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AUTHORITY

APG ltr 19 Nov 1990

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...ment and Proof Services

REPORT NO. DPS/TW-418/15

ARTILLERY DIVISION

REPORT ON

DEVELOPMENT OF SHOT, 90/40-MM, APFSDS, T320 (U)

FIFTEENTH REPORT ON ORDNANCE PROJECT NO. TW-418
(D. A. PROJECT NO. 5A04-03-084)
(PICATINNY ARSENAL TPR NO. TE-174)

O. G. MILLER

FEBRUARY 1959

Aberdeen Proving Ground
Maryland

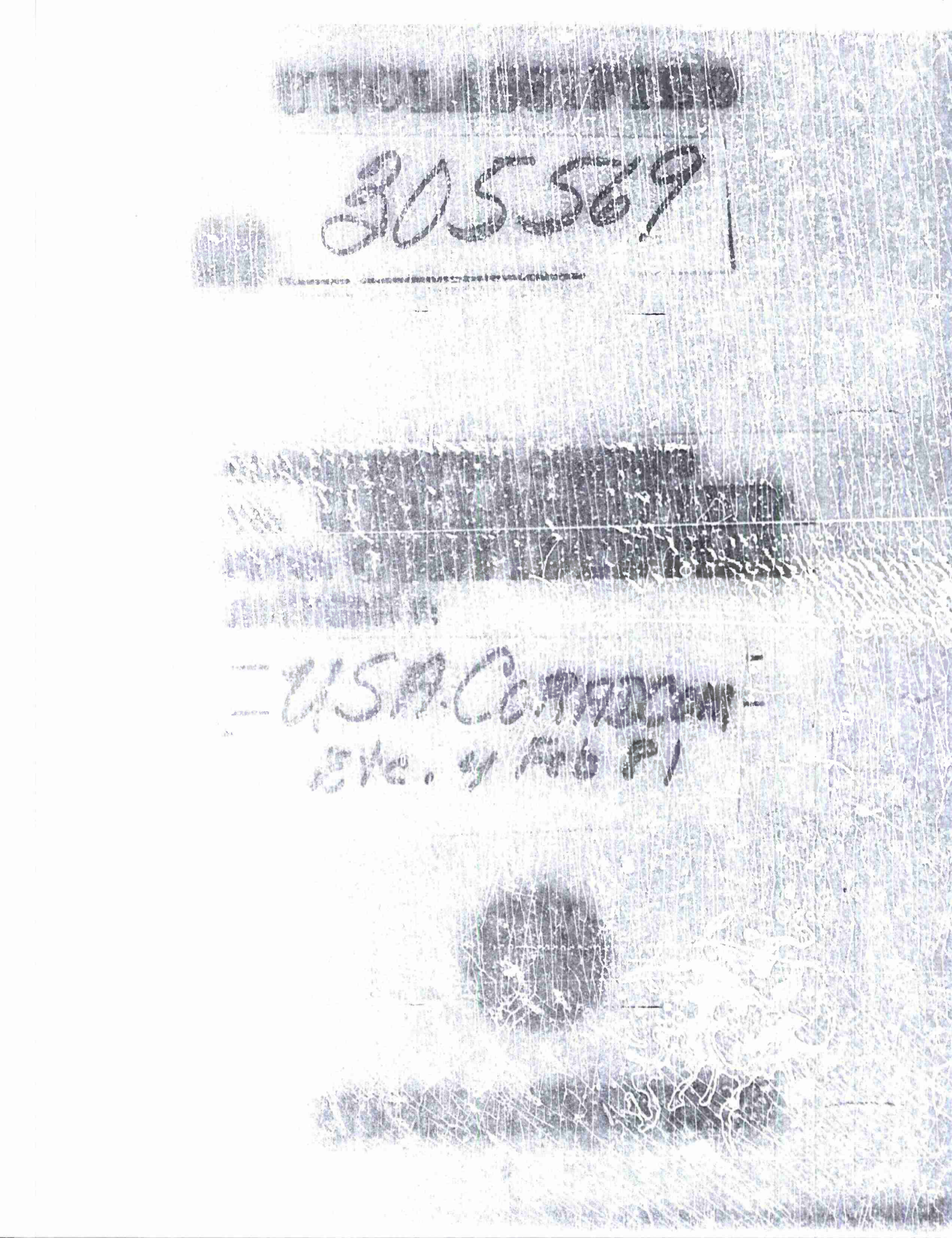
~~CONFIDENTIAL~~

AD- 305569

SECURITY REMARKING REQUIREMENTS

DOD 5200.1-R, DEC 78

REVIEW ON 28 FEB 79



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. BFN55I

AD- 305 569 19/1 19/4

ABERDEEN PROVING GROUND MD

DEVELOPMENT OF SHOT, 90/40-MM, APFSDS, T320 (U)

DESCRIPTIVE NOTE: Rept. no. 15,
FEB 59 1V MILLER,O.G.;
PROJ: TW 41B

UNCLASSIFIED REPORT

DESCRIPTORS: *ARMOR PIERCING AMMUNITION, ARMOR, CARTRIDGES, FIN STABILIZED AMMUNITION, PENETRATION, PROJECTILES, SABOT PROJECTILES, TESTS, VULNERABILITY (U)
IDENTIFIERS: 90-MM ORDNANCE ITEMS, T-320 CARTRIDGES(90-MM) (U)

CONFIDENTIAL

DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND
MARYLAND

AUTHORITY: ORDBB, TPR NO. TE-174
PRIORITY : 1A

OGMiller/jl
11 February 1959

DEVELOPMENT OF SHOT, 90/40-MM, APFSDS, T320 (U)

Fifteenth Report on Ordnance Project No. TW-418

Dates of Test: 28 May to 26 June 1958

ABSTRACT (C)

This test was conducted in order to characterize the 90/40-mm, T320E60 shot as to its plate-penetration capabilities against 4.7-inch-thick rolled homogeneous armor. Sufficient rounds were fired to obtain a protection ballistic limit to determine if the T320E60 shot would penetrate 4.7-inch rolled homogeneous plate at 60 degrees obliquity with a PBL of 4460 fps or less. A six-round protection ballistic limit (three complete penetrations and three partial penetrations), within 150 fps velocity dispersion, of 4585 fps was obtained.

It is concluded that the T320E60 shot will not defeat the above plate condition within the 4460 fps requirement.

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CONTENTS

1. (C) INTRODUCTION

In previous tests with the 90/40-mm, T320 shot, difficulties have been encountered in attaining the ultimate interdependent goals of accuracy (0.15 mil probable error), muzzle velocity (5200 fps) and armor penetration (5 inches at 60 degrees at 2000 yards) because of the excessive aerodynamic and launching stresses imposed on the projectile components. In an effort to provide a round of ammunition within the short time necessary to meet system schedules, it has been decided that it might be desirable to retreat slightly from the original goals, and reduce the muzzle velocity level to approximately 5025 fps to reduce the effects of aerodynamic and in-gun heating. The object of this test was to characterize the projectile with the lowered velocity with respect to armor penetration; specifically, to determine whether the 90/40-mm Arrow projectile is capable of penetrating 120-mm (4.7-inch) rolled homogeneous armor plate mounted at 60 degrees obliquity with a protection ballistic limit of 4460 fps or less. In the event the PBL proved to be in excess of 4460 fps, the PBL was to be determined against 115-mm (4.5-inch) rolled homogeneous armor plate mounted at 60 degrees obliquity.

Subsequent to the firing of the first phase of this test it was decided not to reduce the original goals, and consequently the Picatinny Arsenal representative decided not to fire the second phase of this test (4.5-inch plate at 60 degrees).

2. DESCRIPTION OF MATERIEL

2.1 (C) Items Tested

Cartridge, 90/40-mm, APFSDS, T320E60, for T208 gun, Drawing No. FXP-90022, Lot No. PA-E-26214, without propellant.

2.2 (U) Supporting Materiel

Propellant : MP, M17, 0.070-inch web size, Lot No. RAD-SR-28-57.

Gauges : Pressure, M3, crusher type, copper cylinder Lot No. 9C-55, Frankford Arsenal, annealed Frankford Arsenal 1955.

Gun : 120-mm, T123E1, No. 330.

Tube : 90-mm, T208E4, No. 80217.

Carriage : 155-mm Gun, M1, No. 12.

Recoil : 155-mm Gun, T54, No. 77.

Armor Plate: 4.7-inch-thick rolled homogeneous plate No. 023283, Heat No. 73U078. Average Bhn: 259. Charpy at -40 degrees - 81-79.

3. (C) DETAILS OF TEST

3.1 Procedures

To obtain the protection ballistic limit against 4.7-inch-thick rolled homogeneous armor plate set at 60 degrees obliquity, the plate to be tested was placed in butts constructed from 8-inch-thick armor plate, and the plate wedged at the desired degree of obliquity (60 degrees).

Velocities were obtained by use of velocity coils placed as follows: From muzzle to 1st coil 149.65 feet. From 1st to 2nd coil 83.90 feet. From 2nd coil to plate 60.20 feet.

Chamber pressures were obtained for each round fired by placing two M3 pressure gauges inside the case at time of loading.

A total of nine rounds were loaded with varying propelling charges calculated to give the desired velocities to obtain three complete and three partial penetrations of the plate within the prescribed velocity dispersion limits of 150 fps as prescribed for V50 Ballistic Limit (Protection), Reference OPM-50-10, 11 April 1957.

3.2 Results

A protection ballistic limit of 4585 fps, based upon three complete and three partial penetrations of the plate within 150 fps velocity dispersion was obtained.

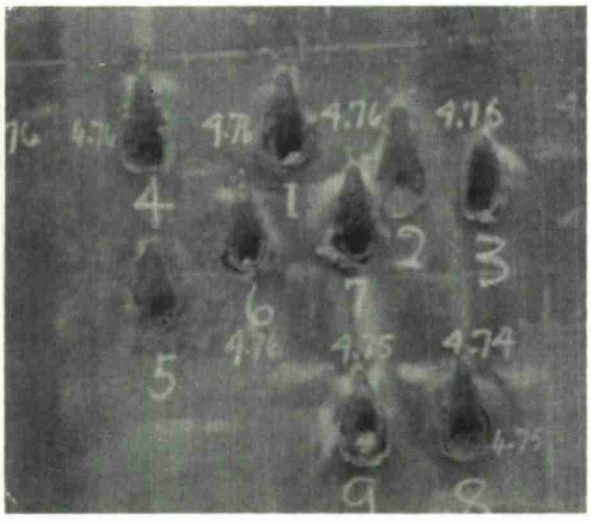

Figure 1 - Front of Plate, 4.7-Inch Rolled Homogeneous Armor.

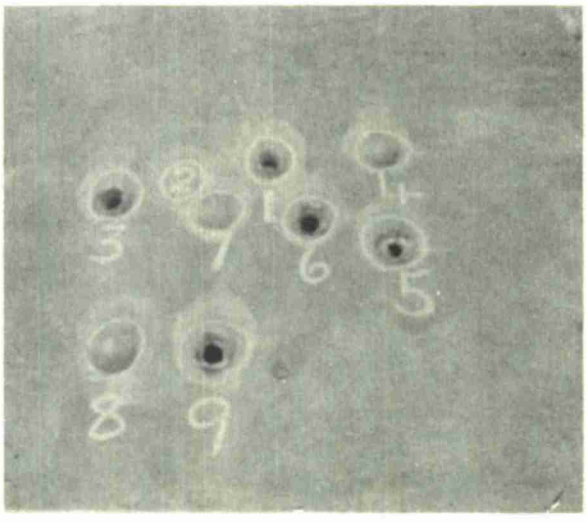

Figure 2 - Rear of Plate, 4.7-Inch Rolled Homogeneous Armor.

4. (C) CONCLUSION

It is concluded that the T320E60 shot will not defeat 4.7-inch armor plate at 60 degrees obliquity within the 4460 fps requirement.

SUBMITTED:

OPIE G. MILLER
CWO-3 Ord Corps
Test Director

REVIEWED:

H. B. ANDERSON
Chief, Artillery
Ammunition Branch

H. A. BECHTOL
Chief
Artillery Division

APPROVED:

H. A. NOBLE
Assistant Deputy Director
for Engineering Testing
Development and Proof Services

REFERENCES

1. Test Program Request Number TE-14, Picatinny Arsenal.
2. Test Program Request Number TE-174, Picatinny Arsenal.
3. OPM 50-10, dated 11 April 1957.

APPENDICES

APPENDIX A

Correspondence

ORDNANCE CORPS
PICATINNY ARSENAL
DOVER, NEW JERSEY

Mr WGMirshak/acm/2277

IN REPLY
REFER TO:
TE5

SUBJECT: Test Program Request No. TE-174 for Cartridge, 90/40mm, APFSDS, T320, Project TW-418.

TO: Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland

ATTENTION: ORDBG-DP-TA, Mr. Youmans

1. Inclosed is Test Program Request No. TE-174, D/A Priority 1A, for testing of the subject round. The cartridges, the description of which is furnished in the inclosed test program request, will be shipped to your Proving Ground in the immediate future. Shipping information and lot numbers will be furnished at that time.

2. Funding Data:

Funds are available under Sub-Project Order No. 70405530-01-11601-01 and Job Order No. 3030-99-901.

3. Coordination:

a. OCO-ORDTW, Attention: Mr. S. Weiss.

b. Aberdeen Proving Ground, Attention: Artillery Ammunition Branch, ORDBG-DP-TA, Mr. Anderson, Extension 33118.

c. Picatinny Arsenal - Engineer primarily responsible for the test is Mr. W. Mirshak, telephone Picatinny Arsenal, Extension 2277.

4. Notification for Test Attendance:

Mr. W. Mirshak will attend the test and requests that notification of test firing date be provided this Arsenal. It is understood that test

17611

ORDBB-TE5
SUBJECT: Test Program Request No. TE-174 for Cartridge, 90/40mm, APFSDS, T320, Project TW-418.

MAY 2 1958 11 AM

scheduling cannot be accomplished until shipping information is provided, (see paragraph 1 above).

FOR THE COMMANDER:

R. H. WOOD
Assistant

1 Incl
1. TPR No. TE-174
6 copies

CC
OCO-ORDTW w/Incl
APG-Comp Office
F.A., ATTN: ORDBA-MIR
W.Blittersdorf w/Incl

Mr. W. G. Mirshak/acm/2277
Test Program Request No. TE-174
(Job Order No. 3030-99-901)
Picatinny Arsenal, Dover, N. J.
9 May 1958

1. Material for Test:

a. 19 each Cartridges, 90/40mm, APFSDS, T320E60, for Gun, T208, Lot PA-E-26214.

b. 350 lbs each Propellant, M17, .070 Web, Lot SR 28-57.

c. 1 each Tube, Gun, T208E4, Ballistic, Serial No. 80217 without muzzle blast deflector (available at Aberdeen Proving Ground).

2. Project Authority:

a. Ordnance Project No. TW-418.

b. Department of the Army No. 5A04-03-084.

c. OCM No. A-489 dated 24 May 1954.

d. Funds available under Sub-Project Order No. 70405530-01-11601-01 and Job Order Number indicated above.

e. Priority: 1A.

3. Object of Development or Experiment:

To develop a satisfactory fin-stabilized, armor-piercing projectile for use in the 90mm Smoothbore Gun for the T95 Tank.

4. History Sketch:

Recent experiences with the 90mm, T320 Shot have indicated that, in order to provide a round of ammunition within the short time necessary to meet systems schedules, it appears necessary to retreat slightly from the ultimate goals of the program. Difficulties have been encountered in attaining the ultimate interdependent goals of accuracy (0.15 mils P.E.), muzzle velocity (5200 f/s) and armor penetration (5"/60° at 2000 yards) because of the excessive aerodynamic and launching stresses imposed on the projectile components.

Test Program Request No. TE-174 (Cont)

As a consequence of this it has been decided to reduce the muzzle velocity level to approximately 5025 f/s at which velocity the effects of aerodynamic and in-gun heating are known to be negligible.

It is now necessary to characterize the projectile with the lowered muzzle velocity with respect to accuracy and armor penetration.

5. Description in Detail of Improvements Made Since Last Proving Ground Test:

None.

6. Local Tests:

None.

7. Object of Test:

To determine whether the 90mm Arrow Projectile is capable of penetrating 120mm (4.7 inches) thick rolled homogeneous armor plate mounted at 60° obliquity with a PBL of 4460 f/s or less.

In the event the PBL against 120mm plate is in excess of 4460 f/s, determine the PBL against 115mm (4.5 inches) thick rolled homogeneous armor, plate mounted at 60° obliquity.

8. Precautions in Handling and Testing:

The usual precautions should be observed in handling and testing APFSDS ammunition.

9. Recommended Test Program:

a. All rounds should be fired from a 90mm T208E4 Ballistic Tube, Serial No. 80217; no blast deflector or tube supports are to be used.

b. Fire sufficient rounds against 120mm thick rolled homogeneous armor plate mounted at 60° obliquity at a range of 100 yards to establish a Protection Ballistic Limit.

c. In the event the Protection Ballistic Limit in paragraph 9b is in excess of 4460 f/s erect a plate 4.5 inches thick in the same manner and establish a Protection Ballistic Limit.

Test Program Request No. TE-174 (Cont)

d. The following instrumentation will be required for all rounds unless otherwise directed by the engineer in attendance:

Record muzzle velocity and chamber pressure.

e. Upon completion of all firing the gun shall be borescoped, stargaged and photographed. Copies of photographs and gun wear charts shall be sent to Watervliet Arsenal and Picatinny Arsenal.

10. References:

Test Program Request No. TE-14 dated 3 January 1957.

11. Report Distribution:

a. Test Report security classification - Confidential.

b. 1 copy - OCO-ORDTW
6 copies - APG ORDBG-DP-TA
4 copies - Picatinny Arsenal
1 copy - ATTN: Inspection Division
1 copy - ATTN: AAD Lab Planning Office
1 copy - ATTN: ORDBB-TH8
1 copy - ATTN: ORDBB-TE5

R. H. WOOD
Chief, Arty Ammo Dev Lab,
Samuel Feltman Ammunition
Laboratories

APPENDIX B

Firing Record

DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND, MARYLAND
FIRING RECORD

Plate Test of Cartridge, 90/40-mm, T320E60 (U)

Firing Record No.: P-63299
Dates of Test: 28 May through 26 June 1958
Authority: Letter Picatinny Arsenal dtd 21 May 1958, File No. ORDBB-TE5-470(TW-418), M&R-CI-58-1567, and TPR TE-174 dtd 9 May 1958

Project No.: TW-418/TE-174
Development

W. O. No. 332-201-11

(C) ITEM TESTED

Cartridge, 90/40-mm, APFSDS, T320E60, for T208 gun, Drawing No. FXP-90022, lot number PA-E-26214.

(U) SUPPORTING MATERIEL

Propellant : MP, M17, 0.070-inch web size, lot number RAD-SR-28-57.

Gauges : Pressure, M3, crusher type, copper cylinder lot number 9C-55, Frankford Arsenal, annealed Frankford Arsenal 1955.

Gun : 120-mm, T123E1, No. 330.

Tube : 90-mm, T208E4, No. 80217.

Carriage : 155-mm Gun, M1, No. 12.

Recoil : 155-mm Gun, T54, No. 77.

Armor Plate: 4.7-inch rolled homogeneous plate No. 023283, United States Steel Corp., Heat No. 73U078. Average Bhn at -40 degrees 259. Charpy at -40 degrees 81-79.

(C) DETAILS OF TEST

To obtain the protection ballistic limit against 4.7-inch rolled homogeneous plate set at 60 degrees obliquity, the plate to be tested was placed

in butts constructed from 8-inch-thick armor plate and wedged at the desired degree of obliquity (60 degrees) with heavy hardwood wedges.

Instrumental and striking velocities were obtained by use of velocity coils located as follows: From muzzle to 1st coil, 149.65 feet. From 1st to 2nd coil, 83.90 feet. From 2nd coil to plate, 60.20 feet.

Chamber pressures were obtained for each round fired by placing two M3 pressure gauges inside the case at time of loading.

To determine the protection ballistic limit, nine rounds were loaded with varying charges calculated to give the desired velocities to obtain three complete and three partial penetrations of the plate within the prescribed velocity dispersion limits of 150 fps.

The T208E4 Tube No. 80217 was star-gauged, borescoped, photographed. Bore impressions were made before and after firing. Star-gauge measurements taken before and after firing are as follows:

	Before Firing (52 Rounds), inches	After Firing (68 Rounds), inches
At 0.1 Inch Forward:	3.669	3.699
At 1.0 Inch Forward:	3.610	3.616
At 2.0 Inches Forward:	3.606	3.611

This test was fired from Position "E", Plate Range on an azimuth of 34 degrees at Aberdeen Proving Ground, Maryland, on 25 and 26 June 1958.

(U) ROUND-BY-ROUND DATA

Round-by-round data may be found in Inclosure 1.

(C) RESULTS

From the nine rounds fired, five complete and four incomplete penetrations of the plate were obtained, for a protection ballistic limit of 4585 fps within a velocity dispersion of 133 fps.

(U) OBSERVERS

Mr. S. Jacobson, Picatinny Arsenal, on 25 and 26 June 1958.
Mr. J. Hegedus, Picatinny Arsenal, on 25 and 26 June 1958.

This firing record forms a part of the Fifteenth Report on Ordnance Corps Project TW-418.

SUBMITTED:

OPIE G. MILLER
CWO-3 Ord Corps
Test Director

REVIEWED:

H. B. ANDERSON
Chief, Artillery
Ammunition Branch

APPROVED:

for HARRY A. BECHTOL
Chief, Artillery
Division

1 Incl
1. Round-by-Round Data.

(C) ROUND-BY-ROUND DATA

Date of Firing: 25 June 1958

Round Number Test	Round Number Tube	Time of Firing[b]	Propellant Charge Wt, lb	Propellant Charge Wt, oz	[a]IV, fps	[b]SV, fps	Chamber Pressure, psi/100	Plate Penetration	Measurement of Penetration, inches Front	Measurement of Penetration, inches Back
18	60	1430	14	6	4789	4779	431	Complete (P)	10-1/2 x 5	3-3/4 x 3-1/2
96	61	1448	13	6	4489	4479	354	Partial (P)	12 x 5-1/2	3/8 bulge
37	62	1510	13	14	Lost	Lost	400	Complete (P)	9-1/4 x 4-3/4	3-1/4 x 4
50	63	1545	13	10	4523	4513	360	Partial (P)	10-1/2 x 5-1/2	1-1/2 bulge
36	64	1600	13	12	4582	4572	378	Complete (P)	10-1/2 x 5-1/2	4-3/4 x 4-1/2
6	65	1612	13	10	4565	4555	368	Complete (P)	10 x 5	5 x 3-3/4
					Date of Firing: 26 June 1958					
15	66	1027	13	10	4597	4587	368	Partial (P)	11 x 5	1-1/4 bulge
79	67	1043	13	12	4646	4636	394	Partial (P)	10 x 5-1/2	Crack (2-in. horiz)
31	68	1110	13	12	4656	4646	391	Complete (P)	10-1/2 x 5-3/4	4-3/4 x 3-1/2

PEL: [c]4585 fps - V50 BL (3 CP (A) and 3 PP (A) within 150 fps).

NOTES: [a]Instrumental velocity at 191.60 ft from muzzle.
[b]Striking velocity at 293.75 ft from muzzle.
[c]Tube Rounds 63 through 68 considered.

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Form ORDMX-1
21 Dec 49 3983

ARMOR DATA CHECK SHEET
SIP-12

ORDNANCE DEPARTMENT
DETROIT ARSENAL

MFG. RECORD NO. 73 U 078	PRIMARY CONTRACTOR: United States Steel Corp
MFG. United States Steel Corp.	FIRING RECORD NO.
ADDRESS Munhall, Pa.	FIRING DATE
MFG. DATE March 26, 1956	SPECIFICATION: MIL-A-12560 (ORD) REVISION AMENDMENT
SHIPPED TO Aberdeen Proving Ground	CONTRACT: DA-36-034-ORD-2091
SHIPPED VIA: FRT XXX XXX	TYPE ARMOR: XXX HOMO ROLLED XXX
PURPOSE: Other XXX XXX XXX	FURNACE: OH XXX ELEC. BASIC XXX
SAMPLE: PRIMARY XXXXX XXXXX	ORDNANCE DISTRICT (OR ARSENAL): Philadelphia Ordnance District - Aberdeen Proving Ground
REPRESENTS: 23011 LBS.	STEEL SOURCE Homestead Dist. Works
CASTING NO.	MATERIAL FOR USE ON: Shell Test

CHEMICAL COMPOSITION

	C	Mn	Si	S	P	Cr	Ni	Mo	
1	.28	.23	.20	.013	.013	1.40	3.37	.41	
2									
3									

STEEL MILL FRACTURE DATA

LOCATION	1ST INGOT	MID. INGOT	LAST INGOT
TOP	B	B	B
MIDDLE			
BOTTOM	B	B	B

HEAT TREATMENT

	CARBURIZE		HOMOGENIZE		NORMALIZE		HARDEN		DRAW		
	TEMP	TIME	TEMP	TIME AT TEMP	TEMP	TIME AT TEMP	TEMP	TIME AT TEMP	TEMP	TIME AT TEMP	COOLANT
1							1652	5 Hours	1168	7 Hours	Water
2							1598	5 Hours	1150	1 Hour	Water

	HEAT NO.	INGOT	SLAB	PLATE NO.	THICK	SIZE	REQ BHN	ACTUAL BHN	HEAT TREATED FRACTURE
1	73U078	4	1	023283	4.7	120"x 144"	241/277	See Below	#1 end-B; #2 End-B
2									
3									

PHYSICAL PROPERTIES

CHARPY AVE. BHN

	TEMP FT LBS	XXXXX	YP psi	ELON % 2"	RA %
1	-40 81-79	259	Cross Sectional	BHN Ave.	
2					
3	AMB. 90-87	259	T 269-255-255-255-255-269	259	

RADIOGRAPHIC INSPECTION

STANDARD	PASSED OR FAILED

REMARKS Surface BHN

End	Top	Bot.
#1	269	269
#2	277	285

Company Representative: /s/ M. J. McMahon
Inspector for Pittsburgh Ordnance District: /s/ W. A. Honse

BALLISTIC TEST RECORD

	TEST	PROJECTILE	OBL.	THKS.	REQD. VEL.	ACT. VEL.	RESULT	REMARKS
1								
2								
3								

PROOF FACILITY SIGNATURES

To be filled in on typewriter (carbon backed) or by hand using India Ink (for reproduction).

MULTIPLE STARGAGE MEASUREMENT & INSPECTION DATA FORM

	NUMBER	MODEL	MANUFACTURER	CASTING NUMBER
90mm TUBE	80217	T208	W.V. T. ARS.	X
120mm GUN	330	T123E1	W.V. T. ARS	X

DATE OF GAUGING: 27-JUNE-58
FIRING STATUS (Check One): BEFORE ☐ AFTER ☑
NUMBER OF ROUNDS: 68
PROOF OFFICER: W.O.332-201-11, TW-418, TE174

90 MM Tube T208E4

Distance Inches From Rear Face of Breech	Distance Inches From Rear Face of Tube	Gage Measurements Indicated in 1/1000" 3.543" Basic Dia. Y	Λ		
269.25	259.75	+.001	+.001		
268.50	259.00	1	1		
267.50	258.00	1	1		
266.00	256.50	1	1		
264.50	255.00	1	1		
259.50	250.00	1	1		
254.50	245.00	1	1		
249.50	240.00	1	1		
244.50	235.00	1	1		
239.50	230.00	1	1		
234.50	225.00	1	1		
229.50	220.00	1	1		
224.50	215.00	1	1		
219.50	210.00	1	1		
214.50	205.00	1	1		
209.50	200.00	1	1		
204.50	195.00	1	1		
199.50	190.00	1	1		
194.50	185.00	1	1		
189.50	180.00	1	1		
184.50	175.00	1	1		
179.50	170.00	1	1		
174.50	165.00	1	1		
169.50	160.00	1	1		
164.50	155.00	1	1		
159.50	150.00	2	1		
154.50	145.00	2	1		
149.50	140.00	2	2		
144.50	135.00	3	2		
139.50	130.00	4	2		
134.50	125.00	5	3		
129.50	120.00	5	4		
124.50	115.00	6	5		
119.50	110.00	7	6		
114.50	105.00	8	7		
109.50	100.00	9	9		
104.50	95.00	11	11		
99.50	90.00	14	13		
94.50	85.00	17	16		
89.50	80.00	21	21		
84.50	75.00	25	25		
79.50	70.00	30	29		
74.50	65.00	35	35		
69.50	60.00	40	40		
64.50	55.00	44	45		
59.50	50.00	49	50		
54.50	45.00	55	55		
49.50	40.00	61	61		
44.50	35.00	67	67		
41.50	32.00	70	70		
39.50	30.00	64	70		
38.50	29.00	68	68		
37.50	28.00	73	72		
37.25	27.75	75	76		
37.00	27.50	73	74		
36.75	27.25	88	87		
36.60	27.10	+.156	+.160		

ORDBG Form 2045-(R) 4 Apr 57 (Part I)

90 MM Tube T208E4								CHAMBER		
DISTANCE (Inches) FROM				GAUGE MEASUREMENTS INDICATED IN 1/1000 OF AN INCH						
					VERTICAL ⊥			HORIZONTAL ⊥		
REAR FACE OF BREECH	MUZZLE FACE	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	GAUGE READING	ACTUAL DIAMETER	DIFFERENCE	GAUGE READING	ACTUAL DIAMETER	DIFFERENCE
36.00		26.50	3.674	3.677"	-.003	3.674	.000	-.003	3.674	.000
35.50		26.00	3.674		+.003	3.680	+.006	+.003	3.680	+.006
34.50		25.00	3.693		.021	3.698	.005	.021	3.698	.005
33.50		24.00	3.716		.044	3.721	.005	.044	3.721	.005
32.50		23.00	3.739		.066	3.743	.004	.066	3.743	.004
31.50		22.00	3.763		.089	3.766	.003	.089	3.766	.003
30.50		21.00	3.786		.114	3.791	.005	.114	3.791	.005
29.50		20.00	3.809		.137	3.814	.005	.137	3.814	.005
28.50		19.00	3.833		.159	3.836	.003	.159	3.836	.003
28.05		18.55	3.843		+.170	3.847	+.004	+.170	3.847	+.004
24.00		14.50	5.875	6.000"	-.124	5.876	+.001	-.124	5.876	+.001
23.50		14.00	5.883		.115	5.885	.002	.115	5.885	.002
22.50		13.00	5.899		.098	5.902	.003	.098	5.902	.003
21.50		12.00	5.915		.081	5.919	.004	.081	5.919	.004
20.50		11.00	5.931		.065	5.935	.004	.065	5.935	.004
19.50		10.00	5.947		.048	5.952	.005	.048	5.952	.005
18.50		9.00	5.963		.032	5.968	.005	.032	5.968	.005
17.50		8.00	5.979		.016	5.984	.005	.016	5.984	.005
16.50		7.00	5.995		+.001	6.001	.006	+.001	6.001	.006
15.50		6.00	6.011		.017	6.017	.006	.017	6.017	.006
14.50		5.00	6.028		.031	6.031	.003	.031	6.031	.003
13.50		4.00	6.044		.048	6.048	.004	.048	6.048	.004
12.50		3.00	6.060		.064	6.064	.004	.064	6.064	.004
11.50		2.00	6.076		.081	6.081	.005	.081	6.081	.005
10.50		1.00	6.092		.098	6.098	.006	.098	6.098	.006
10.00		.50	6.100		.106	6.106	.006	.106	6.106	.006
9.60		.10	6.106		+.111	6.111	+.005	+.111	6.111	+.005

Borescope photographs taken of commencement of main bore at 12:00 and 6:00 o'clock and general view. Impressions were made of commencement of main bore at 12:00 and 6:00 o'clock.

SPECIAL MEASUREMENTS	BASIC	ACTUAL		BASIC	ACTUAL
TOTAL LENGTH OF GUN			ROTATION OF TUBE AT BREECH		
TOTAL LENGTH OF TUBE			MOVEMENT OF TUBE AT BREECH		
DEPTH OF BREECH RECESS			NUMBER OF LANDS AND GROOVES		

Maximum depth of erosion 26.80" from rear face of tube - Vert. 3.764" Horz. 3.762"

Remarks: Borescoped. Moderate brass deposits encircling forward edge of centering cylinder. Moderate copper discoloration encircling commencement and extending forward (approx) 2.00". Heavy to moderate to light erosion encircling commencement of main bore and extending forward to 140.00" from rear face of tube. Heavy to light heat checking from commencement forward to 140.00" from rear face of tube. Light scoring from 36.00" to 48.00", and moderate to heavy scoring from 48.00" to 140.00" from rear face of tube. Heat checking is heavy in eroded area. Longitudnal deposits at various times and distances throughout muzzle half of bore. See APG Photograph Nos. B30476 thru B30478 incl., B30498

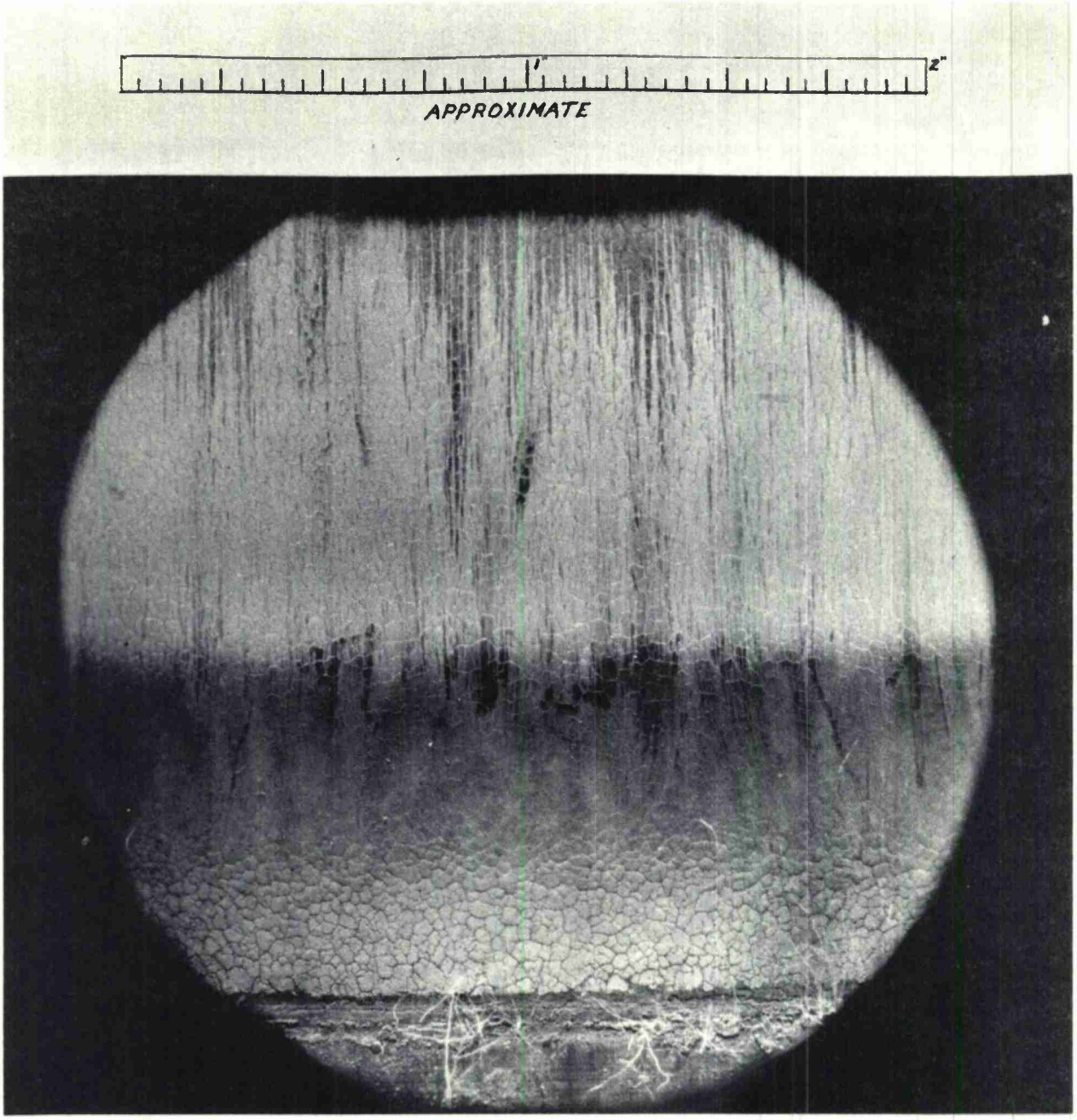
APG STAMPED	STARGAUGED AND INSPECTED BY Booth	REVIEWED BY
RODMAN Boyd	TIME	COMPILATOR
RECORDER Kirk	PLACE 525	GRAPHED BY

ORDBG Form 2045-(R) 4 Apr 57 (Part 2)

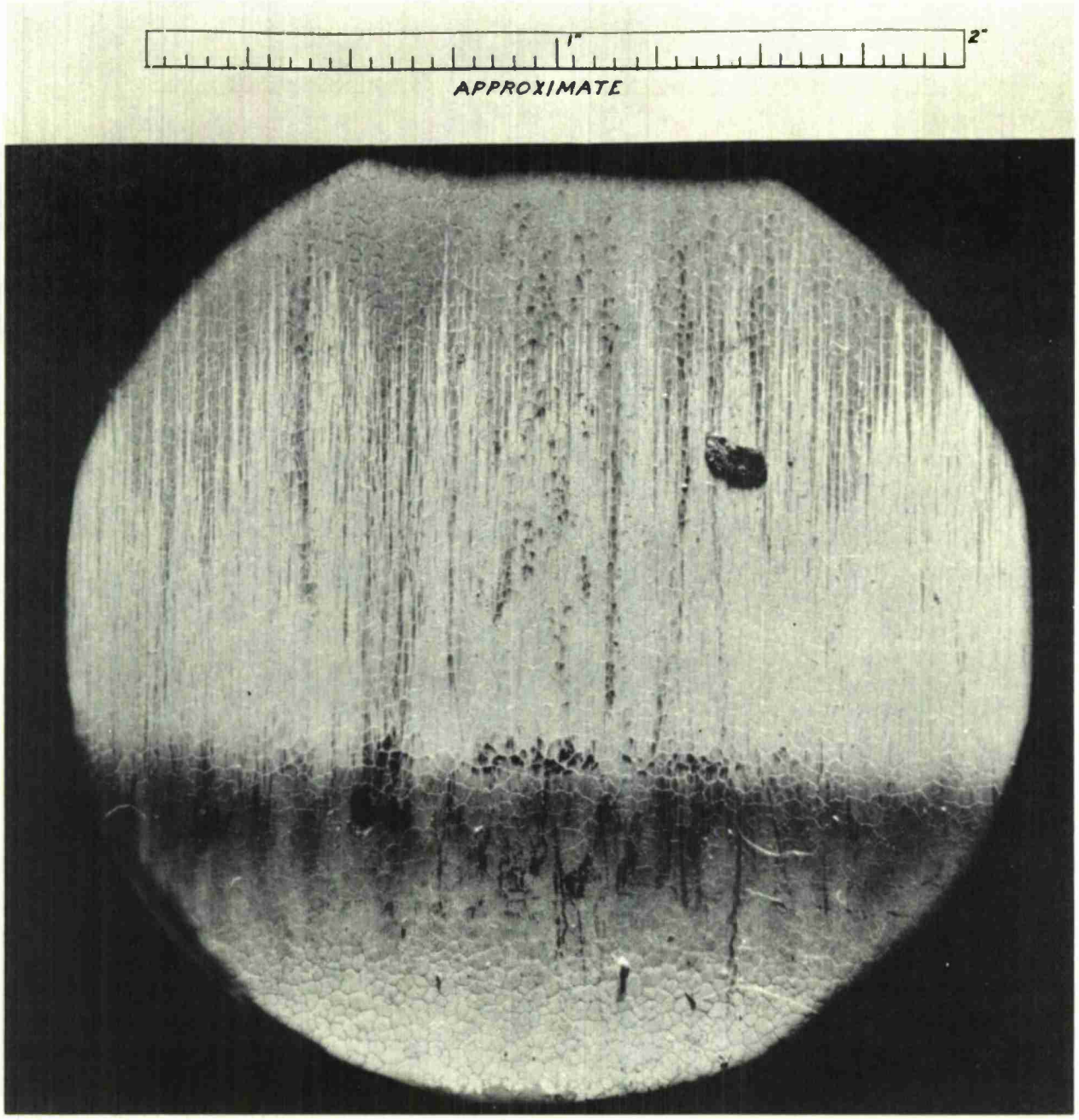
90 7/n Tube # 80217
90 7/n Gun # 330
27 June 58

T208
T123E1
AFTER FIRE 68

W.V.T. ARS.
W.V.T. ARS
1.10.332-201-45 1x1-418 TE172

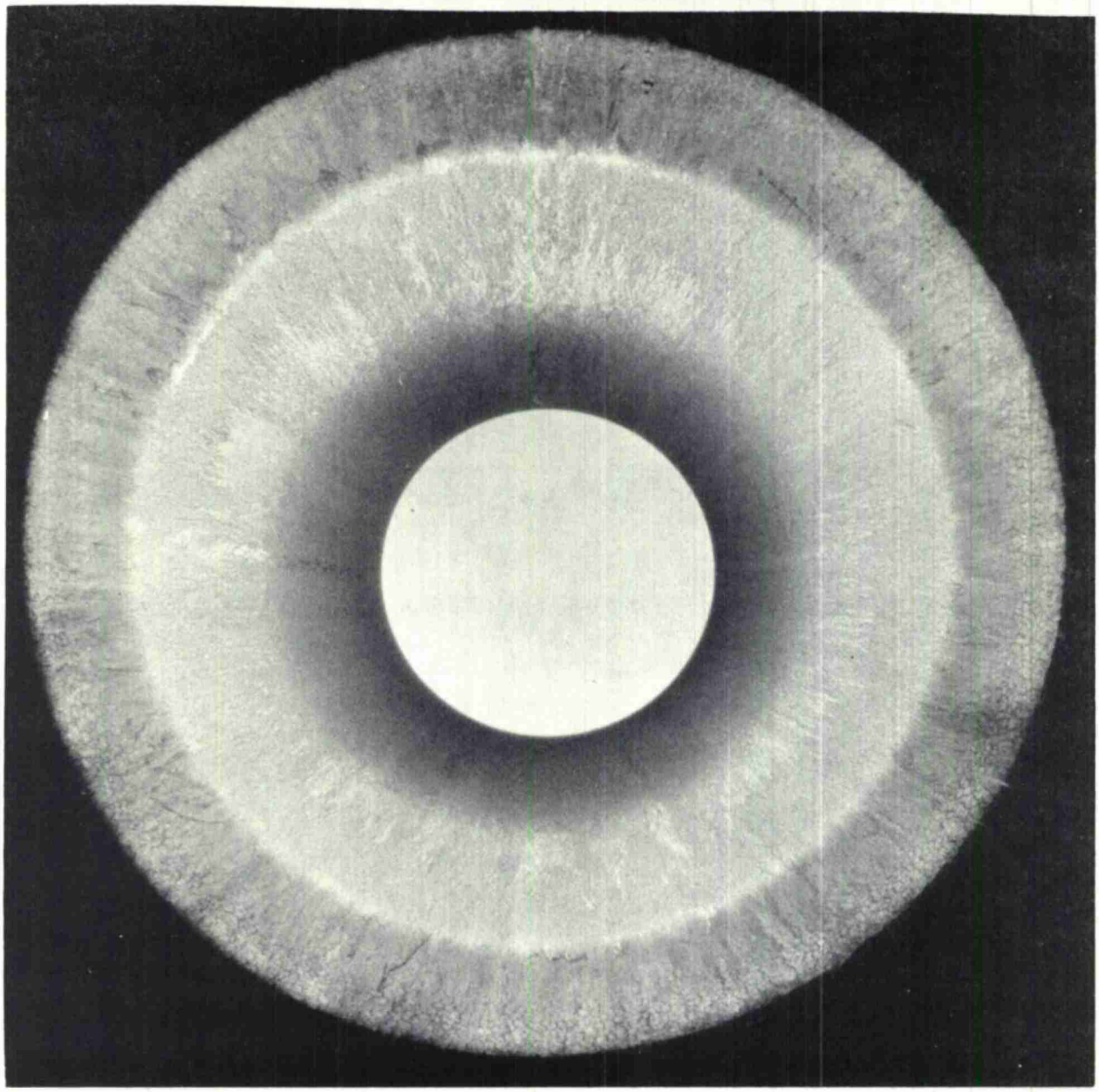


B30476: Bore Photograph Showing Condition of Commencement of Main Bore at 12:00 O'Clock, After Firing 68 Rounds.

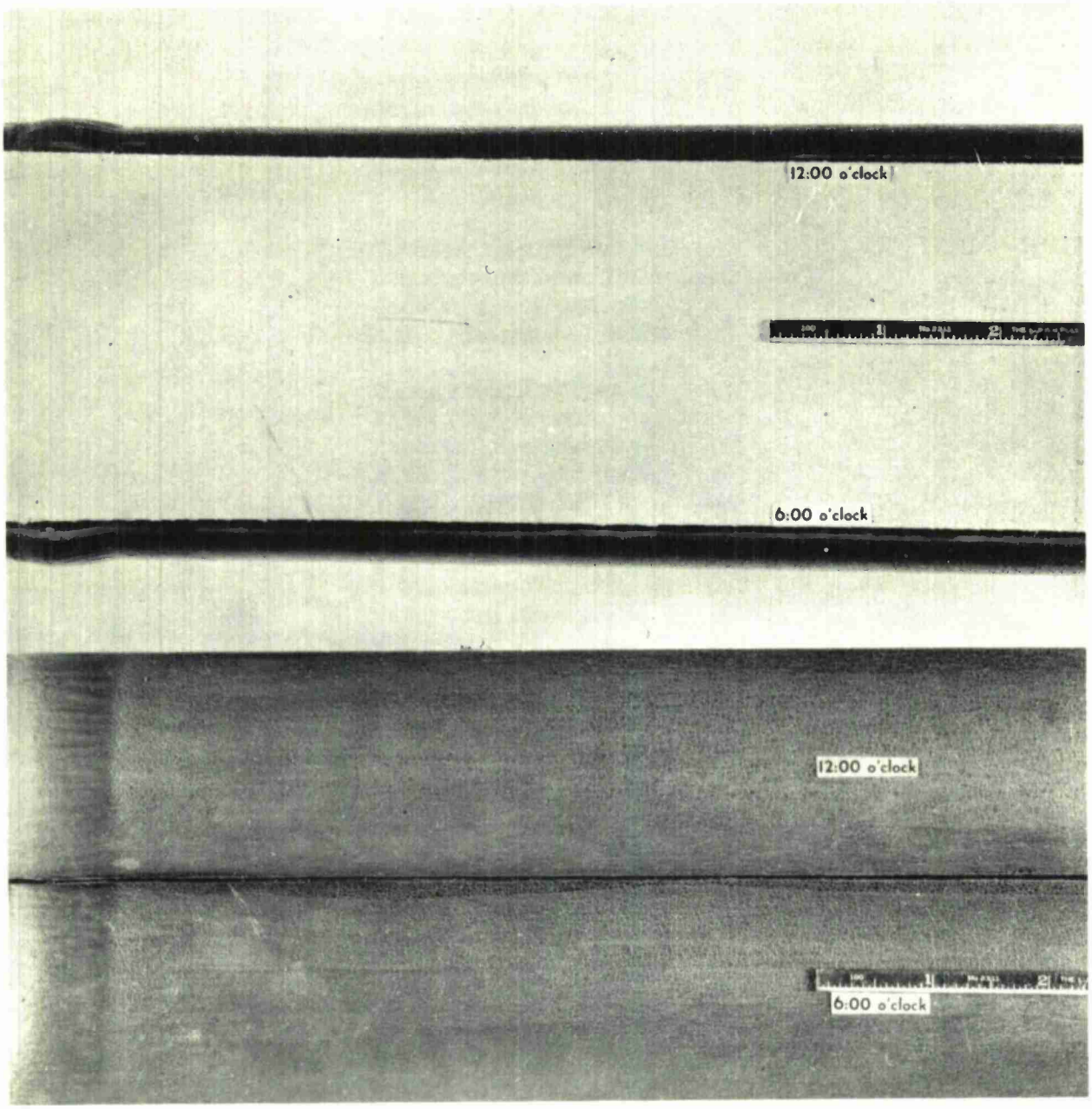


B30477: Bore Photograph Showing Condition of Commencement of Main Bore at 6:00 O'Clock, After Firing 68 Rounds.

12:00 O'clock



B30478: Bore Photograph Showing Condition of Commencement of Main Bore After Firing 68 Rounds.



B30498: Impressions Showing Condition of Commencement of Main Bore at 6:00 and 12:00 O'Clock, After Firing 68 Rounds.

APPENDIX E

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