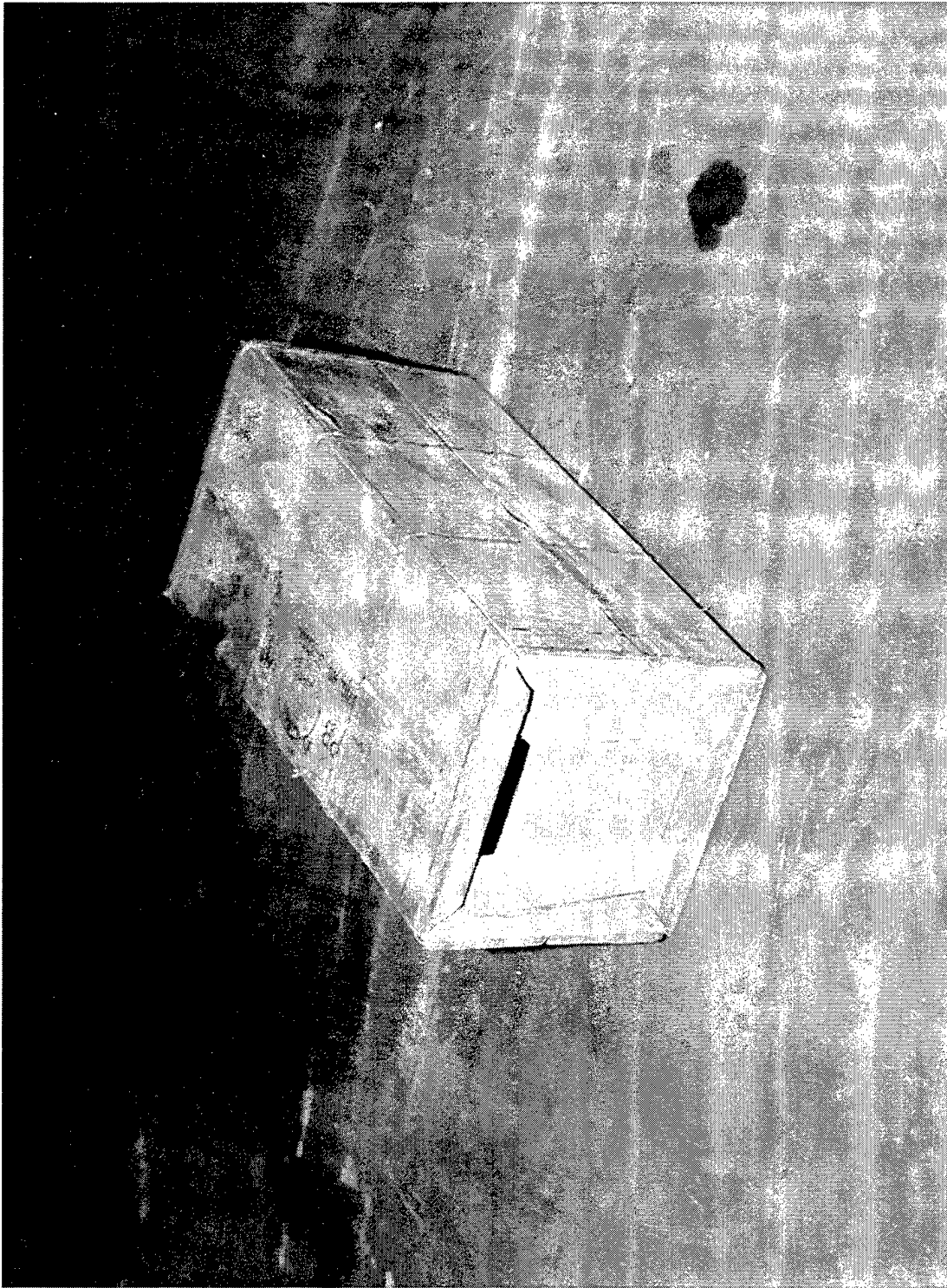
SC HAZARD SYMBOL MEANING

CO HAZARD CLASS DIVISION CG COMPATIBILITY GROUP
 .4 MODERATE FIRE, NO BLAST OR C PKGD PROPELLANTS/PROPELLING CHARGES,
 FRAGMENT DEVICES CONTAINING PROPELLANT

END OF LIST

PART 7

PHOTOGRAPH



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
USADACS-DEV-96-70-01. This photo shows an overview of the item tested.		