

PHOTOGRAPH THIS SHEET

AD-A953 788

DTIC ACCESSION NUMBER

LEVEL

INVENTORY

WAL-710/45

DOCUMENT IDENTIFICATION

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

DISTRIBUTION STATEMENT

ACCESSION FOR

NTIS GRA&I

DTIC TAB

UNANNOUNCED

JUSTIFICATION

BY

DISTRIBUTION /

AVAILABILITY CODES

DIST

AVAIL AND/OR SPECIAL

A-1



DTIC
ELECTE
OCT 20 1984
C

DATE ACCESSIONED

DISTRIBUTION STAMP

UNANNOUNCED

DATE RETURNED

84 - 0 17 083

DATE RECEIVED IN DTIC

REGISTERED OR CERTIFIED NO.

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-DDAC

FOR OFFICIAL USE ONLY

LABORATORY INDEXED

710/45



REPORT NO. 710/45

PROGRESS REPORT ARMOR PLATE CASTINGS
PART I

AD-A953 788

~~RESTRICTED~~

By

E. L. Reed

~~RESTRICTED~~

December 10, 1935.
WATERTOWN ARSENAL
WATERTOWN, MASS.

UNCLASSIFIED
FOR OFFICIAL USE ONLY

December 10, 1935

Progress Report

Armor Plate Castings - Part I

Object

To investigate the Physical, Ballistic and Structural Properties of Armor Plate Castings.

Conclusions

1. The results of this test indicate that fine porosity and slightly spongy metal, as revealed by radiographic examination, do not lower the ballistic limit.
2. Variations in the ballistic limit of two castings of the same nominal thickness may be due to small differences in actual thickness.

Experimental Procedure

Eight armor plate castings, rejected at X-Ray examination consisting of two carburetor covers, two right hand shields and two brackets were heat-treated to the required Brinell Hardness 418/444 and subjected to ballistic test at Aberdeen Proving Ground. The castings were tested with caliber .30 M1922 armor piercing 165 gr., core 87.5 gr. and caliber .50 M1 armor piercing 750 gr., core 412 gr. ammunition at a distance of 100 yards.

UNCLASSIFIED
RESTRICTED

The castings were X-Rayed at the areas subjected to the ballistic test.

Experimental Results

A brief summary of the ballistic tests and X-Ray examination is given in Table I. For further details see 99th Partial Report on Test of Thin Armor Plate Ordnance Program No. 4334.

Chemical analyses of the castings are given in Table II.

Discussion

The variation in ballistic limit of the generator covers, Numbers 33 and 38, is due to differences in thickness.

Although right hand shields Numbers 37A and 44A contained .505 and .420% Silicon, respectively, no evidence of brittleness was observed while under the firing tests.

The machining of physical test bars and metallographic samples is now in progress.

Respectfully submitted,

E. L. Reed.

E. L. Reed,
Research Metallurgist

TABLE I

SUMMARY OF RESULTS

Casting	Thickness	Round No.	Ballistic Limit		Penetration	Cal. Location	Depth Pen.	X-Ray Examination
			Lowest Vel. Comp. Pen. f.s.	Highest Vel. Not Comp. Pen. f.s.				
Generator Cover #33	3/8"	5	1832		Complete	.30 AP Crown Top	C.I.P.	Clear metal
"	3/8"	8		1825	Partial	.30 AP Crown Top	.43"	Clear metal
"	3/8"	10	1818		Complete	.30 AP Crown Side	C.I.P.	Clear metal
"	5/16"	9		1853	Partial	.30 AP Crown Side	-	Slightly spongy
Generator Cover #38	7/16"	9	2068		Complete	.30 AP Crown Top	-	Clear metal
"	7/16"	4		2046	Partial	.30 AP Crown Top	.38"	Clear metal
Carburetor Cover #A	7/16"	9	2330		Complete	.30 AP Bulge	-	Slightly porous
"	9/16"	7		2354	Partial	.30 AP Bulge	.48"	Slightly porous
"	3/8"	13	1912		Complete	.30 AP Flat	-	Clear metal
"	3/8"	16		1871	Partial	.30 AP Flat	.46"	Slightly porous
Carburetor Cover #B	3/8"	10	1972		Complete	.30 AP Flat	-	Clear metal
"	7/16"	2		1942	Partial	.30 AP Flat	.46"	Clear metal
R.H.Shield #44A	3/4"	10	1823		Complete	.50 AP Center	-	Clear metal
"	3/4"	5		1843	Partial	.50 AP Center	.62"	Clear metal

TABLE I (Cont'd)

Casting	Thickness	Round No.	Ballistic Limit		Penetration	Cal.	Location	Depth Pen.	X-Ray Examination
			Lowest Vel. Comp. Pen. f.s.	Highest Vel. Not Comp. Pen. f.s.					
R.H. Shield #37A	9/16"	6		2706*	Partial	.30 AP	Center	.38"	-
"	-	8		2763*	Partial	.30 AP	web	Glance	Clear metal
"	3/4"	9		2772*	Partial	.30 AP	Lunette	.49"	Very fine porosity
Bracket #13	3/4"	8	1934		Complete	.50 AP	Raised out-side	-	Some gas porosity
"	3/4"	5		1930	Partial	.50 AP	Raised in-side	.77"	Clear metal
"	7/8"	11	1943		Complete	.50 AP	Raised end	-	Clear metal
"	7/8"	13		1902	Partial	.50 AP	Raised end	.82"	Fine Porosity 1/2" away
Bracket #16	11/16"	14	1831		Complete	.50 AP	Raised out-side	-	Clear metal
"	11/16"	15		1567	Partial	.50 AP	Raised out-side	.66"	Clear metal
"	13/16"	16	1919		Complete	.50 AP	Raised end	-	Clear metal
"	13/16"	18		1861	Partial	.50 AP	Raised end	.66"	Clear metal

*Note: No bal. limit, highest vel. not comp. penetrated

TABLE II

CHEMICAL COMPOSITION

Casting and No.	Heat No.	C %	Mn %	P %	S %	Si %	Cr %	Mo %	Va %	Brinell No.
Generator Cover #33	979	.39	.76	.006	.017	.230	1.36	.565	.24	418
Generator Cover #38	981	.40	.80	.007	.016	.235	1.33	.56	.225	418
Carburetor Cover #A	-	-	-	-	-	-	-	-	-	418
Carburetor Cover #B	-	-	-	-	-	-	-	-	-	444
R.H.Shield #37A	944	.47	.82	.008	.016	.505	1.31	.66	.27	418
R.H.Shield #44A	955	.42	.70	.007	.016	.420	1.22	.715	.255	418
Bracket #13	866	.395	.56	.006	.016	.180	1.22	.50	.225	444
Bracket #16	869	.395	.73	.006	.016	.390	1.31	.56	.24	430